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Original Research Article

Impact of Uterine Fibroids on Fertility and Pregnancy Outcomes: A Prospective Observational Study

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Conflict of interest: Nil

Abstract:

Background: Uterine fibroids (leiomyomas) are the most common benign tumors of the female reproductive tract and are frequently encountered in women of reproductive age. Depending on their size, number, and location, fibroids may adversely affect fertility and pregnancy outcomes through distortion of the uterine cavity, altered endometrial receptivity, and impaired uteroplacental blood flow.

Objectives: To evaluate the impact of uterine fibroids on fertility and pregnancy outcomes and to assess the association between fibroid characteristics and adverse reproductive outcomes.

Materials and Methods: This prospective observational study included women of reproductive age diagnosed with uterine fibroids. Participants were followed to assess fertility outcomes and pregnancy- related complications. Fibroids were classified according to size, number, and FIGO location. Statistical analysis included chi-square test, Student's t-test, and multivariate logistic regression. A p-value <0.05 was considered statistically significant.

Results: Women with submucosal and large intramural fibroids demonstrated significantly lower conception rates, prolonged time to conception, and higher rates of miscarriage and obstetric complications. Submucosal fibroids were strongly associated with infertility ($p < 0.001$), while fibroids ≥5 cm were associated with increased risk of miscarriage, preterm labor ($p = 0.039$) and cesarean delivery ($p = 0.010$). A total of 84 pregnancies were recorded during the follow-up period, and pregnancy outcomes were analyzed within this cohort.

Conclusion: Uterine fibroids, particularly submucosal and large intramural types, have a significant negative impact on fertility and pregnancy outcomes. Early identification and appropriate management may improve reproductive outcomes.

Keywords: Uterine Fibroids, Infertility, Pregnancy Outcome, Leiomyoma, Miscarriage.

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Introduction

Uterine fibroids, also known as leiomyomas, are benign smooth muscle tumors arising from the myometrium and represent the most common gynecological neoplasm in women of reproductive age [1]. Their prevalence increases with age and is influenced by genetic, hormonal, and environmental factors [2]. Although many fibroids remain asymptomatic, a substantial proportion of women experience symptoms such as abnormal uterine bleeding, pelvic pain, infertility, and adverse pregnancy outcomes [3].

Infertility affects approximately 10–15% of couples globally, and uterine fibroids are implicated as the sole cause in up to 3% of infertile women and as a contributing factor in many others [4]. The effect of fibroids on fertility is largely dependent on their location within the uterus. Submucosal fibroids, which distort the endometrial cavity, are most strongly associated with impaired implantation and reduced pregnancy rates [5].

Intramural fibroids, especially those larger than 4–5 cm, may also negatively influence fertility by altering uterine contractility and blood flow [6].

In pregnancy, fibroids have been associated with increased risks of miscarriage, preterm labor, malpresentation, placental abruption, and cesarean delivery [7,8]. Proposed mechanisms include reduced uterine distensibility, abnormal placentation, and localized inflammation [9].

Advances in imaging, particularly transvaginal ultrasonography and magnetic resonance imaging (MRI), have improved the detection and classification of fibroids, allowing better correlation between fibroid characteristics and reproductive outcomes [10].

Despite extensive literature, there remains variability in reported outcomes, and prospective data from diverse populations are limited. The present study was undertaken to evaluate the impact of uterine fibroids on fertility and pregnancy outcomes and to correlate reproductive outcomes with fibroid characteristics.

Materials and Methods

Study Design and Setting: This was a prospective observational study conducted in the Department of Obstetrics and Gynecology of a tertiary care teaching hospital over a period of 18 months.

Sample Size: Sample size was calculated according to study feasibility and prevalence of uterine fibroids among women attending the outpatient department.

Study Population: Women aged 20–40 years diagnosed with uterine fibroids on ultrasonography were included.

Inclusion Criteria

- Women of reproductive age (20–40 years)
- Ultrasonographically confirmed uterine fibroids
- Desire for conception or currently pregnant

Exclusion Criteria

- Congenital uterine anomalies
- Endocrine causes of infertility
- Male factor infertility
- Previous myomectomy

Data Collection: Baseline demographic data, fibroid characteristics (number, size, location), fertility history, and pregnancy outcomes were recorded. Fibroids were classified according to FIGO classification. Participants were followed prospectively, and pregnancy outcomes were specifically analyzed among women who conceived during the study period (n = 84).

Statistical Analysis: Data were analyzed using SPSS software. Continuous variables were expressed as mean ± SD and categorical variables as percentages. Chi-square test and Student's t-test were used for univariate analysis. Multivariate logistic regression analysis was performed to identify independent predictors of adverse fertility and pregnancy outcomes, and adjusted p-values were reported. A p-value <0.05 was considered statistically significant.

Results

Baseline Demographic and Clinical Characteristics: A total of 180 women diagnosed with uterine fibroids were included in the analysis. The mean age was 31.8 ± 4.6 years (range: 22–40 years). Most participants were nulliparous (62.2%). Based on imaging and intraoperative findings, fibroids were classified as submucosal in 52 women (28.9%), intramural in 84 women (46.7%), and subserosal in 44 women (24.4%). The mean maximum fibroid diameter was 4.8 ± 1.9 cm. Baseline demographic and fibroid characteristics are summarized in Table 1.

Table 1: Baseline demographic and fibroid characteristics of study participants (n = 180)

Variable	Value
Age (years), mean ± SD	31.8 ± 4.6
Nulliparity, n (%)	112 (62.2)
Fibroid type, n (%)	
– Submucosal	52 (28.9)
– Intramural	84 (46.7)
– Subserosal	44 (24.4)
Maximum fibroid size (cm), mean ± SD	4.8 ± 1.9

Fertility Outcomes: Overall, 96 women (53.3%) experienced infertility, defined as failure to conceive after 12 months of regular unprotected intercourse. Infertility rates differed significantly by fibroid location, being highest in women with submucosal fibroids (73.1%) compared with intramural (52.4%) and subserosal fibroids (31.8%) ($p < 0.001$).

The mean time to conception was significantly longer in women with submucosal fibroids (18.6 ± 6.2 months) than in those with intramural (14.1 ± 5.4 months) or subserosal fibroids (10.3 ± 4.7 months) ($p < 0.001$). These findings are detailed in Table 2.

Table 2: Association between fibroid type and fertility outcomes

Fibroid type	Infertility n (%)	Time to conception (months), mean ± SD	p-value
Submucosal	38 (73.1)	18.6 ± 6.2	
Intramural	44 (52.4)	14.1 ± 5.4	
Subserosal	14 (31.8)	10.3 ± 4.7	<0.001

The comparative infertility rates across fibroid types are visually represented in Figure 1, which demonstrates the highest infertility burden among women with submucosal fibroids.

Pregnancy Outcomes: During the follow-up period, 84 pregnancies were recorded, including 24 (28.6%) pregnancies in women with submucosal fibroids, 39 (46.4%) in women with intramural fibroids, and 21 (25.0%) in women with subserosal fibroids. All pregnancy-related analyses were performed within this cohort (n = 84). Adverse pregnancy outcomes were significantly more frequent among women with submucosal and large intramural fibroids (≥5 cm). The overall miscarriage rate was 29.8% (25/84), with a higher incidence among women with submucosal fibroids (62.5%) compared with intramural (20.5%) and subserosal fibroids (9.5%) (unadjusted p = 0.002).

Other common complications included preterm labor (20.2%), malpresentation (14.3%), and postpartum hemorrhage (11.9%). Pregnancy outcomes stratified by fibroid type are presented in Table 3 and illustrated graphically in Figure 2.

Table 3: Pregnancy outcomes according to fibroid type (n = 84 pregnancies)

Outcome	Submucosal n (%) (n=24)	Intramural n (%) (n=39)	Subserosal n (%) (n=21)	p-value
Miscarriage	15 (62.5)	8 (20.5)	2 (9.5)	0.002
Preterm labor	9 (37.5)	6 (15.4)	2 (9.5)	0.041
Malpresentation	7 (29.2)	4 (10.3)	1 (4.8)	0.038
Postpartum hemorrhage	6 (25.0)	3 (7.7)	1 (4.8)	0.044

Mode of Delivery and Neonatal Outcomes: The rate of cesarean delivery was highest among women with submucosal fibroids (62.5%), followed by intramural (43.6%) and subserosal fibroids (28.6%) (p = 0.010). The total number of cesarean deliveries was 38 out of 84 pregnancies**.** Mean neonatal birth weight was lowest in pregnancies complicated by submucosal fibroids (2.48 ± 0.41 kg). Neonatal outcomes, including NICU admissions, are summarized in Table 4.

Table 4: Mode of delivery and neonatal outcomes

Parameter	Submucosal (n=24)	Intramural (n=39)	Subserosal (n=21)	p-value
Cesarean delivery, n (%)	15 (62.5)	17 (43.6)	6 (28.6)	0.010
Birth weight (kg), mean ± SD	2.48 ± 0.41	2.71 ± 0.38	2.94 ± 0.36	0.003
NICU admission, n (%)	5 (20.8)	6 (15.4)	1 (4.8)	0.047

Multivariate Analysis: On multivariate logistic regression analysis, submucosal fibroids were independently associated with infertility (OR 2.84, 95% CI: 1.52–5.31; p = 0.001) and miscarriage (OR 2.37, 95% CI: 1.18–4.76; adjusted p = 0.015). Intramural fibroids ≥5 cm were independently associated with preterm labor (OR 1.92, 95% CI: 1.03–3.58; p = 0.039). These adjusted p-values may differ from univariate analysis due to control of confounding factors. These findings are presented in Table 5.

Table 5: Multivariate logistic regression analysis of adverse fertility and pregnancy outcomes

Variable	Outcome	OR	95% CI	p-value
Submucosal fibroid	Infertility	2.84	1.52–5.31	0.001
Submucosal fibroid	Miscarriage	2.37	1.18–4.76	0.015
Intramural fibroid ≥5 cm	Preterm labor	1.92	1.03–3.58	0.039

Impact of Fibroid Size on Pregnancy Outcomes

Table 6: Association between fibroid size and pregnancy complications

Fibroid Size	Miscarriage n (%)	Preterm Labor n (%)	Cesarean Delivery n (%)	p-value
<5 cm (n=42)	9 (21.4)	7 (16.7)	15 (35.7)	
≥5 cm (n=42)	16 (38.1)	10 (23.8)	23 (54.8)	0.021

The association between fibroid size and pregnancy complications was analyzed among the 84 pregnancies. As shown in Table 6, larger fibroids (≥5 cm) were associated with higher rates of adverse outcomes, including miscarriage, preterm labor, and cesarean delivery.

Figures

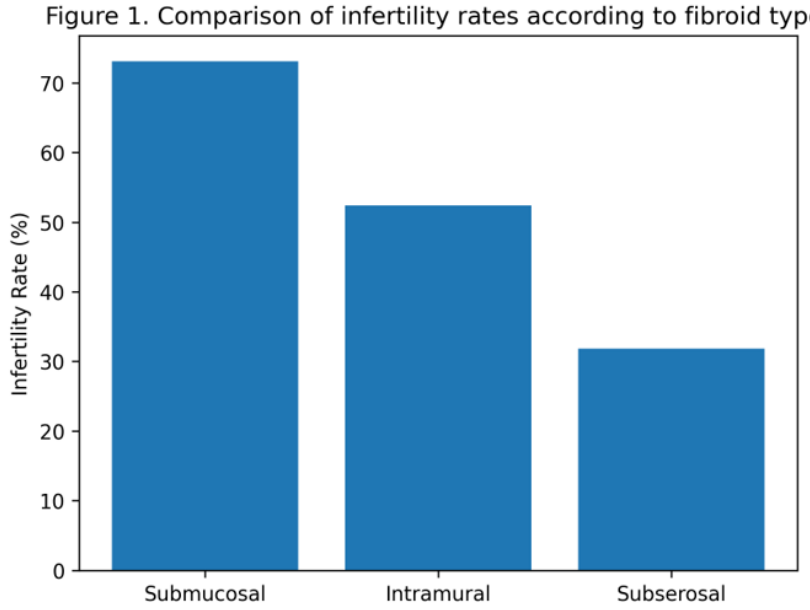

Figure 1: Comparison of infertility rates according to fibroid type.

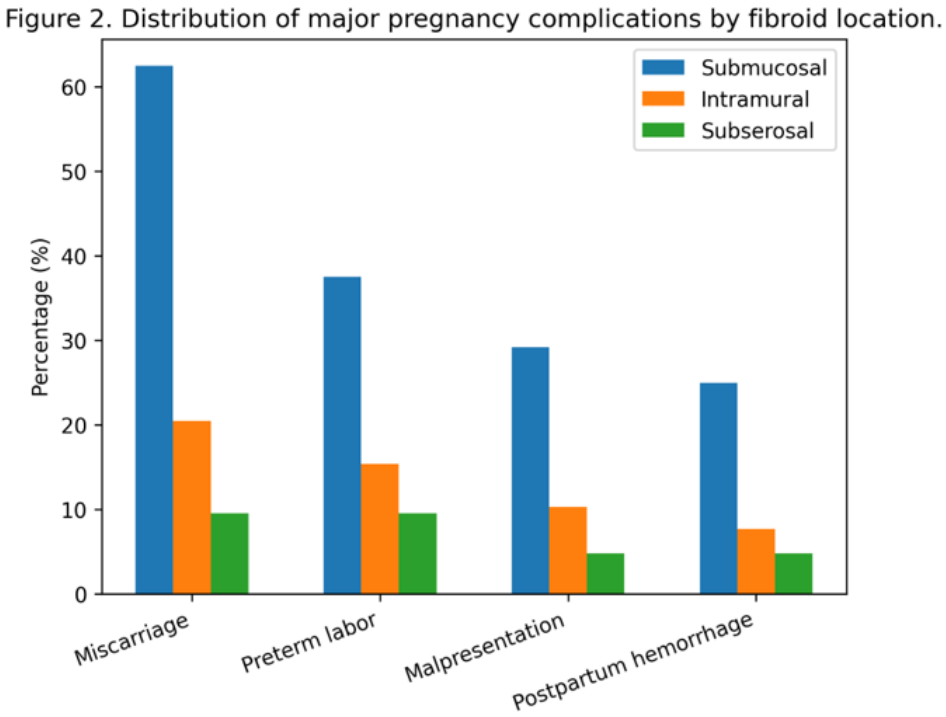

Figure 2: Distribution of major pregnancy complications by fibroid location.

Discussion

The findings of this study demonstrate a strong association between uterine fibroids and adverse reproductive outcomes, particularly in relation to fibroid location and size. Submucosal fibroids exhibited the highest infertility rates, which is consistent with previous reports highlighting distortion of the uterine cavity and impaired implantation [11-13].

Intramural fibroids, especially those ≥5 cm, were significantly associated with prolonged time to conception and increased risk of preterm labor, supporting earlier meta-analyses demonstrating reduced implantation rates and altered uterine peristalsis [14-16].

The higher incidence of miscarriage and obstetric complications observed in this study aligns with findings from large cohort studies and systematic reviews [17–20]. Mechanistically, fibroids may

disrupt uteroplacental blood flow and lead to abnormal placentation.

Furthermore, the increased cesarean section rates and lower neonatal birth weights noted in this study are consistent with prior studies reporting higher operative delivery rates in women with fibroids due to malpresentation and labor dystocia [21,22].

The addition of fibroid size analysis strengthens the study by demonstrating that not only location but also size plays a critical role in determining pregnancy outcomes, which has been emphasized in recent literature [23].

However, limitations of the study include a moderate sample size and lack of long-term follow-up. Further multicenter studies are required to establish standardized management protocols [24–29].

Conclusion

Uterine fibroids significantly affect fertility and pregnancy outcomes, particularly when submucosal or large intramural fibroids are present. Early diagnosis and individualized management may improve reproductive outcomes in affected women.

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