RESEARCH PAPER

Impact of Mode of Conception on Maternal and Perinatal Outcomes in Advanced Maternal Age

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ABSTRACT

Introduction:

Advanced maternal age (AMA), defined as pregnancy at age ≥35 years, is increasingly prevalent due to delayed childbearing and the growing use of assisted reproductive technologies (ART). The independent effect of mode of conception on maternal and perinatal outcomes remains an area of clinical importance.

Aim and Objective:

To assess the association between mode of conception (ART vs spontaneous) and maternal and perinatal outcomes in women of advanced maternal age.

Materials and Methods:

A hospital-based cross-sectional observational study was conducted in the Department of Obstetrics and Gynaecology at KAHER's Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi, from January to December 2025. A total of 153 pregnant women aged ≥35 years with gestational age ≥24 weeks were included. Participants were categorized into ART (n=41) and spontaneous conception (n=112) groups. Maternal and perinatal outcomes were compared using the Chi-square test. A p-value <0.05 was considered statistically significant.

Results:

The incidence of AMA pregnancies was 3.26%, among which ART-conceived pregnancies accounted for 26.8% of the study population. ART conception was significantly associated with a higher incidence of maternal comorbidities (43.9% vs 26.8%, p=0.038), hypertensive disorders (39.0% vs 22.3%, p=0.03), preterm birth (53.7% vs 30.4%, p=0.01), and NICU admissions (63.4% vs 40.2%, p=0.02). Although caesarean section rates were higher in ART pregnancies (90.2% vs 79.5%), this difference was not statistically significant (p=0.153).

Conclusion:

Mode of conception significantly influences maternal and perinatal outcomes in advanced maternal age pregnancies, with ART-conceived pregnancies showing higher maternal comorbidities and adverse neonatal outcomes. These findings highlight the need for closer antenatal surveillance and individualized management in this high-risk group.

Keywords: Advanced maternal age, maternal outcomes, neonatal outcomes, high-risk pregnancy, caesarean section, assisted reproductive technology, NICU admission

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INTRODUCTION

Advanced maternal age (AMA), defined as pregnancy at age ≥35 years, has become increasingly common worldwide due to changing social trends such as delayed marriage, higher education, career prioritisation and the growing use of assisted reproductive technologies (ART) [1,2]. In India, urbanisation and shifting socioeconomic patterns have further contributed to this rise, making AMA an important public health concern [3].

Pregnancies at an advanced age differ biologically, with declining ovarian reserve and oocyte quality, along with a higher prevalence of comorbidities such as hypertension, diabetes, thyroid disorders, and obesity, all of which can adversely affect outcomes [4,5]. Together, these factors place AMA pregnancies in a high-risk category, requiring closer antenatal monitoring and specialised care

Despite these risks, many women with AMA achieve favourable pregnancy outcomes, particularly with early registration, regular antenatal care, and timely intervention. Advances in obstetric care, improved diagnostic modalities, and multidisciplinary

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management have significantly reduced maternal and perinatal morbidity and mortality in this group [6].

ART has played a crucial role in enabling conception among older women, thereby contributing to the rising prevalence of AMA pregnancies. ART pregnancies are often associated with higher risks of adverse maternal and perinatal outcomes compared to spontaneous conception [9,10]. This increased risk may be attributed to multiple factors, including underlying infertility, altered implantation, and higher rates of multiple gestations [7]. In low- and middle-income countries like India, these risks are compounded by disparities in healthcare access, delayed antenatal booking, inadequate screening, and late referrals to higher centres [8]. Regional variations in healthcare infrastructure, nutritional status, and patient characteristics highlight the need for context-specific research. There is also a relative lack of comprehensive studies evaluating both maternal and perinatal outcomes in AMA pregnancies in Indian tertiary care settings.

In this context, the present study aims to evaluate the impact of mode of conception on maternal and perinatal outcomes among women with advanced maternal age. By comparing pregnancies conceived through assisted reproductive technologies and spontaneous conception, and analysing obstetric complications and neonatal outcomes, the study seeks to generate region-specific evidence. This will aid in risk stratification, facilitate tailored antenatal and intrapartum management, and ultimately improve maternal and neonatal outcomes.

MATERIALS AND METHODS

This hospital-based cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at KAHER's Dr. Prabhakar Kore Hospital, Belagavi, from January to December 2025. Pregnant women aged ≥35 years with gestational age ≥24 weeks were included using convenient sampling after informed consent, while those with incomplete records or unwilling to participate were excluded. A total of 153 women were analysed. Participants were categorised based on mode of conception into assisted reproductive techniques (ART), which included in vitro fertilisation (IVF), ovulation induction, and intrauterine insemination (IUI), and spontaneous conception groups. Data on demographics, obstetric profile, comorbidities, mode of conception, maternal and neonatal outcomes were collected from records and interviews. Maternal outcomes included hypertensive disorders, gestational diabetes, and mode of delivery, while neonatal outcomes included gestational age, birth weight, and NICU admission. For perinatal outcomes, analysis was performed on a per-baby basis. Data were analysed using SPSS version 25.0 with appropriate statistical tests, considering $p<0.05$ as significant. Ethical approval was obtained, and the study followed Declaration of Helsinki guidelines.

RESULTS

During the one-year study period, a total of 4,699 deliveries were recorded, of which 153 women were of advanced maternal age. This represents an institutional incidence of 3.26%.

Table 1: Distribution Based on Mode of Conception

Category	Frequency (N=153)	Percentage
IVF - 1st Cycle	21	13.73%
IVF - 2nd Cycle	7	4.58%
IVF - 3rd Cycle	5	3.27%
Ovulation induction and Intrauterine Insemination	8	5.23%
Spontaneous	112	73.20%

Spontaneous conception accounted for 112 cases (73.20%) among 153 pregnancies. IVF in the first cycle was seen in 21 cases (13.73%), second cycle in 7 (4.58%), and third cycle in 5 (3.27%). Ovulation induction and intrauterine insemination was noted in 8 cases (5.23%) (Table 1).

Table 2: Association Between Mode of Conception and Maternal Comorbidities

Mode of Conception	No Comorbidities (N=105)	With Comorbidities (N=48)	Total	Chi square (p-value)
ART	23 (56.10%)	18 (43.90%)	41	0.038
Spontaneous	82 (73.21%)	30 (26.79%)	112	
Total	105 (68.63%)	48 (31.37%)	153	

The ART group shows a higher clinical burden, with 43.9% (18) of patients having a pre-existing medical condition, compared to 26.8% (30) in the spontaneous group. The association showed a p-value of 0.038, indicating a statistically significant difference between groups (Table 2).

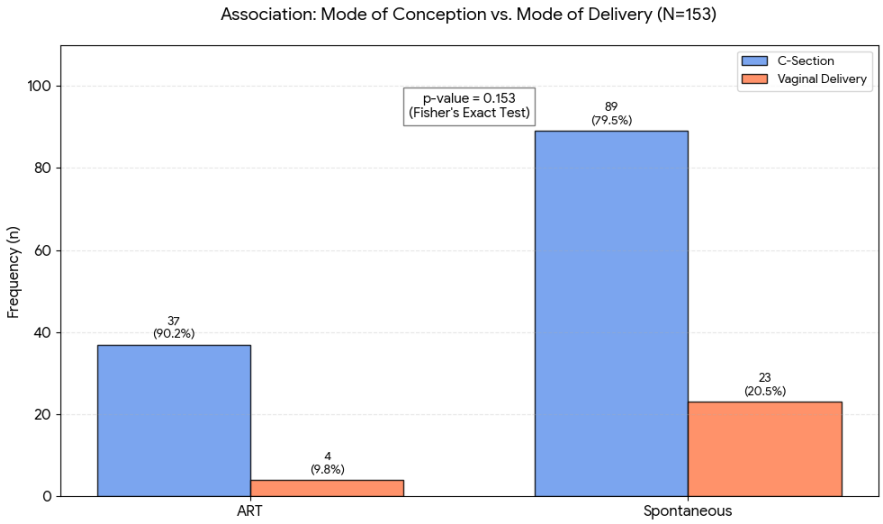

Figure 1: Association Between Mode of Conception and Mode of Delivery

Figure 1 shows in ART pregnancies, 37 cases underwent caesarean section and 4 had vaginal delivery. In spontaneous pregnancies, 89 cases had caesarean section, and 23 had vaginal delivery. The p-value was 0.153, indicating no statistically significant association between mode of conception and delivery.

Table 3: Association Between Mode of Conception and Antepartum Risk Factors

Antepartum Risk Factor	Spontaneous (n=112)	ART (n=41)	p-value
Thyroid Abnormality	29 (25.9%)	12 (29.3%)	0.684
Hypertensive Disorders	24 (21.4%)	16 (39.0%)	0.038
Twins	1(0.89%)	14(34.15%)	<0.001
Fetal Growth Restriction (FGR)	26 (23.2%)	13 (31.7%)	0.301
Gestational Diabetes (GDM)	21 (18.8%)	9 (22.0%)	0.652

Table 3 shows the association between mode of conception and antepartum risk factors showed that hypertensive disorders (39.0% vs 21.4%; p=0.038) and twin gestation (34.15% vs 0.89%; p<0.001) were significantly higher in ART pregnancies, while thyroid disorders, fetal growth restriction, and gestational diabetes showed no significant association (p>0.05).

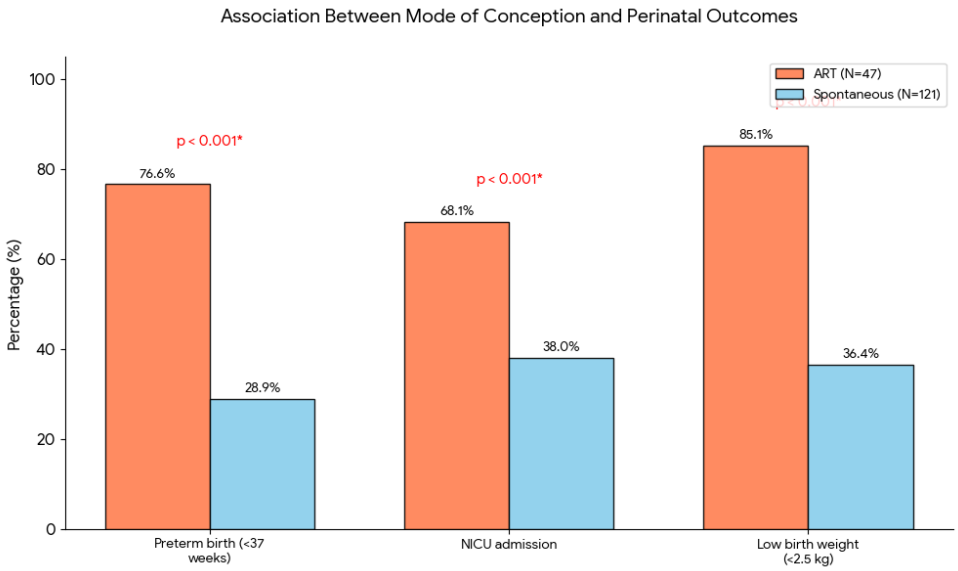

Figure 2: Association Between Mode of Conception and Perinatal Outcomes

Figure 2 shows statistical analysis using the Pearson Chi-square test (per-baby basis, N=168), showing that ART-conceived infants (n=47) had significantly higher risks than spontaneously conceived infants (n=121). Preterm birth (76.6% vs 28.9%), NICU admission (68.1% vs 37.2%), and low birth weight (85.1% vs 36.4%) were all significantly higher in the ART group (p<0.001),

indicating increased neonatal risk with assisted conception in advanced maternal age.

4. DISCUSSION

The present study demonstrated a significant association between mode of conception and the presence of pre-existing maternal comorbidities. Women who conceived through assisted reproductive techniques (ART) had a higher prevalence of comorbidities compared to those who conceived spontaneously (43.9% vs 26.8%; p=0.038), suggesting that women undergoing ART are more likely to have underlying medical or reproductive conditions necessitating assisted conception. Similar observations have been reported by **Sauer and Paulson** [8], who noted that ART pregnancies are often associated with advanced maternal age and pre-existing disorders. **Pandey et al**. [9], in a systematic review, also highlighted that women undergoing ART frequently have comorbidities or infertility-related conditions requiring closer antenatal monitoring. **Shan et al**. [13] further reported a higher burden of maternal comorbidities in advanced maternal age pregnancies, contributing to increased obstetric risks.

A significant association between mode of conception and maternal comorbidities was also observed, with a relatively higher burden of medical and gynaecological complications among ART pregnancies. This may reflect both biological ageing and the underlying health conditions contributing to infertility. Similar findings have been reported by **Shan et al.** [13] and **Shekari et al.** [16], who observed increased rates of hypertensive and metabolic disorders in advanced maternal age women. **Bouzaglou et al.** [14] reported notable incidences of gestational hypertension and diabetes among older mothers, attributing these to age-related metabolic changes, while **Pawde et al.** [12] emphasised the higher prevalence of chronic conditions such as hypertension and diabetes in elderly gravida.

Although the rate of caesarean section was higher in ART pregnancies compared to spontaneous conceptions (90.2% vs 79.5%), the difference was not statistically significant (p=0.153). This trend may reflect a more cautious clinical approach, as ART pregnancies are often considered high value, particularly in women of advanced maternal age. Similar patterns of increased operative deliveries in ART pregnancies have been described by **Pandey et al.** [9] and **Sauer and Paulson** [8], although mode of conception alone may not independently determine the mode of delivery, with other factors such as comorbidities and obstetric complications also playing significant roles.

In terms of antenatal risk factors, hypertensive disorders and twin gestations were significantly more common among ART pregnancies, whereas thyroid disorders, fetal growth restriction, and gestational diabetes did not show a significant association. The increased incidence of hypertensive disorders may be attributed to advanced maternal age, pre-existing conditions, and placental dysfunction. Similar findings have been reported by **Pandey et al**. [9] and **Sauer and Paulson** [8], while **Shan et al.** [13] and **Shekari et al**. [16] also documented higher rates of hypertensive and metabolic complications in this population. The higher frequency of twin gestations in ART pregnancies is consistent with studies by **Pinborg** [11] and **Helmerhorst et al**. [10], who attributed this to multiple embryo transfer practices during in vitro fertilisation.

Perinatal outcomes were significantly poorer among ART-conceived infants compared to those conceived spontaneously. Preterm birth, low birth weight, and NICU admissions were all significantly higher in the ART group (p<0.001), indicating increased neonatal risk. These findings are consistent with previous studies. **Shan et al.** [13] reported that advanced maternal age combined with ART is associated with increased neonatal morbidity. **Bouzaglou et al.** [14] also noted that infertility treatment in older women contributes to higher intervention rates and earlier deliveries. **Devi et al**. [17] and **Mahato et al.** [15] reported higher rates of preterm birth in pregnancies with advanced maternal age, while **Kenny et al.** [5] identified maternal age as an independent predictor of preterm birth. The increased NICU admissions observed in the present study are likely related to the higher incidence of prematurity and low birth weight, findings that are supported by studies conducted by **Bouzaglou et al.** [14], **Shekari et al**. [16], and **Sharma** [18].

CONCLUSION

The present study demonstrates that pregnancies in women with advanced maternal age (≥35 years) are associated with increased maternal and neonatal risks, with notable differences based on mode of conception. While spontaneous conception accounted for the majority of cases, pregnancies achieved through assisted reproductive techniques (ART) showed a higher prevalence of pre-existing comorbidities and obstetric complications. Although the caesarean section rate was higher in ART pregnancies, the difference was not statistically significant. Importantly, perinatal outcomes were significantly poorer in the ART group, with higher rates of preterm birth, low birth weight, and NICU admissions compared to spontaneous conceptions. These findings suggest that ART pregnancies represent a higher-risk subgroup within advanced maternal age, likely due to underlying maternal conditions and increased incidence of multiple gestations. Therefore, pregnancies conceived through ART require preconceptional counselling closer antenatal surveillance, careful risk stratification, and multidisciplinary management to optimise both maternal and neonatal outcomes.

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