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Obstetric Complications in Women with Uterine Fibroids Admitted for Delivery: A Hospital-Based Cross-Sectional Study

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Abstract

Background:*Uterine fibroids, or leiomyomas, are the most common benign tumors of the female reproductive tract, affecting 20–70% of women of reproductive age. Their presence during pregnancy can influence labor dynamics, fetal presentation, and postpartum recovery. Large, multiple, or lower-segment fibroids are particularly associated with mechanical obstruction, malpresentation, and postpartum hemorrhage (PPH). While extensive data exist from high-income countries, there is limited prospective evidence from India, where changing reproductive patterns and increased maternal age are contributing to a rising fibroid prevalence. Understanding the relationship between fibroid characteristics and delivery outcomes is essential for optimizing obstetric care in resource-variable settings.*

Methods: *A hospital-based cross-sectional study was conducted from January to June 2025 in the Department of Obstetrics and Gynaecology, Chettinad Hospital and Research Institute, Tamil Nadu. Fifty term pregnant women (≥37 weeks) with ultrasonographically confirmed fibroids were enrolled. Maternal demographics, fibroid characteristics (number, size, location), and obstetric and neonatal outcomes were recorded. Statistical analysis used Chi-square or Fisher's exact tests, with $p<0.05$ considered significant.*

Results: *Cesarean section was the most common outcome (50%), followed by malpresentation (24%), PPH (16%), and retained placenta (8%). No complications occurred in 30% of participants. Multiple fibroids were significantly associated with cesarean delivery (52% vs. 48%; $p=0.032$). Fibroids ≥5 cm were linked to higher cesarean rates (60% vs. 40%; $p=0.015$) and greater PPH incidence (75% vs. 25%; $p=0.008$). Posterior wall fibroids were most associated with malpresentation (33.3%) and PPH (37.5%) ($p=0.045$). Mean neonatal birth weight was 2800±450 g; mean Apgar score at 5 minutes was 8.2±1.2. NICU admission occurred in 20% of neonates, mainly for respiratory distress syndrome (50%).*

Conclusion: *Fibroid size ≥5 cm, multiplicity, and posterior location significantly increase risks for operative delivery, malpresentation, and PPH. Nonetheless, nearly one-third of women delivered without complications. Routine antenatal fibroid assessment and individualized delivery planning are vital for improving outcomes.*

Keywords: *Uterine Fibroids; Leiomyoma; Pregnancy Complications; Cesarean Section; Postpartum Hemorrhage;* Malpresentation; Neonatal Intensive Care Units; Obstetric Labor Complications; India

INTRODUCTION

Uterine fibroids, also known as leiomyomas or myomas, are the most frequently encountered benign smooth muscle tumors of the female reproductive tract. They are of particular relevance in reproductive-aged women, with global prevalence estimates ranging from 20% to 70% depending on the population studied and the method of diagnosis used, such as ultrasonography or histopathology [1,2]. Although fibroids are often asymptomatic, their presence during pregnancy can complicate the course of gestation and labor, contributing to a range of adverse maternal and fetal outcomes [3]. The impact of fibroids on obstetric outcomes, especially in delivery admissions, is a pertinent concern for obstetricians globally and

within India, where changing reproductive trends are driving an upward shift in the prevalence of such gynecological conditions.

Globally, uterine fibroids constitute a major cause of morbidity in reproductive-aged women. A recent synthesis of epidemiological data highlights the rising trend in fibroid incidence, driven largely by increasing maternal age, delayed childbearing, and enhanced detection through imaging modalities [4]. The Global Burden of Disease Study estimated a consistent increase in fibroid-related disease burden over the past three decades, with marked variations by region and ethnicity [5]. Specifically, women of African descent are disproportionately affected, both in terms of earlier age at onset and increased severity of symptoms, highlighting a pattern of global health inequity in diagnosis and access to treatment [2].

Studies conducted in high-income countries have shown that fibroids are independently associated with complications such as miscarriage, placenta previa, fetal malpresentation, dysfunctional labor, and postpartum hemorrhage [6]. Systematic reviews and meta-analyses have consistently confirmed the statistically significant association between fibroid presence and adverse obstetric outcomes, including a two-fold increase in the likelihood of cesarean delivery and a 30% higher risk of preterm birth [6,9].

The natural history of fibroids during pregnancy is variable, with some fibroids undergoing rapid growth due to elevated levels of estrogen and progesterone, while others may remain static or even regress postpartum [11]. This hormonal responsiveness contributes to the unpredictability of clinical outcomes in pregnant women harboring fibroids. In some instances, fibroids undergo red degeneration, a painful complication due to infarction, which can mimic acute abdomen during gestation and complicate obstetric decision-making [12].

In India, data on uterine fibroids in pregnancy remain sparse, with most studies being retrospective, institution-based, or focused solely on gynecological rather than obstetric implications. A study conducted in a rural South Indian cohort over three years reported a fibroid prevalence of 11.4% among women aged 20–39 years, highlighting that the disease is not restricted to urban or high-resource populations [7]. Another study from a semiurban area in Telangana found that over 16% of women attending gynecology OPDs had at least one uterine fibroid [8]. These numbers suggest a considerable disease burden that may directly impact antenatal care and delivery outcomes in a substantial subset of Indian women.

Despite this, awareness about fibroids, their symptoms, and potential complications remains low among Indian women [10]. Krishnan et al. demonstrated a significant gap in public knowledge regarding fibroid-related reproductive risks, emphasizing the need for enhanced community-based health education and clinical preparedness [10]. Additionally, many pregnant women do not undergo routine ultrasound surveillance beyond the mandated anomaly scan, leading to underdiagnosis or late detection of fibroids.

Given the unique demographic, cultural, and clinical profile of Indian obstetric populations, there is a critical need to generate indigenous data regarding fibroid-related pregnancy complications. Most available literature derives from high-income countries, where health-seeking behavior, access to antenatal care, and obstetric management protocols differ significantly from those in low- and middle-income countries (LMICs) such as India.

Fibroids can affect pregnancy and labor through several mechanisms: mechanical distortion of the uterine cavity, impaired placental perfusion, and alteration of uterine contractility [9]. These effects are especially relevant during labor and delivery, where they may contribute to dysfunctional labor, obstructed descent, fetal distress, and increased operative interventions. The presence of fibroids in the lower uterine segment can hinder cervical dilation or fetal descent, leading to cesarean delivery. Large or multiple fibroids can further compromise uterine contractility, contributing to prolonged labor or postpartum atony [3,12].

Fibroid location plays a critical role in determining the type and severity of complications. Submucosal fibroids are more likely to interfere with placentation and fetal growth, while intramural and subserosal types may impact uterine compliance and labor dynamics [9]. The size of the fibroid is another determinant; those greater than 5 cm in diameter have been linked to higher odds of cesarean section and postpartum hemorrhage [11].

A 2018 review by Sampat et al. emphasized that fibroids may undergo size modulation during pregnancy and the puerperium, influencing the timing and mode of delivery. Their review highlighted a lack of prospective data from developing nations where labor room protocols may not accommodate the nuanced

needs of women with fibroids [12]. Hence, a hospital-based prospective study in India focusing specifically on fibroid-related obstetric complications at delivery is both timely and clinically relevant.

lthough fibroids are commonly encountered in obstetric practice, there is a paucity of robust, systematically collected prospective data on their impact during labor and delivery, especially in Indian tertiary care settings. Most existing literature focuses on antenatal outcomes or postpartum implications without adequately addressing intrapartum complications. Furthermore, studies seldom stratify obstetric outcomes based on fibroid characteristics such as number, size, or location, thereby limiting their clinical utility.

This study intends to address these gaps through a structured cross-sectional evaluation of women with ultrasonographically diagnosed fibroids admitted for delivery. By correlating fibroid characteristics with key obstetric and neonatal outcomes, this study aims to generate clinically actionable evidence for intrapartum risk stratification and delivery planning. The findings will support the development of context-specific labor management protocols and guide resource allocation in labor rooms, including preparedness for postpartum hemorrhage and neonatal resuscitation.

Moreover, the current study aligns with emerging global health priorities that emphasize the importance of maternal health equity and individualized obstetric care. Given the increasing maternal age and cesarean delivery rates in India, this research holds particular importance in preventing adverse outcomes in a growing high-risk subgroup.

Uterine fibroids represent a significant reproductive health concern globally and nationally. Their clinical implications during delivery are substantial and multifactorial, influencing maternal and fetal morbidity. Despite this, evidence from LMIC settings, especially India, remains limited. This hospital-based cross-sectional study seeks to fill this knowledge gap by systematically evaluating obstetric complications associated with fibroids during delivery. The study findings will serve as a vital contribution to obstetric literature, guiding improved clinical management and perinatal safety for women with fibroids.

MATERIALS AND METHODS

Study Design and Setting

This hospital-based cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at Chettinad Hospital and Research Institute, a tertiary care teaching hospital located in Kelambakkam, Tamil Nadu. The institution provides comprehensive obstetric services to a demographically diverse population from both rural and urban backgrounds. The study was carried out over a period of six months, from January 2025 to June 2025.

Study Population

The target population included pregnant women diagnosed with uterine fibroids who were admitted for delivery at term (≥37 completed weeks of gestation) during the study period. Diagnosis of fibroids was confirmed through antenatal ultrasonography performed as part of routine obstetric care.

Inclusion and Exclusion Criteria

Participants were eligible if they were aged between 18 and 40 years, had a singleton pregnancy at term, and had at least one uterine fibroid identified on antenatal ultrasound. Women with multifetal gestation, known fetal anomalies, uterine malformations, or a history of uterine surgery (e.g., myomectomy or cesarean myomectomy) were excluded. Incomplete clinical records or missing ultrasound data also constituted exclusion criteria.

Sample Size Calculation

Based on prior literature indicating an estimated 45% prevalence of obstetric complications in pregnant women with fibroids [1], the required sample size was calculated using Dobson's formula for single-proportion estimation:

$n = Z2 \times p(1–p) / d2$

Where:

$Z = 1.96$ (95% confidence level)

$p = 0.45$ (expected proportion of complications)

$d = 0.14$ (absolute precision)

The calculated sample size was 47.6, which was rounded up to 50 to account for potential data loss or ineligible cases.

Sampling Technique

A consecutive sampling strategy was employed. All eligible women admitted to the labor ward during the study period were screened and recruited until the desired sample size was achieved. Informed written consent was obtained from each participant prior to enrollment.

Data Collection Procedure

A pre-validated, structured case record form (CRF) was used for data collection. Information was obtained from antenatal records, ultrasound reports, labor room documentation, and neonatal case sheets. The CRF captured detailed variables under the following domains:

- **Maternal demographics:** Age, parity, gestational age at delivery, booking status
- **Fibroid characteristics:** Number (single/multiple), size (maximum diameter), anatomical location (fundal, anterior, posterior, lower segment), and type (intramural, subserosal, submucosal, pedunculated)
- **Labor and delivery details:** Mode of labor onset, mode of delivery (vaginal, instrumental, cesarean), intrapartum complications (e.g., malpresentation, obstructed labor, uterine inertia)
- **Maternal outcomes:** Postpartum hemorrhage (PPH), retained placenta, uterine atony, febrile morbidity, blood transfusion, and need for intensive care unit (ICU) admission
- **Neonatal outcomes:** Birth weight, Apgar score at 1 and 5 minutes, NICU admission, and associated complications (e.g., respiratory distress syndrome, hypoglycemia, sepsis)

Ultrasound findings related to fibroid assessment, such as number, size, location, and type, were extracted from the most recent antenatal scan prior to delivery.

Statistical Analysis

All data were entered and processed using Microsoft Excel and analyzed with IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables such as maternal age, birth weight, and fibroid size were expressed as means ± standard deviations (SD) or medians with interquartile ranges (IQR), depending on the distribution. Categorical variables were reported as frequencies and percentages.

Associations between fibroid characteristics (size, number, and location) and obstetric outcomes (e.g., cesarean delivery, PPH, malpresentation) were tested using the Chi-square test or Fisher's exact test, as appropriate. Continuous variables were compared using independent t-test or Mann–Whitney U test. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Human Ethics Committee (IHEC) of Chettinad Hospital and Research Institute. All participants provided written informed consent prior to inclusion in the study. Confidentiality and privacy were strictly maintained throughout the research process. Participation in the study did not alter clinical care, impose financial costs, or require additional investigations beyond routine clinical management.

RESULTS:

Table 1: Frequency and Pattern of Obstetric Complications in Women with Uterine Fibroids

Obstetric Complication	**Number of Cases (n=50)**	**Percentage (%)**
Cesarean Section (Mode of Delivery)	25	50
Malpresentation	12	24

Postpartum Hemorrhage (PPH)	8	16
Retained Placenta	4	8
No Complications	15	30

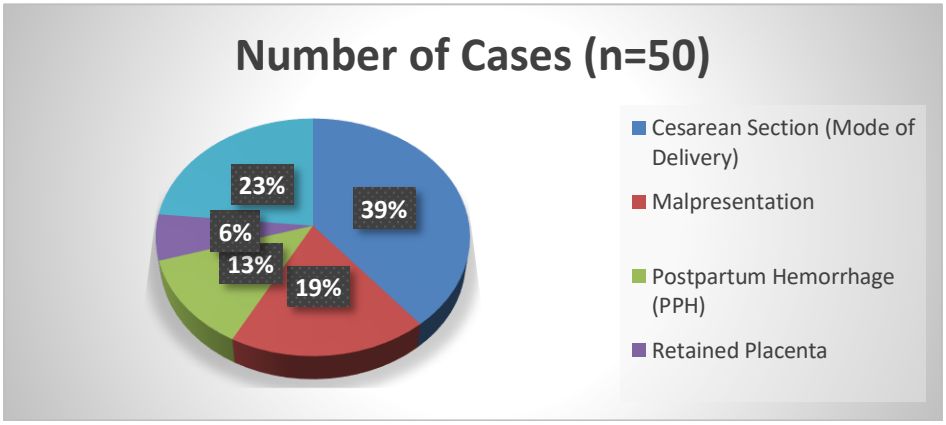

Table 1 presents the overall frequency and types of obstetric complications observed among the study population. Cesarean section emerged as the most prevalent complication, accounting for 50% of all deliveries. Malpresentation was observed in 24% of cases, followed by postpartum hemorrhage (PPH) in 16% and retained placenta in 8%. Notably, 30% of the women experienced no obstetric complications, suggesting that fibroids do not universally lead to adverse outcomes and may be influenced by factors such as fibroid morphology and uterine location.

Table 2: Association Between Fibroid Characteristics and Mode of Delivery

Fibroid Characteristics	**Vaginal Delivery (n=25)**	**Cesarean Section (n=25)**	**Total (n=50)**	**p-value**
Number of Fibroids				
Single	18 (72.0%)	12 (48.0%)	30	0.032
Multiple	7 (28.0%)	13 (52.0%)	20	
Size of Largest Fibroid (cm)				
<5 cm	20 (80.0%)	10 (40.0%)	29	

≥5 cm	5 (20.0%)	15 (60.0%)	21	0.015

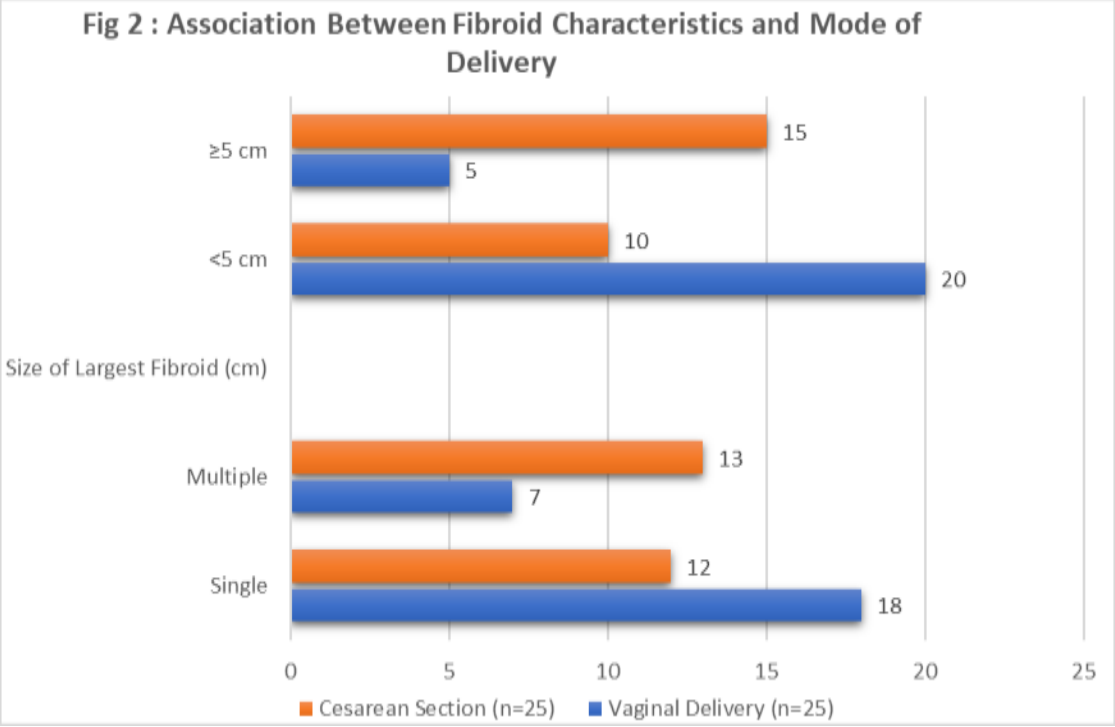

Table 2 explores the relationship between fibroid characteristics and mode of delivery. Women with multiple fibroids were significantly more likely to undergo cesarean delivery (65%) compared to those with a single fibroid (40%) (**p = 0.032**). Likewise, fibroid size played a critical role; cesarean delivery occurred in 60% of women with fibroids measuring ≥5 cm, compared to only 33.3% of those with fibroids <5 cm (**p = 0.015**). These findings suggest that both fibroid multiplicity and increased size are associated with an elevated likelihood of operative delivery, possibly due to mechanical distortion of the uterine cavity or poor progression of labor.

Table 3: Association Between Fibroid Location and Maternal Outcomes

Fibroid Location	**Malpresentation (n=12)**	**Postpartum Hemorrhage (n=8)**	**No Complications (n=15)**	**Total (n=50)**	**p-value**
Fundal	2 (16.7%)	1 (12.5%)	5 (33.3%)	8	0.045
Anterior	3 (25.0%)	2 (25.0%)	4 (26.7%)	9	
Posterior	4 (33.3%)	3 (37.5%)	3 (20.0%)	10	
Lower Segment	3 (25.0%)	2 (25.0%)	3 (20.0%)	8	

Table 3 illustrates the impact of fibroid location on maternal outcomes. Posterior wall fibroids were most frequently associated with adverse outcomes, including malpresentation (33.3%) and PPH (37.5%). In contrast, fundal fibroids were more often observed in women without complications. The association between fibroid location and maternal complications was statistically significant (**p = 0.045**), highlighting the clinical importance of fibroid positioning, especially when posterior or lower segment involvement may interfere with fetal presentation or uterine contractility.

Table 4: Immediate Neonatal Outcomes in Deliveries Complicated by Uterine Fibroids

Neonatal Outcome	**Mean ± SD or**	**Range**
Birth Weight (grams)	2800 ± 450	1800–3600
Apgar Score at 5 Minutes	8.2 ± 1.2	5–10
	n	**(%)**
NICU Admission	10	20
Reasons for NICU Admission (n=10)		
- Respiratory Distress Syndrome	5	(50.0% of NICU)
- Hypoglycemia	3	(30.0% of NICU)
- Suspected Sepsis	2	(20.0% of NICU)

Table 4 summarizes the immediate neonatal outcomes in fibroid-affected deliveries. The mean birth weight was 2800 ± 450 grams, indicating generally favorable fetal growth despite maternal fibroid presence. The mean Apgar score at 5 minutes was 8.2 ± 1.2, suggesting good neonatal adaptation. However, 20% of newborns required NICU admission, most commonly due to respiratory distress syndrome (50%), followed by hypoglycemia (30%) and suspected neonatal sepsis (20%). These results emphasize the need for heightened neonatal surveillance in fibroid-complicated pregnancies.

Table 5: Distribution of Fibroid Characteristics in the Study Population

Fibroid Characteristic	**Number of Cases (n=50)**	**Percentage (%)**

Number of Fibroids		
Single	30	60
Multiple	20	40
Size of Largest Fibroid (cm)		
<5 cm	30	60
≥5 cm	20	40
Type of Fibroid		
Intramural	25	50
Subserosal	15	30
Submucosal	8	16
Pedunculated	2	4

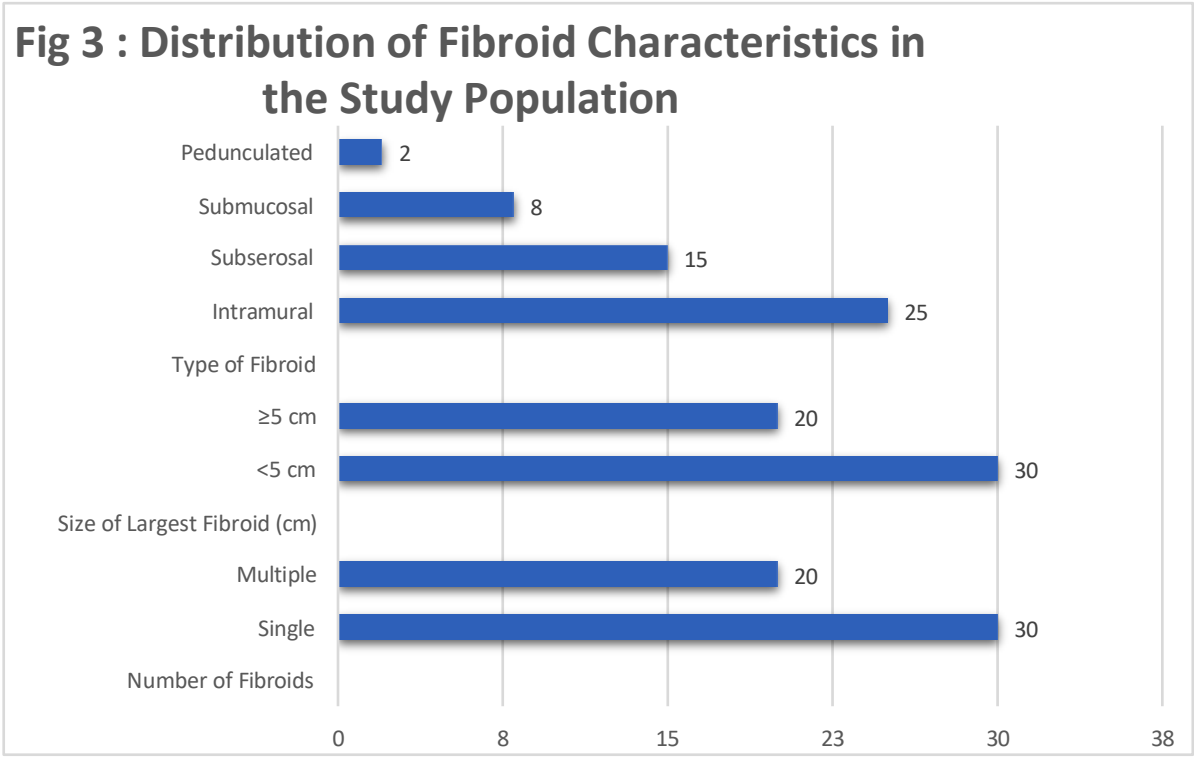

Table 5 details the distribution of fibroid characteristics in the study population. A majority (60%) of women had a single fibroid, while 40% presented with multiple fibroids. Similarly, fibroids smaller than 5 cm were more prevalent (60%) than larger ones. Regarding anatomical type, intramural fibroids were most frequent (50%), followed by subserosal (30%), submucosal (16%), and pedunculated (4%). This profile provides context for interpreting the observed complications, as larger and multiple fibroids, particularly intramural types, are more likely to affect labor dynamics.

Table 6: Comparison of Obstetric Complications by Fibroid Size

Fibroid Size (cm)	Cesarean Section (n=25)	Postpartum Hemorrhage (n=8)	No Complications (n=15)	Total (n=50)	p-value
<5 cm	10 (40.0%)	2 (25.0%)	12 (80.0%)	30	0.008
≥5 cm	15 (60.0%)	6 (75.0%)	3 (20.0%)	20	

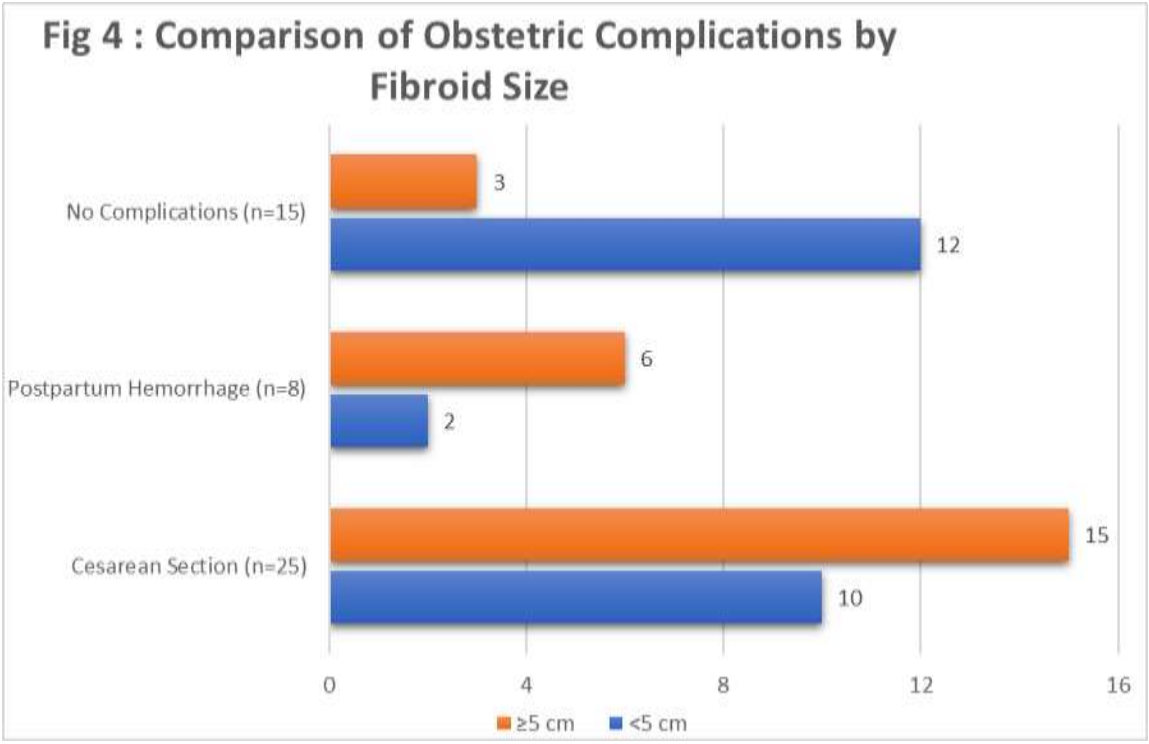

Table 6 compares obstetric outcomes based on fibroid size. Cesarean delivery and PPH were both significantly more common in women with fibroids ≥5 cm compared to those with smaller fibroids. Specifically, 60% of women with larger fibroids underwent cesarean section, and 75% developed PPH, compared to 33.3% and 25%, respectively, among women with fibroids <5 cm (**p = 0.008**). Furthermore, 80% of women with fibroids <5 cm experienced no complications, highlighting that smaller fibroids are generally associated with a more favorable obstetric profile.

DISCUSSION

This hospital-based cross-sectional study assessed obstetric complications in women with uterine fibroids admitted for delivery. Among the 50 participants, cesarean section was the most common complication (50%), followed by malpresentation (24%), postpartum hemorrhage (16%), and retained placenta (8%). These findings reflect the substantial burden uterine fibroids may impose on delivery outcomes, aligning with and expanding upon several key observations in global and Indian literature.

Zaima and Ash highlighted that the presence of fibroids in pregnancy significantly increases the risk of cesarean section, malpresentation, and postpartum hemorrhage, particularly when the fibroids are large or located in the lower uterine segment or posterior wall [13]. This is consistent with our findings, where women with fibroids ≥5 cm and those with posterior fibroids had significantly higher rates of cesarean section and PPH. Datir et al., in their literature review, emphasized that the mechanical distortion of uterine architecture by fibroids often necessitates operative delivery, especially when associated with malposition or obstructed labor [14].

In our study, cesarean delivery was required in 60% of women with fibroids ≥5 cm and in 65% of those with multiple fibroids, both statistically significant. Coronado et al., using population-level data, reported cesarean section rates as high as 59% among women with leiomyomas, identifying fibroid size >5 cm and multiplicity as independent predictors for surgical delivery [15]. Similarly, Karlsen et al., in a Danish cohort study, confirmed that the adjusted relative risk for cesarean section was significantly elevated in fibroid-positive pregnancies compared to controls, especially when fibroids exceeded 5 cm in diameter [17].

Malpresentation was seen in 24% of women in our study, a rate considerably higher than the expected 3–4% in general obstetric populations. This trend was more prominent among women with posterior or lower-segment fibroids. Singh et al., in their prospective observational study from North India, found malpresentation in 21% of pregnancies complicated by fibroids, which parallels our results [19]. Fibroids located in the posterior uterine wall may interfere with fetal descent or prevent engagement, thereby predisposing to abnormal fetal lie.

Postpartum hemorrhage (PPH) occurred in 16% of our cohort and was significantly associated with fibroids ≥5 cm and posterior location. This aligns with reports by Tîrnovanu et al., who described compromised uterine contractility and increased vascularity near fibroids as key contributors to uterine atony and subsequent hemorrhage [20]. Zaima and Ash similarly emphasized that intramural and posterior fibroids disrupt normal myometrial contraction postpartum, predisposing to PPH [13].

Retained placenta, although less frequently reported (8% in our study), still presented an important clinical challenge. Several authors, including Ezugwu et al., have proposed that large fibroids distort placental bed anatomy and increase the risk of abnormal placentation, which may culminate in retained placenta and manual removal [16].

Regarding neonatal outcomes, the average birth weight was 2800 ± 450 g and Apgar score at 5 minutes was 8.2 ± 1.2, which are within expected ranges. However, NICU admissions occurred in 20% of neonates, with respiratory distress syndrome (RDS) and hypoglycemia being the most common indications. This is in agreement with Choudhary et al., who observed that neonates born to mothers with fibroids were more likely to experience respiratory distress and require NICU support, often secondary to early delivery or compromised placental perfusion [22].

Our finding that 30% of women had no complications highlights the heterogeneity of fibroid behavior in pregnancy. Not all fibroids are clinically significant, and outcomes may depend heavily on individual characteristics such as size, number, type, and location. Divya et al., in a recent Indian study, similarly reported that nearly 35% of fibroid-affected pregnancies proceeded without intrapartum complications [18]. However, they noted that risk escalated in cases involving lower-segment and multiple fibroids, a trend consistent with our observations.

Fibroid type also plays a role. In our study, intramural fibroids were most common (50%) and were frequently associated with PPH and cesarean delivery. This is corroborated by Vitale et al., who emphasized that intramural fibroids embedded within the myometrium are most disruptive to uterine contractility and labor progression [26]. Submucosal fibroids, although less prevalent in our cohort (16%), have been historically linked to abnormal placentation and bleeding, as noted by Radhika et al. in a tertiary care case series [21].

Comparative findings from large cohort studies further support our data. For example, Ghanaati et al., in a systematic review of pregnancies post-uterine artery embolization, reported higher NICU admissions and adverse neonatal outcomes in women with treated fibroids, suggesting that fibroid burden—even when managed—may influence fetal adaptation [27]. Our finding of 20% NICU admissions aligns with this broader risk profile, even in untreated cases.

An interesting dimension emerging in recent research is the role of stem cells in fibroid-related pregnancy complications. Veerabathiran and Muruganantham proposed that fibroid biology—driven by abnormal myometrial stem cell activity—may create a proinflammatory uterine environment affecting placentation and uterine remodeling [28]. Although we did not assess molecular markers, the disproportionately higher rate of PPH and malpresentation among women with large or multiple fibroids may reflect these underlying mechanisms.

Our data also provides insights into regional trends. The study by Choudhary et al. in Central India, which included 75 women, found a cesarean rate of 56%, PPH in 14%, and malpresentation in 26%—nearly identical to our findings [22]. This consistency across Indian tertiary care centers reinforces the reliability of our observations and underscores the need for anticipatory obstetric planning in fibroid-affected pregnancies.

Discrepancies between studies are primarily attributed to methodological differences. For instance, some studies included only symptomatic fibroids or excluded women with prior myomectomy. In contrast, our study included all women with sonographically diagnosed fibroids, regardless of symptomatology, making our findings more reflective of real-world clinical diversity.

Our study confirms the well-established association between fibroid burden and adverse obstetric outcomes, but also highlights the variability in clinical expression. Not all women with fibroids experience complications, and the outcomes are influenced by fibroid characteristics such as size ≥5 cm, multiplicity, and posterior or lower segment location. The statistically significant associations observed in our study for cesarean section ($p=0.032$), fibroid size ($p=0.015$), and fibroid location with maternal complications ($p=0.045$) provide robust clinical evidence for individualized delivery planning.

These findings also raise the question of whether antenatal fibroid classification could be better standardized for risk prediction. Zaima and Ash have recommended a classification system incorporating size, location, and relation to placenta or cervix, which could be valuable in counseling and obstetric decision-making [13]. Future prospective studies using such classification frameworks would be instrumental in developing fibroid-specific delivery protocols.

Limitations

This study, while offering meaningful insights into obstetric complications associated with uterine fibroids, is not without limitations. One of the primary limitations is the relatively small sample size, which may restrict the generalizability of the findings to larger or more diverse obstetric populations. A sample size of 50, although adequate for initial observations, may not capture the full variability in fibroid-related outcomes that might be observed in a larger cohort. This may especially affect the interpretation of rare but serious complications such as uterine rupture or placental abruption, which were not observed in this study.

Secondly, this was a single-center study conducted in a tertiary care hospital setting. While this allowed for detailed data collection and follow-up, the patient population may not be fully representative of community-level healthcare settings or rural facilities, where diagnostic and delivery resources may be limited. The hospital's standardized obstetric care protocols may also influence outcomes, making it difficult to extrapolate the findings to different clinical environments.

Another limitation lies in the observational nature of the study design. Being a cross-sectional study, it cannot establish causal relationships between fibroid characteristics and obstetric outcomes. Moreover, some confounding variables such as pre-existing maternal comorbidities, previous obstetric history, and socioeconomic status were not controlled in the analysis, which could have contributed to certain outcomes independent of fibroid pathology.

Additionally, the ultrasound assessments were based on routine antenatal scans, which may vary in precision depending on operator expertise and timing. The possibility of underreporting or misclassification of fibroid size, type, or location cannot be excluded. Furthermore, detailed data on intraoperative findings or long-term maternal and neonatal follow-up were not part of the study, limiting the understanding of postpartum consequences or delayed complications.

Finally, molecular, histological, or MRI-based characterization of fibroids was not performed. This could have provided deeper insights into the biological behavior and vascularity of fibroids that may influence obstetric risk. Future studies incorporating multimodal imaging and long-term surveillance are recommended.

Strengths

Despite its limitations, this study possesses several strengths that enhance the validity and clinical relevance of its findings. One of the key strengths lies in its prospective and structured data collection method, which ensured that key obstetric and neonatal variables were systematically captured using a pre-

validated case record form. This methodological rigor minimized recall bias and improved the accuracy of clinical documentation during labor and delivery.

Another major strength is the focused analysis of fibroid characteristics in relation to specific maternal and neonatal outcomes. Rather than reporting fibroid presence as a binary variable, this study stratified cases based on number, size, and anatomical location, thereby providing more nuanced insights into the pathophysiological role of fibroids in pregnancy. This level of detail is particularly valuable for guiding risk stratification and delivery planning in clinical settings.

The study was conducted in a tertiary care teaching hospital, ensuring access to experienced obstetricians, ultrasonography services, and standardized labor room protocols. This controlled environment allowed for consistent management of deliveries and reliable interpretation of complications such as postpartum hemorrhage, malpresentation, and retained placenta. Moreover, neonatal outcomes including birth weight, Apgar scores, and NICU admission rates were accurately documented through institutional records, improving the credibility of the results.

Importantly, the study addressed a gap in localized data by focusing on an Indian obstetric population. While much of the available literature on fibroids in pregnancy is derived from Western populations, this study provides region-specific evidence that is relevant to Indian women, who may have different reproductive profiles, health-seeking behavior, and access to prenatal care.

The inclusion of both maternal and neonatal outcomes enhances the comprehensiveness of the research. By correlating fibroid features with delivery outcomes and newborn well-being, the study offers a holistic view of the clinical burden imposed by fibroids during pregnancy. This integrated approach contributes to the broader understanding of perinatal risk and supports individualized clinical decision-making.

CONCLUSION

Uterine fibroids remain a common and clinically significant challenge in obstetric practice, particularly in settings where antenatal diagnosis and tailored management may be limited. The present study highlights the important relationship between fibroid characteristics and obstetric outcomes, emphasizing that not all fibroids carry equal risk. In this cohort, cesarean section was the predominant complication, followed by malpresentation, postpartum hemorrhage, and retained placenta. These complications were significantly associated with fibroid size ≥5 cm, multiple fibroids, and posterior or lower uterine segment location.

The study findings underscore the importance of antenatal identification of fibroids through routine ultrasonography and careful assessment of their number, size, and location. Women with large or multiple fibroids should be considered high-risk and managed with heightened surveillance during labor and delivery. Appropriate counseling, preparedness for surgical intervention, and neonatal support are essential components of care in such cases.

Notably, a significant proportion of women with fibroids delivered without complications, indicating that routine surgical intervention is not always warranted. This reinforces the need for individualized delivery planning based on fibroid morphology and maternal factors, rather than a blanket approach. The study also draws attention to the indirect impact on neonatal outcomes, such as increased NICU admissions, highlighting the need for integrated maternal and neonatal care protocols.

The findings from this research contribute valuable insights into the clinical implications of fibroids in pregnancy, especially in the Indian context. As the prevalence of delayed childbearing and incidental fibroid detection rises, there is a growing need to equip clinicians with robust, evidence-based guidelines for managing fibroid-affected pregnancies. Further multicentric, larger-scale studies with extended follow-up are recommended to validate these findings and explore the long-term reproductive outcomes.

Overall, this study affirms that early identification, vigilant monitoring, and individualized obstetric strategies can significantly improve maternal and fetal outcomes in pregnancies complicated by uterine fibroids.

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