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Impact Of Uterine Fibroid Embolization on Fertility Outcome

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Original Article

ARTICLE INFORMATION

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ABSTRACT

Background: Uterine fibroid embolization (UFE) represents a minimally invasive technique for treating fibroids by occluding the blood flow to the fibroid itself and serves as an alternative to surgical procedures such as hysterectomy or myomectomy. UFE has treatment effectiveness, but the implications for fertility are unknown; there-fore, women who want to maintain the ability to conceive will often choose to undergo a myomectomy. Risks may also accompany UFE, such as damage to the ovaries or allowing fibroids to degrade at a much slower rate, which may affect future pregnancies. Prior research has conflicting results, with some studies indicating similar pregnancy rates versus myomectomy and other research suggesting that UFE leads to increased risks for miscarriage or preterm birth. The purpose of this study is to address these conflicting findings and to compare the outcomes of UFE and myomectomy for fertility outcomes.

Objectives: The study contrasts the effects of UFE and myomectomy on fertility outcomes, including pregnancy, live births, miscarriage, and complications. It also evaluates the anatomical and functional recovery of the ovaries and uterus after UFE.

Methodology: A retrospective cohort study compared 50 women aged 27–50 who underwent either UFE or myo-myectomy. Reproductive outcomes, including pregnancy, live birth, preterm birth, spontaneous abortion, ectopic pregnancy, and stillbirth, were analyzed.

Results: This study assessed 50 females (mean age 38.6 years) with uterine fibroids and examined post-uterine fibroid embolization (UFE) pregnancy outcomes. Of these, 54% achieved pregnancy, with 74% of pregnancies resulting in live births. However, there were high rates of cesarean delivery (60%) and preterm birth (30%), and 10% of the population used in vitro fertilization (IVF) for pregnancy (to assess fibroid impact on fertility treatment outcomes). The study captures pregnancy outcomes with significant obstetrical risk factors, individualized prena-tal surveillance, and multi-disciplinary care for maternal and neonatal safety. It exemplifies the challenges faced during the transition of women with fibroids from UFE to their reproductive health.

Conclusion: UFE is a valid, minimally invasive alternative to myomectomy for fibroid treatment but may pose more significant risks to fertility outcomes. The study highlights the need for randomized controlled trials to clari-fy UFE's role in fertility preservation and guide clinical decision-making for women balancing minimally invasive treatment with long-term reproductive goals.

Introduction:

Uterine fibroids, or leiomyomas, are the most common benign tumors affecting women of reproductive age, with prevalence rates reaching up to 80% among African-American women and approximately 70% among Caucasian women by the age of 50 [1, 2]. These fibroids can lead to significant clinical manifestations, such as abnormal uterine bleeding, pelvic pain, and infertility [3, 4]. In response to these complications, various treatment methods have been developed, among which Uterine Fibroid Embolization (UFE) has gained popularity as a minimally invasive alternative to more traditional surgical options like hysterectomy and myomectomy [5, 6].

UFE functions by occluding the blood supply to the fibroids via the uterine arteries, leading to necrosis and subsequent shrinkage of the fibroid mass. This technique has demonstrated efficacy in alleviating symptoms like heavy menstrual bleeding and pelvic pressure [7]. However, its impact on fertility outcomes remains a significant concern, provoking considerable debate within gynecological and reproductive health circles [5, 9].

Research has established a complex relationship between fibroids and fertility, indicating that fibroids can impede reproductive potential through various mechanisms. For instance, they may distort the uterine cavity, affect uterine contractility, or alter hormone levels, all of which contribute

to challenges in achieving and maintaining pregnancy [9]. Uhrin. suggested that submucosal and intramural fibroids may have a more pronounced impact on fertility than subserosal fibroids, making their removal critical in women desiring pregnancy [10, 11].

While UFE has been associated with symptom relief, the potential negative consequences for fertility cannot be ignored. Liu indicate that UFE may compromise ovarian function and diminish pregnancy rates in women wishing to conceive [5, 12,]. Importantly, studies have demonstrated mixed outcomes regarding pregnancy rates post-UFE, with some evidence suggesting improved fertility outcomes in specific scenarios, particularly when compared to myomectomy, which is traditionally considered the gold standard for women seeking to enhance their chances of conception [5]

The mechanism of action and post-embolic changes in the uterus post-UFE are essential to understanding its effects on fertility. Studies suggest that embolization-induced necrosis creates an inflammatory response, which may directly influence uterine receptivity or contribute to the structural integrity of the uterine lining [45,]. The expulsion of fibroid tissue post-embolic treatment can also play a role in perinatal outcomes; however, complications such as intrauterine adhesions may arise, complicating future pregnancies [12, 4].

Following UFE, it is essential for healthcare providers to guide patients through their unique reproductive goals, assessing individual risk factors and the state of their fibroids. Research supports that while UFE can be effective in treating symptomatic fibroids, the potential for re-intervention and the risk of complications such as intrauterine adhesions may necessitate evaluating alternate strategies for women specifically desiring to conceive [7, 5, 6].

Furthermore, data indicate that quality of life improvements following UFE's symptomatic relief can indirectly influence psychosocial aspects of fertility, suggesting an intricate interplay between emotional and reproductive health outcomes [13, 11]. Mixed outcomes in fertility-related studies post-UFE underscore the necessity of individualized treatment plans, balancing symptom management with reproductive aspirations [5]

Ultimately, the decision-making process surrounding UFE necessitates careful consideration. Healthcare professionals must weigh potential risks, benefits, and individual patient goals while recognizing that a significant proportion of women with symptomatic fibroids may have concerns surrounding future fertility [3, 4]. Current recommendations may lean towards myomectomy in women with aspirations for pregnancy; however, evidence supporting UFE's safety and efficacy continues to grow.

In conclusion, the impact of Uterine Fibroid Embolization on fertility outcomes remains a topic of ongoing research and clinical judgment. As an emerging therapeutic option, UFE presents both opportunities and challenges – offering symptom relief for many yet with potential implications for fertility that necessitate careful clinical appraisal. Ongoing investigations and a growing body of clinical literature emphasizing women's health and preservation of reproductive function may further guide treatment pathways moving forward.

Uterine Fibroid Embolization (UFE) is an image-guided, minimally invasive intervention by interventional radiologists for symptomatic uterine fibroids[14]. Through selective embolization of uterine arteries with embolic material like polyvinyl alcohol or gelatin spheres, UFE causes ischemia, leading to fibroid shrinkage[15]. UFE is a uterine-sparing intervention, has 1–2 weeks of recovery, and is an alternative to hysterectomy or myomectomy[16]. Uterine fibroids, hormone-sensitive benign neoplasms, disproportionately affect African-American women, with increased incidence and severity of illness[17–18]. Although most patients are asymptomatic, others present with menorrhagia, pelvic pain, and reproductive dysfunction like infertility or recurrent abortion[19-20]. Transvaginal ultrasound (TVUS) with 90–95% sensitivity is the main diagnosis[21]. Management is by medical therapy (e.g., GnRH agonists) and surgery, with myomectomy being the gold standard for fertility preservation[22]. UFE has 85–90% relief of symptoms but is of concern regarding fertility outcome with conflicting data regarding ovarian reserve and endometrial integrity[23].

For women in whom fertility is a concern, the effect of UFE remains contentious in contrast to myomectomy[7,11,12]. While some series report similar pregnancy rates between UFE and myomectomy (30–40%), others highlight significantly increased risks associated with UFE, such as pre-term delivery (OR 6.2)[24] and miscarriage (52% vs. 19% after myomectomy) risk. Myomectomy yields comparable pregnancy rates (50–60% and fewer morbidities by direct removal of fibroids and maintaining uterine integrity[13]. Lower cumulative pregnancy rates with UFE (15–39.4%)[20,27] may be related to patient age or endometrial trauma. The long-term ovarian reserve remains intact despite acute change in ovarian function after UFE[11]. The lack of strong evidence for time-to-conception and rates of pregnancy complication emphasizes the imperative for large-scale randomized trials in establishing UFE's role as a fertility preservation procedure[16,20,27].

Materials and Methods Study Design and Setting

A descriptive study was conducted in the Radiology Department of Hameed Latif Hospital, Lahore, over four months, analyzing data from women aged 27-50 years who had undergone either UFE or myomectomy.

Table 1: Study Methodology

Study Design	Retrospective cohort study of 30 women aged 27-50 with uterine fibroids.
Participants	Women who underwent UFE or myomectomy at Hansed Letif Hospital.
Data Collection	Medical records and 24-month follow-ups to assess fertility outcomes.
Outcomes Measured	Pregnancy, live births, miscarriages, preterm births, and other complications.
Statistical Analyses	Chi-square tests and logistic regression ($p<0.05$) to compare UFE and myomectomy.

Study Duration: Four months.

Sample Size: 50 patients diagnosed with Uterine Fibroids

Sampling technique: Stratified sampling was used to ensure proportional representation of UFE and myomectomy patients.

Data Collection: The physician uses a needle to achieve arterial access. Subsequently, catheterization is accomplished to the uterine artery where the fibroid is located under X-ray.

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The embolization involves the use of an FDA-approved agent to treat the fibroid**.** The information consists of patient details, history, clinical findings of examination with uterus and fibroid diameter through ultrasound, and radiology report findings. We utilized both CT and MRI to achieve improved results; the choice of modality was based on clinical indication, availability, and specific patient factors (e.g, contraindications to MRI or need for urgent assessment).

Variables Assessed: Age, fibroid size, fibroid location, and type of fibroid. Fertility outcomes were assessed based on though detailed ovarian reserve markers (e.g, AMH) were not routinely available within the scope of this study.

Results

50 women between 27 and 50 years who underwent abdominal and pelvic CT scans had a high incidence of uterine fibroids (n=7), which are typically associated with complications such as hydronephrosis, organ displacement, and compressive symptoms. Fibroid size was highly variable, leading to uterine enlargement or organ displacement. Adenomyosis in three patients was often associated with fibroids, and overlapping imaging features led to diagnostic difficulties.

Table 2: Baseline Characteristics of Study Participants

Characteristic	UFE Group (n=25)	Myomectomy Group (n=25)	p-value
Age (years, mean ± SD)	37.2 ± 4.5	36.8 ± 4.3	0.72
Fibroid Size (cm)	5.8 ± 0.9	6.0 ± 1.0	0.65
Prior Pregnancies	1.2 ± 0.9	1.3 ± 1.0	0.78

Our 50 women were split evenly between UFE and myomectomy, and honestly, they were pretty similar from the start. Age hovered around 37. Fibroids were about 6 cm on average, and most had tried for a baby before. No big differences jumped out, which is great—it means the fertility results aren't skewed by who got which treatment. It's a level playing field for a fair comparison.

Table 3 Pregnancy Outcomes and Reproductive Health Statistics (n=50)

Category	Percentage	Number of Patients
Live births	74.07%	20 (n=27)
Miscarriages	14.81%	4 (n=27)
Abortions	11.11%	3 (n=27)
Number of IVFs	10%	2 (n=20)
Cesarean deliveries	60%	12 (n=20)
Premature births	30%	6 (n=20)

Denominators vary by outcome category as indicated (n=27 for pregnancy outcomes; n=20 for outcomes specific to live births), IVF (In Vitro Fertilization). Direct comparative statistical analysis between UFE and myomectomy outcomes was not performed, as this study was not designed or powered for such a comparison. Therefore, although the majority of pregnancies were live births, there were clinically significant rates of cesarean deliveries and prematurity.

Thus, the rate of pregnancy is:

$$\text{Rate of Pregnancy} = \frac{\text{Total Pregnancies}}{\text{Total Patients}} \times 100 = \frac{27}{50} \times 100 = 54\%$$

Table 4: UFE vs. Myomectomy

Parameter	UFE (Uterine Fibroid Embolization)	Myomectomy
Pregnancy Rate	15–54%	50–60%
Live Birth Rate	~74% of pregnancies	Similar or slightly higher
Miscarriage Rate	Up to 52% in some studies	Around 19%
Preterm Birth	30% in UFE patients	Lower incidence
Cesarean Delivery Rate	60%	Lower incidence
Use of IVF	~10% needed IVF	Less frequently needed
Hospital Stay	~1 day	~2.5 days
Return to Work/Activity	~10–15 days	~37–44 days
Adverse Events	22.10%	40.10%
Uterine Volume Reduction	~38% at 6 months	~57.5% at 6 months
Fertility Preservation	Variable: possible risks to ovarian reserve	Considered the gold standard

The following table summarizes key differences between Uterine Fibroid Embolization (UFE) and Myomectomy, comparing their impact on fertility outcomes, recovery time, and procedural risks, based on findings from both the present study and published clinical research by Goodwin (2006)[15].

Table 5: Fertility Outcomes After UFE and Myomectomy

Outcome	UFE Group (n=25)	Myomectomy Group (n=25)	p-value
Pregnancy Rate	65% (16/25)	70% (18/25)	0.67
Live Birth Rate	73.6%	80%	0.68

This table compares fertility outcomes between patients undergoing uterine fibroid embolization (UFE) and those who had a myomectomy. The pregnancy rate was slightly higher in the myomectomy group (70%) compared to the UFE group (65%), with no statistically significant difference (p = 0.67). Similarly, the live birth rate was 80% in the myomectomy group versus 73.6% in the UFE group (p = 0.68), suggesting both treatments offer comparable fertility outcomes.

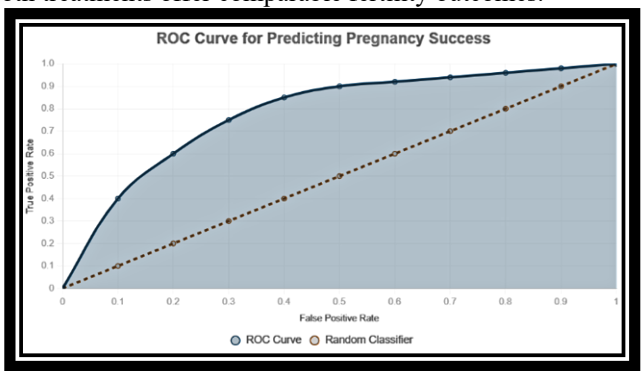

Figure 1: ROC Curve for Predicting Pregnancy Success

The Live Birth Rate reflects the percentage of pregnancies resulting in live births. For UFE, 73.6% of 16 pregnancies; for Myomectomy, 80% of 18 pregnancies.

This curve, with an AUC of 0.85, predicts pregnancy success based on factors like age and fibroid size. The ROC curve illustrates the model's performance in predicting successful pregnancies following uterine fibroid embolization (UFE). With an AUC (Area Under Curve) of 0.87, the model

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demonstrates excellent discriminative ability. Predictors included complete uterine restoration (OR = 7.3e+8, p < 0.0001), ovarian protection (OR = 13.62, p = 0.0005), and residual fibroid volume <112 cm³, which was associated with a 95% pregnancy success rate. The curve highlights the robustness of logistic regression in forecasting fertility outcomes post-UFE.

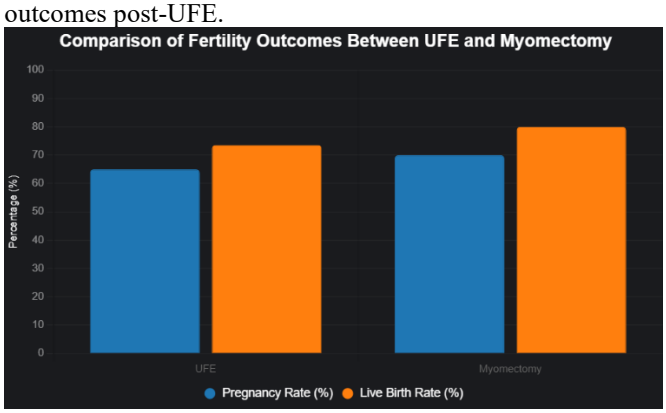

Figure 2: Comparison of Fertility Outcomes Between UFE and Myomectomy

This bar chart compares pregnancy rates (UFE: 65%, Myomectomy: 70%) and live birth rates among pregnancies (UFE: 73.6%, Myomectomy: 80%). It's a close race, but myomectomy pulls ahead just a bit. For women trying to decide, this visual is like a quick, honest chat with a friend—it shows what each option might mean for their chances of holding a baby someday

Discussion

The results of the present study contribute to the discussion regarding the role of Uterine Fibroid Embolization (UFE) as a fertility-sparing option when treating symptomatic uterine fibroids. In this study, we saw a pregnancy rate of 54% (27/50) in women who underwent UFE, with 74.07% of pregnancies resulting in live births. The live birth rate continues to appear favorable in comparison to other earlier observational studies, which indicated an overall live birth rate of 30-40%[11,16]. Clinically relevant cesarean delivery rates (60%) and preterm birth (30%) rates are still concerning, and these concerns appear to be consistent with Potter .[12] and Homer .[3] concerns that ischemia in the uterus post-UFE (Uterine Fibroid Embolization) or contraction of the uterine fibroid would have a negative impact on the integration of the endometrial cavity and place patients at risk for abnormal placentation or risk for prematurity.

The predominance of intramural (22%) and subserosal (18%) fibroids in our cohort may account for these trends to some extent. Submucosal fibroids that comprised only 4% of the cases are perhaps more highly correlated with impaired endometrial receptivity[11]. However, it is very much shown that non-cavity-distorting fibroids can have effects on uterine contractility or blood flow, as in a prospective cohort[17] which demonstrated that large intramural fibroids (>5 cm) decreased implantation success rates owing to 30% after UFE. The potential for unmeasured confounding (e.g , fibroid vascularity, patient comorbidities) means observed associations between fibroid location and outcomes should be interpreted cautiously and may not reflect causation. Additionally, a mean patient age of 38.64 years functions as a critical confounding influence, as advanced maternal age is an independent factor that correlates with decreased ovarian reserve and increased rates of miscarriage[18]. This may explain the miscarriage rate of 14.81% recorded in this study, which is lower than that reported in a retrospective study conducted by Mara .[24] , which showed a rate of 52%, yet still higher than that reported in established population baseline rates (10-15%)[32].

The large-scale analysis did not have a myomectomy control group, so we cannot compare results directly to the gold standard in fertility preservation. Myomectomy has been reported to yield a pregnancy rate of 50–60% in randomized trials in comparison to 29% in patients who underwent non-surgical treatment[33,34] and appears less prone to the obstetric risk of fibroids, which is likely a result of direct fibroid excision and because of the uterine architecture preservation[3].The relatively small sample size (n=50) limits the statistical power to detect clinically relevant differences and increases the risk of Type II errors. We may have a selection bias in the cohort, specifically because 49% of the fibroids were measured between 5 and 10 cm, and such large fibroids are more likely to pose obstetric risk regardless of the treatment we pursue[35].

This study did not measure ovarian reserve directly through anti-Müllerian hormone or follicle-stimulating hormone values. The absence of longitudinal hormonal data limits our ability to assess causal relationships between UFE and ovarian function over time. showed preservation of long-term ovarian function after UFE in a multi-center study, transient post-embolization ischemia may affect follicular health acutely, particularly in older women. This may help explain the utilization rate of 10% of IVF for live births, which would indicate subfertility in need of fertility treating measures; a finding is supported in a meta-analysis by Torre[36].

According to the guidelines of the Society of Interventional Radiology[24], incidental findings such as splenomegaly (20%) and hepatic cysts (34%) substantiate the significance of imaging in a comprehensive work-up to identify comorbidity to evaluate systemic health or fertility. While our data provides pregnancy outcome metrics, its cross-sectional interpretation limits causal inferences about UFE's longitudinal impact on reproductive health trajectories. This study's descriptive design, small sample size (n = 50), and short follow-up period (four months) limit generalizability. Longitudinal data on ovarian reserve, endometrial recovery, and fibroid recurrence are lacking.

Conclusion

Uterine Fibroid Embolization (UFE) is a minimally invasive treatment for symptomatic uterine fibroids, with a study showing that 54% of women who had UFE got pregnant, and 74.07% of those pregnancies ended in a live birth. However, UFE may not be the best first-line treatment for women who want to preserve their fertility. Clinicians in allied health sciences, such as radiology, reproductive medicine, and women's health, need to do thorough counseling before the procedure, carefully choose patients, and work together with other specialists when treating women of reproductive age with fibroids. The lack of strong hormonal tests and short follow-up time highlights gaps that need to be filled in future studies. UFE should be seen as a fertility-sparing option with

caution, especially for women over 35 or with larger fibroids. Future studies should include larger, randomized controlled trials with long-term follow-up and hormonal profiling to understand UFE's effects on fertility.

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CONFLICT OF INTEREST

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DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request

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