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Original Research Article

Maternal and perinatal outcomes in pregnancies conceived after infertility treatment at a tertiary care centre in Chhattisgarh: a prospective observational study

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ABSTRACT

Background: Infertility affects 10-15% of couples in India, with increasing reliance on ovulation induction, intrauterine insemination (IUI), and assisted reproductive technologies (ART). Pregnancies conceived following infertility treatment have been associated with higher maternal and perinatal risks. Objective of this study was to evaluate maternal and fetal complications in pregnancies conceived after infertility treatment and identify factors influencing maternal-neonatal morbidity.
Methods: A prospective observational study was conducted over 12 months at a tertiary care center in Chhattisgarh. Sixty antenatal women who conceived after infertility treatment (OI, IUI, IVF, fertility-enhancing surgery) were enrolled. Demographic, clinical, obstetric, and neonatal outcomes were analysed using descriptive statistics.
Results: Mean maternal age was 31.8 years; 68.3% had primary infertility. PCOS was the most common female cause (56.7%). IVF accounted for 40% of conceptions, while OI+TI accounted for 43.3%. Medical complications included gestational hypertension (26.7%), GDM (26.7%), IHCP (16.7%), and preeclampsia (3.3%). PROM occurred in 15%, and preterm labor in 5%. LSCS rate was high (78.3%), with 87.5% of IVF pregnancies delivered by LSCS. Neonatal outcomes showed 31.8% low birth weight and 7.6% very low birth weight infants. Preterm delivery occurred in 23.3%.
Conclusions: Pregnancies conceived after infertility treatment especially those resulting from IVF, older maternal age, PCOS, obesity, and long-standing infertility were associated with higher risks of hypertensive disorders, GDM, PROM, preterm birth, LSCS, and low birth weight. Enhanced antenatal surveillance and multidisciplinary management are essential to optimize outcomes.

Keywords: Assisted reproductive techniques, Fertilization *in vitro*, Pregnancy complications, Premature birth, Infant, Low birth weight, India

INTRODUCTION

Infertility is increasingly recognized as a global public health challenge, affecting nearly one in six couples worldwide. The World Health Organization (2023) estimates that 15-20% of reproductive-age couples experience difficulty conceiving, with significant psychosocial and economic consequences.[1] In India, prevalence varies widely, from 3.9% in rural regions to as high as 16.8% in urban centers, reflecting disparities in lifestyle, environmental exposures, and healthcare access.[2,3]

Assisted reproductive technologies (ART), including ovulation induction, intrauterine insemination (IUI), and in vitro fertilization (IVF), have revolutionized infertility

management, enabling millions of couples to achieve parenthood. However, pregnancies conceived through these interventions are biologically distinct. Altered hormonal milieu, supraphysiologic ovarian stimulation, and embryo manipulation may predispose to abnormal placentation, metabolic dysfunction, and adverse maternal-fetal outcomes.

Studies worldwide have shown increased maternal risks such as hypertensive disorders, gestational diabetes mellitus (GDM), caesarean delivery, placental abnormalities, and multiple gestations.[6,9,10] Neonates from ART pregnancies show higher rates of prematurity, low birthweight, NICU admissions, and perinatal morbidity.[7,9,13]

Despite extensive global literature, regional data from central India remain scarce. Chhattisgarh, with its unique demographic profile predominantly semi urban, with limited tertiary ART centers offers an important setting to evaluate outcomes. This study therefore aimed to systematically assess maternal and perinatal complications among pregnancies conceived after infertility treatment at a tertiary care center in Bhilai.

METHODS

A prospective observational study was conducted in the Department of Obstetrics and Gynecology, JLNHRC, Bhilai, December 2023 to November 2024 for 12 months. Ethical clearance was obtained from the institutional review board, and informed consent was taken from all participants.

Study population

Sixty antenatal women who conceived following infertility treatment were enrolled. Sampling was consecutive, including all eligible women presenting during the study period.

Inclusion criteria

Pregnant women who conceived after infertility treatment (OI, IUI, IVF, fertility-enhancing surgery).

Exclusion criteria

The study excluded spontaneously conceived pregnancies and women who did not deliver at the study institution.

Data collection

Data were collected using a structured proforma that recorded demographic details, type and duration of infertility, method of conception, and the presence of maternal medical and obstetric complications. Information on gestational age at delivery and mode of delivery was documented. Neonatal outcomes assessed included birth weight, APGAR scores, and the need for neonatal intensive care unit (NICU) admission.

Definitions

Preterm birth was defined as delivery before 37 completed weeks of gestation. Low birth weight (LBW) was defined as a birth weight of less than 2.5 kg, while very low birth weight (VLBW) was defined as less than 1.5 kg. Gestational diabetes mellitus (GDM) was diagnosed using the DIPSI15 criteria. Gestational hypertension was defined as blood pressure ≥140/90 mmHg detected after 20 weeks of gestation.

Statistical analysis

Data were analysed using Microsoft Excel 2021. Frequencies, percentages, means, and standard deviations were calculated. Associations between risk factors (e.g., obesity, PCOS) and complications were explored descriptively.

RESULTS

Demographic profile

The mean age of the study population was 31.8±4.9 years. The most common age group was 31-35 years, comprising 36.7% of participants. A majority of women were primigravida (68.3%), and 83.3% had booked pregnancies, indicating regular antenatal care utilization.

Infertility characteristics

Primary infertility was observed in 68.3% of women. The duration of infertility was 1-5 years in 80% of cases. Among female factor infertility, polycystic ovarian syndrome (PCOS) was the most common cause (56.7%), followed by diminished ovarian reserve (15%) and tubal block (15%). Male factor infertility included oligospermia (5%) and azoospermia (3.3%).

Method of conception

Figure 1 illustrates the distribution of modes of conception in the study population. Ovulation Induction with Timed Intercourse (OI+TI) was the most frequently utilized method, accounting for 43.33% of pregnancies, followed closely by in vitro fertilization (IVF) in 40%. Smaller proportions conceived through Intrauterine Insemination with Husband's semen (IUI-H) (5%) and intrauterine insemination with donor semen (iui-d) (3.33%), while intracytoplasmic sperm injection (ICSI) accounted for 1.67%. Spontaneous conception with timed intercourse (SPONT+TI) was observed in 6.67% of cases. Among the four women who conceived spontaneously, three had polycystic ovary syndrome (PCOS) and one had hyperprolactinemia, suggesting that appropriate endocrine management may restore ovulatory function and facilitate

conception without advanced assisted reproductive techniques in selected patients.

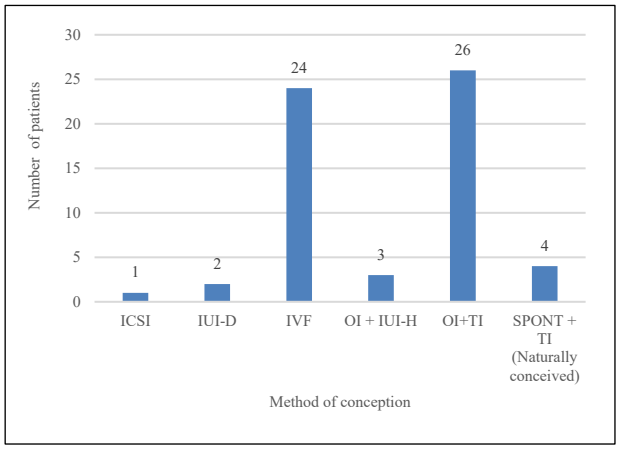

Figure 1: Distribution of patients according to method of conception.

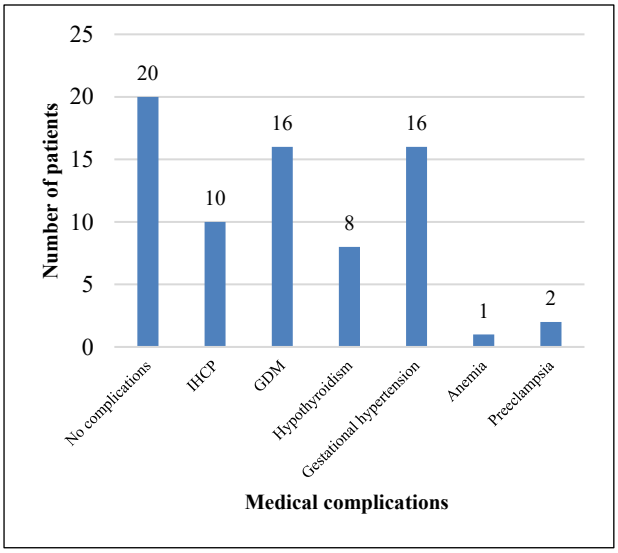

Figure 2: Distribution of patients according to medical complications.

Maternal complications

Figure 2 depicts the distribution of maternal medical complications in the study population. One-third of women (33.33%) had no associated medical disorder during pregnancy. Among those with complications, gestational diabetes mellitus (GDM) and gestational hypertension (GHTN) were the most frequently observed, each affecting 26.67% of cases. Intrahepatic cholestasis of pregnancy (IHCP) was noted in 16.67%, while hypothyroidism was present in 13.33% of women. Other complications such as anemia and preeclampsia were comparatively less common, with preeclampsia observed in only 3.33% of cases. Notably, obesity demonstrated a strong association with metabolic and hypertensive disorders, showing significant overlap with polycystic ovary syndrome (PCOS) (71.4%), gestational hypertension (57.1%), and gestational diabetes mellitus (50%), emphasizing obesity as an important contributory risk factor in this cohort.

Obstetric complications

Figure 3 illustrates the distribution of obstetric complications among the 60 study participants. The majority of women experienced an uncomplicated pregnancy, with no obstetric complications reported in 71.67% of cases. Among the complications observed, Premature Rupture of Membranes (PROM) was the most common, affecting 15% of pregnancies. Miscarriage occurred in 6.67% of women, while preterm labour was noted in 5%. Placental abruption was the least frequent complication, seen in only 1.67% of cases. Overall, PROM emerged as the predominant obstetric complication in the study population.

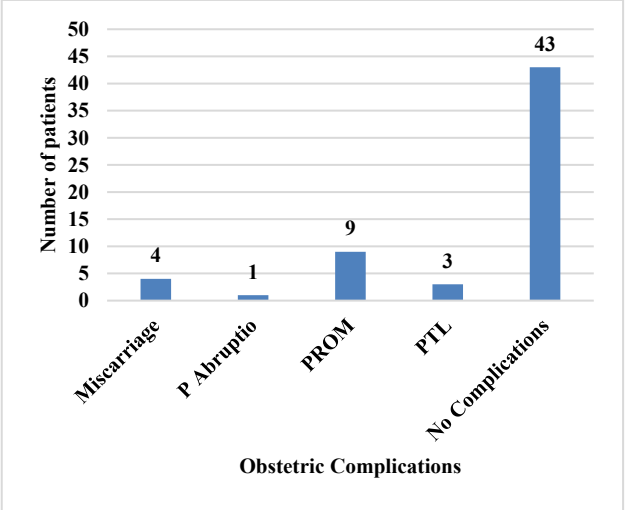

Figure 3: Distribution of patients according to obstetric complications.

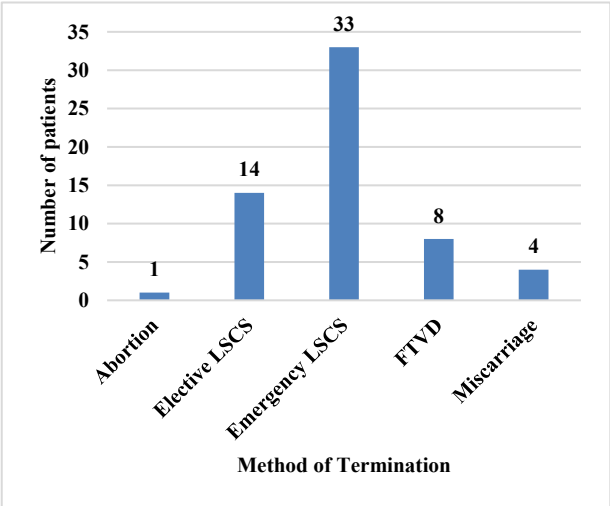

Figure 4: Distribution of patients according to method of termination.

Mode of delivery

Figure 4 demonstrates the distribution of delivery outcomes in the study population. Lower-segment caesarean section (LSCS) was the predominant mode of delivery, observed in 78.3% of cases. Emergency LSCS constituted the majority (55%), whereas elective LSCS accounted for 23.3%. Vaginal delivery was achieved in 13.3% of women. Adverse pregnancy outcomes such as miscarriage (4%) and abortion (1.67%) were comparatively infrequent. Importantly, pregnancies conceived through in vitro fertilization (IVF) exhibited an even higher LSCS rate of 87.5%, indicating a greater tendency toward operative delivery in this subgroup. This may be attributed to the increased obstetric surveillance, perceived high-risk status, and cautious delivery planning commonly associated with infertility-treated and IVF conceptions.

Neonatal outcomes

Figure 5 depicts the neonatal outcomes of pregnancies conceived following infertility treatment. A total of 66 neonates were delivered, including those from twin gestations. Most neonates (60.6%) had a birth weight ≥2500 g, while 31.8% were classified as low birth weight (<2500 g) and 7.6% as very low birth weight (<1500 g). Preterm delivery was observed in 23.3% of cases, whereas the majority of women (60%) delivered at term. Miscarriage occurred in 6.67% of pregnancies. Reassuringly, no neonatal deaths or congenital anomalies were reported. Neonatal Intensive Care Unit (NICU) admissions were predominantly due to prematurity and low birth weight.

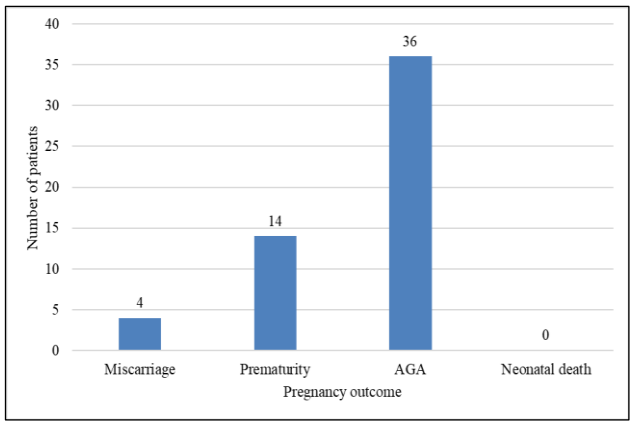

Figure 5: Distribution of patients according to pregnancy outcome.

DISCUSSION

This study reinforces global findings that pregnancies conceived after infertility treatment particularly IVF and those with underlying PCOS, obesity, hypothyroidism, and advanced maternal age are at increased risk of maternal and neonatal complications.

Maternal age and infertility duration

Older infertile women exhibited more hypertensive disorders and GDM, consistent with previous literature.[11] Advanced age is associated with vascular stiffness, endothelial dysfunction, and reduced metabolic reserve, compounding risks in ART pregnancies.

PCOS and metabolic dysfunction

With 56.7% PCOS prevalence, metabolic dysfunction contributed to GDM, hypertensive disorders, and high LSCS rates. PCOS is characterized by insulin resistance, hyperandrogenism, and obesity, all of which predispose to adverse outcomes. Our findings align with ESHRE guidelines (2023).[5]

ART and hypertensive disorders

Our findings align with Chih et al, where ART significantly increased the risk of hypertensive disorders and preeclampsia.[6] Mechanistically, altered placentation due to supraphysiologic hormonal environment may explain this association.

LSCS rate in IVF pregnancies

The IVF LSCS rate of 87.5% reflects physician and patient preference, precious pregnancy anxiety, and increased obstetric complications. Similarly, high rates are reported in Chinese and European ART cohorts, where caesarean rates exceed 70%.[13]

Preterm birth and LBW

Similar to Lei et al ART and ovulation induction were associated with prematurity and LBW.[7] Our cohort demonstrated elevated prematurity even in singleton pregnancies, suggesting intrinsic ART-related risks beyond multiple gestations.

Public health implications

From a public health perspective, our findings highlight the necessity of integrated infertility-pregnancy care pathways. ART centers must collaborate with obstetric units to ensure early screening for metabolic disorders, targeted fetal surveillance, and judicious delivery planning. Establishing a regional ART registry in Chhattisgarh could facilitate long term monitoring and policy formulation.

Strengths of the study

The prospective design of the study allowed for systematic and standardized data collection, thereby minimizing recall bias and enhancing the reliability of the findings. Conducting the research at a single tertiary care centre ensured uniform antenatal care protocols, monitoring, and delivery practices, which reduced variability related to

institutional differences. Additionally, the focus on a regional population from central India adds important real-world evidence from an under-represented geographic area, contributing valuable data to the existing body of literature.

Limitations of the study

The relatively small sample size (n=60) limits the statistical power of the study and restricts the generalizability of the findings. As the study was conducted at a single centre, the results may not fully represent outcomes across diverse healthcare settings with differing infrastructure and clinical practices. Observational nature precludes causal inference; associations should be interpreted cautiously.

Comparison with other studies

Our findings resonate with Thyagarajan et al who reported increased maternal morbidity in ART pregnancies in South India[8]. Similarly, CDC surveillance (2015) documented higher rates of preterm birth and LBW among ART neonates in the US.[9] Wang et al found ART pregnancies had a two-fold increased risk of hypertensive disorders, consistent with our 26.7% incidence.

Mechanistic insights

Several biological mechanisms may underlie the increased risk of adverse maternal and perinatal outcomes observed in pregnancies following infertility treatment. Altered hormonal exposure during assisted reproductive technology (ART) cycles may interfere with normal endometrial receptivity and trophoblastic invasion, resulting in abnormal placentation. This impaired placental development has been implicated in conditions such as preeclampsia, fetal growth restriction, and preterm birth.

In women with polycystic ovary syndrome (PCOS), underlying metabolic disturbances including insulin resistance, chronic low-grade inflammation, and endothelial dysfunction can adversely affect placental perfusion and vascular adaptation during pregnancy, thereby increasing obstetric and neonatal risks.

Advanced maternal age, which is common among women undergoing infertility treatment, is associated with age-related vascular changes such as increased arterial stiffness and reduced uterine blood flow. These factors may compromise uteroplacental circulation and contribute to adverse pregnancy outcomes.

Furthermore, the practice of multiple embryo transfer in in vitro fertilization (IVF) significantly increases the likelihood of multiple gestations, which are independently associated with a higher risk of prematurity, low birth weight, and neonatal morbidity.

Clinical implications

Assisted reproductive technique–conceived pregnancies represent a distinct high-risk obstetric group requiring proactive and multidisciplinary care. Early identification and management of gestational diabetes mellitus and hypertensive disorders are critical. Optimized antenatal nutrition and weight control, especially in women with polycystic ovary syndrome or obesity, can reduce adverse pregnancy outcomes. Individualized delivery planning should be prioritized to minimize non-indicated caesarean sections. Furthermore, strengthened neonatal preparedness, including timely neonatal intensive care unit availability for preterm and low-birth-weight neonates, is essential to improve perinatal outcomes.

CONCLUSION

Pregnancies conceived after infertility treatment are high risk and require specialized antenatal, intrapartum, and neonatal care. Factors contributing to adverse outcomes include advanced maternal age, PCOS and metabolic syndrome, obesity, IVF conception, and long duration of infertility. Enhanced monitoring, preconception optimization, and multidisciplinary management can significantly improve outcomes.

Recommendations

Preconception optimization

Women should be counselled for weight reduction, correction of thyroid dysfunction, and control of glucose metabolism before conception to minimize pregnancy-related complications.

Early maternal screening

ART pregnancies should be considered high risk, hence early and repeated screening for GDM and hypertensive disorders is recommended for timely diagnosis and management.

Enhanced foetal surveillance

Regular growth scans and Doppler monitoring should be planned to detect foetal growth restriction and predict risk of preterm birth, ensuring early intervention when required.

Delivery counselling

Women should be counselled regarding the appropriate mode of delivery, promoting vaginal birth whenever feasible and reducing unnecessary LSCS unless medically indicated.

Integrated care and registries

Tertiary centres should develop coordinated infertility-antenatal care pathways, along with ART registries, to

ensure long-term monitoring of maternal and neonatal outcomes and improve future treatment strategies.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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