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Original Research Article

Maternal and Fetal Outcomes in Pregnancies Conceived after Assisted Reproductive Techniques in a Tertiary Care Center of Western Gujarat

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Abstract:

Background: Assisted reproductive techniques (ART) have revolutionized infertility treatment, enabling many couples to achieve pregnancy. However, concerns persist regarding the safety of ART pregnancies, particularly in terms of maternal and fetal outcomes. This study evaluates maternal and fetal outcomes in ART-conceived pregnancies compared to spontaneously conceived pregnancies in a tertiary care center in Western Gujarat, India.

Material and Methods: A retrospective cohort study was conducted at a tertiary care center in Western Gujarat for a period of 2 years, including 250 ART-conceived pregnancies and 500 age-matched spontaneously conceived pregnancies. Maternal outcomes assessed included gestational diabetes mellitus (GDM), hypertensive disorders, preterm birth, and cesarean section rates. Fetal outcomes included gestational age, birth weight, Apgar scores, and congenital anomalies. Logistic regression and t-tests were used to compare outcomes, adjusting for confounders like maternal age and parity.

Results: ART pregnancies showed a higher incidence of GDM (OR 1.8, 95% CI 1.2–2.7), hypertensive disorders (OR 1.6, 95% CI 1.1–2.4), preterm birth (OR 1.5, 95% CI 1.0–2.2), and cesarean delivery (OR 2.0, 95% CI 1.4–2.9) compared to spontaneous pregnancies. Fetuses from ART pregnancies had lower mean gestational age (37.2 vs. 38.5 weeks, p=0.001) and birth weight (2.8 vs. 3.1 kg, p=0.002). Multiple pregnancies (25% in ART vs. 5% in controls) significantly mediated these outcomes. Congenital anomalies were slightly higher in ART (3.2% vs. 2.0%, p=0.08).

Conclusion: The increased risks in ART pregnancies, particularly for GDM and preterm birth, align with global and Indian studies, likely due to multiple pregnancies and maternal factors. ART pregnancies in Western Gujarat exhibit higher maternal and fetal complications compared to spontaneous pregnancies, primarily driven by multiple gestations. Enhanced prenatal care is warranted to optimize outcomes.

Keywords: Assisted Reproductive Techniques, Maternal Outcomes, Fetal Outcomes, Gujarat, Pregnancy Complications.

Introduction

Assisted reproductive techniques (ART), including in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI), have become increasingly common in addressing infertility worldwide. [1] In India, the use of ART has surged, with an estimated 1–2% of births resulting from these procedures. [2]

However, ART pregnancies are associated with a higher risk of adverse maternal and fetal outcomes compared to spontaneous conceptions, as reported in studies from India and globally. [3] These risks include gestational diabetes mellitus (GDM), hypertensive disorders, preterm birth, and low birth weight, often compounded by the higher incidence of multiple pregnancies in ART. [4,5] The mechanisms underlying these adverse outcomes remain debated, with factors such as advanced maternal age, underlying infertility, and ART procedures themselves implicated. [6] In the Indian context, limited data exist on ART outcomes in specific regions like Western Gujarat, where healthcare access and socioeconomic factors may influence results. Previous studies, such as those from Eastern India, have highlighted regional variations in ART outcomes. [7, 8]

This study is justified by the need to understand regional patterns of ART-related complications in Western Gujarat, where ART services are expanding. Such data can guide local healthcare

providers in optimizing maternal and fetal care, addressing a critical gap in region-specific evidence.

Materials and Methods

This retrospective cohort study was conducted at a tertiary care center in Western Gujarat, India, for 2 years. The study included 250 ART-conceived pregnancies (IVF or ICSI) and 500 age-matched spontaneously conceived pregnancies as controls. Ethical approval was obtained from the Institutional Ethics Committee, and informed consent was waived due to the retrospective design. Data were collected from electronic medical records, ensuring confidentiality and compliance with ethical guidelines. All ART procedures were performed by experienced reproductive medicine specialists, and pregnancies were managed per standard obstetric protocols.

Inclusion criteria for the ART group included singleton or multiple pregnancies conceived via IVF or ICSI, with delivery occurring at the study center. The control group comprised age-matched (±2 years) women with spontaneous pregnancies delivering during the same period. Exclusion criteria included pregnancies with pre-existing chronic conditions (e.g., diabetes, hypertension), incomplete medical records, or those lost to follow-up before delivery. Women with non-ART fertility treatments (e.g., ovulation induction alone) were also excluded to ensure homogeneity. Both groups were restricted to women aged 20–40 years to minimize age-related confounding.

Data on maternal outcomes (GDM, hypertensive disorders, preterm birth, cesarean section) and fetal outcomes (gestational age, birth weight, Apgar scores, congenital anomalies) were extracted. GDM was diagnosed per Indian Council of Medical Research (ICMR) guidelines, and preterm birth was defined as delivery before 37 weeks. Continuous variables (e.g., birth weight) were analyzed using independent t-tests, and categorical outcomes (e.g., GDM) were compared using chi-square tests. Multivariable logistic regression adjusted for confounders (maternal age, parity, BMI) was used to estimate odds ratios (OR) with 95% confidence intervals (CI). Mediation analysis assessed the role of multiple pregnancies. A p-value <0.05 was considered significant.

Results

The study included 250 ART pregnancies (60% IVF, 40% ICSI) and 500 spontaneous pregnancies. Maternal characteristics showed no significant differences in age (mean 32.4 vs. 31.8 years, p=0.12) or BMI (mean 24.8 vs. 24.5 kg/m², p=0.34). However, ART pregnancies had a higher rate of nulliparity (65% vs. 40%, p<0.001) and multiple gestations (25% vs. 5%, p<0.001).

Table 1: Maternal Complications in ART vs. Spontaneous Pregnancies

Outcome	ART (n=250)	Spontaneous (n=500)	OR (95% CI)	p-value
Gestational Diabetes	18% (45)	10% (50)	1.8 (1.2–2.7)	0.005
Hypertensive Disorders	15% (38)	9% (45)	1.6 (1.1–2.4)	0.02
Preterm Birth (<37 weeks)	20% (50)	12% (60)	1.5 (1.0–2.2)	0.04
Cesarean Section	60% (150)	35% (175)	2.0 (1.4–2.9)	<0.001

Table 2: Fetal Outcomes in ART vs. Spontaneous Pregnancies

Outcome	ART (n=250)	Spontaneous (n=500)	p-value
Gestational Age (weeks)	37.2 ± 1.8	38.5 ± 1.5	0.001
Birth Weight (kg)	2.8 ± 0.5	3.1 ± 0.4	0.002
Apgar Score (5-min)	8.5 ± 0.7	8.8 ± 0.6	0.03
Congenital Anomalies	3.2% (8)	2.0% (10)	0.08

Table 3: Outcomes in Singleton ART vs. Spontaneous Pregnancies

Outcome	ART Singleton (n=188)	Spontaneous Singleton (n=475)	OR (95% CI)	p-value
Gestational Diabetes	15% (28)	9% (43)	1.6 (1.0–2.6)	0.05
Preterm Birth	12% (23)	8% (38)	1.4 (0.8–2.4)	0.07
Cesarean Section	55% (103)	33% (157)	1.8 (1.2–2.7)	0.003

Table 4: Outcomes in Multiple ART vs. Spontaneous Pregnancies

Outcome	ART Multiple (n=62)	Spontaneous Multiple (n=25)	OR (95% CI)	p-value
Preterm Birth	45% (28)	28% (7)	2.1 (1.1–4.0)	0.03
Low Birth Weight (<2.5 kg)	50% (31)	32% (8)	1.9 (1.0–3.6)	0.04
NICU Admission	30% (19)	20% (5)	1.7 (0.8–3.5)	0.06

ART pregnancies exhibited significantly higher rates of GDM, hypertensive disorders, preterm birth, and cesarean delivery compared to spontaneous pregnancies. Fetal outcomes showed lower gestational age and birth weight in ART pregnancies, with a trend toward higher congenital anomalies, though not statistically significant. Mediation analysis revealed that multiple pregnancies accounted for approximately 85% of the increased risk of preterm birth and low birth weight in ART pregnancies.

Discussion

This study highlights increased maternal and fetal risks in ART-conceived pregnancies in a tertiary care center in Western Gujarat, consistent with global and Indian literature. The higher incidence of GDM (18% vs. 10%) aligns with a Chinese study reporting a 1.6-fold increased risk in ART pregnancies, attributed to hormonal manipulations and underlying maternal factors. [9] Similarly, an Eastern Indian study found elevated GDM rates in ART pregnancies, suggesting regional consistency in India. [10]

Hypertensive disorders were more frequent in ART pregnancies (15% vs. 9%), corroborating a Brazilian cohort study that noted a 1.3-fold risk, largely mediated by multiple pregnancies. [11]

A meta-analysis of twin pregnancies further confirmed higher hypertensive risks in ART conceptions. [12] The increased cesarean section rate (60% vs. 35%) in our study mirrors findings from a Chinese cohort, where ART pregnancies had a 1.8-fold higher cesarean rate, possibly due to cautious obstetric management. [9]

Preterm birth rates were elevated in ART pregnancies (20% vs. 12%), consistent with a global meta-analysis reporting a 1.26 odds ratio for preterm birth at <37 weeks in ART twins. [12] An Indian study [10] from Eastern India also noted higher preterm rates in ART pregnancies, emphasizing the role of multiple gestations.

Fetal outcomes, including lower gestational age and birth weight, align with a Brazilian study where ART infants had reduced birth metrics, mediated by multiple pregnancies. [11] A pilot study comparing IVF and ICSI outcomes reported lower birth weights in ICSI conceptions, similar to our findings (40% ICSI in our cohort). [13]

Congenital anomalies showed a non-significant increase in ART pregnancies (3.2% vs. 2.0%), consistent with a meta-analysis reporting a 1.17 odds ratio for malformations in ART twins. An Indian study from a tertiary center noted similar trends, suggesting ART procedures may contribute to subtle developmental risks. The high rate of multiple pregnancies (25% in ART vs. 5% in controls) significantly mediated adverse outcomes, as confirmed by our mediation analysis. This finding underscores the need for single embryo transfer (SET) protocols to reduce complications, as advocated in global ART guidelines. [10,12]

This study is limited by its retrospective design, which may introduce selection bias. The sample size, particularly for multiple pregnancies, may have underpowered some analyses. Additionally, data on specific ART protocols (e.g., fresh vs. frozen embryo transfer) were not consistently available, limiting further subgroup analysis.

Conclusion

This study demonstrates that ART-conceived pregnancies in a tertiary care center in Western Gujarat are associated with higher risks of maternal complications, including gestational diabetes, hypertensive disorders, preterm birth, and cesarean delivery, compared to spontaneous pregnancies. Fetal outcomes, such as lower gestational age and birth weight, are also adversely affected, primarily due to the higher incidence of multiple pregnancies in ART. These findings align with Indian and international studies, emphasizing the need for tailored obstetric care in ART pregnancies. Strategies such as promoting single embryo transfer and enhancing prenatal monitoring could mitigate these risks. Future research should focus on larger prospective studies and the impact of specific ART protocols to further refine clinical management and improve maternal and fetal outcomes in this population.

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