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# IMPACT OF ADVANCED MATERNAL AGE ON OBSTETRICAL AND PERINATAL OUTCOMES: A PROSPECTIVE COMPARATIVE STUDY

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**Abstract:** Background: Women who are 35 years or older at the time of their estimated delivery date, termed as having advanced maternal age, tend to face a greater number of obstetric complications and negative pregnancy outcomes compared to their younger counterparts.

**Patient and Method:** This prospective, comparative study was conducted at the Department of Obstetrics and Gynecology at Al-Batool Teaching Hospital over a period of three months, from September 25 to December 30, 2022. A total of 106 pregnant women participated in the study, divided evenly into two age groups: one group consisting of women aged 35 years and older, and the other including women under 35 years. Women aged 20-34 years served as the control group. The primary goal was to compare the obstetric and perinatal outcomes between these different age groups.

**Results:** The findings highlighted that women aged 35 years and older were significantly more likely to have higher parity, suffer from pre-eclampsia, chronic hypertension, gestational diabetes mellitus, diabetes mellitus (type 1 or 2), and antenatal hemorrhage. They were also more likely to deliver via cesarean section compared to the younger women under 35. On the other hand, younger women under 35 did not exhibit a significant relationship with adverse obstetric outcomes. Notably, preterm delivery was strongly correlated with women aged 35 and older. However, perinatal outcomes such as neonatal death, admission to the neonatal care unit, low birth weight, and APGAR scores at 5 minutes were not significantly different between the two age groups.

**Conclusion:** The study concluded that women of advanced maternal age had a higher incidence of medical conditions during pregnancy, were more likely to require cesarean delivery, and had a higher rate of preterm deliveries.

**Keywords:** Advanced maternal age pregnancy, adverse perinatal outcomes, adverse obstetrical outcomes, pregnancy.

## 1. Introduction

Advanced maternal age (AMA) is defined as being 35 years or older at the time of delivery, a trend that has been increasing worldwide over recent decades [1, 2]. If conception occurs at 40 years or older, it is labeled

as very advanced maternal age (VAMA), and if it occurs at 45 years or older, it is termed extremely advanced maternal age (EAMA) [3]. The prevalence of later motherhood has been rising globally due to various reasons. Couples often delay pregnancy for multiple factors, such as waiting until they are financially stable or considering social and lifestyle aspects. For instance, many women may focus on their careers or seek better preparation before starting a family [4].

Furthermore, the widespread adoption of assisted reproductive technologies (ART) has played a crucial role in pushing maternal age beyond 35 and even into the mid-forties [5]. Grasping the range of complications associated with advanced maternal age (AMA) and existing comorbidities is vital for the effective management of pregnancies in this age group [6]. Women with AMA face an elevated risk of pregnancy-related issues, including preeclampsia, gestational diabetes mellitus (GDM), intrauterine growth restriction (IUGR), preterm births, and placental complications, compared to those under 35 years of age [7]. Moreover, understanding the outcomes of AMA pregnancies is crucial for creating specialized programs for parents. This helps them better navigate and manage the challenges of pregnancies at an advanced maternal age, which can lead to neonatal issues such as low birth weight, birth asphyxia, low APGAR scores, higher admission rates to neonatal care units (NCU), congenital anomalies, and even fetal death [8].

Advanced maternal age (AMA) significantly impacts fertility, leading to an increased reliance on assisted reproductive technologies (ART). These technologies have allowed more women of advanced age to achieve pregnancy. Nonetheless, it's important to recognize that ART comes with its own set of risks, such as a higher chance of fetal loss before 28 weeks of gestation due to genetic and chromosomal issues [9, 10].

On a positive note, recent advancements in perinatal technologies have markedly improved obstetric outcomes for women of advanced maternal age [11]. Despite the increased risks, many women in this age group experience healthy pregnancies and deliver healthy babies. It is imperative for women planning to conceive at an advanced age to engage in detailed discussions with their healthcare providers about potential risks and available options. Prenatal care, along with effective management of any complications that may arise, can significantly improve pregnancy outcomes [12, 13]. Consequently, the purpose of this study was to compare the maternal complications, risks, and obstetric outcomes of pregnancies in women of advanced maternal age with those in a younger demographic.

## 2. Patient and methods

### 2.1. Study Design

Over a three-month span from September 25 to December 30, 2022, a prospective comparative study was carried out at Al-Batool Teaching Hospital, which is affiliated with the Diyala Health Department and the Iraqi Ministry of Health. The primary aim was to assess the relationship between pregnancies in advanced maternal age and the occurrence of adverse obstetrical and perinatal outcomes within the Department of Obstetrics and Gynecology. Ethical approval was granted by the hospital, and all participating women provided informed consent. The study encompassed 106 pregnant women who delivered during the study period, evenly split into two groups: half were aged 35 or older, and the other half were younger than 35.

The control group included women aged 20-34 years. For these individuals, demographic data, the gestational age at delivery, and any pregnancy-related complications were documented. They were followed until discharge, with perinatal outcomes, along with intrapartum and postpartum complications, being recorded in a specially designed research form.

Maternal characteristics were documented, including pre-existing conditions such as chronic hypertension, diabetes mellitus types I and II, thrombophilia, heart disease, renal disease, neurological disorders, asthma, and psychiatric conditions. Pre-pregnancy body mass index (BMI) was classified into categories: underweight, normal, overweight, and obese. Information on the use of drugs, alcohol, and tobacco was also

gathered (indicated as either yes or no). Additionally, previous obstetric history was recorded, detailing parity, prior cesarean sections, and previous pregnancy-related complications. Neonatal characteristics were also noted, including gender, weight, gestational age at delivery, admission to the neonatal care unit (NCU), and the APGAR score at five minutes.

### 2.2. Included and Excluded Criteria

The inclusion criteria were as follows:

1) Women aged over 35 years and those under 35 years of age.
2) Women with either spontaneous pregnancies or those conceived after ovulation induction.
3) Women with a medical history of past conditions.
4) Women with singleton or twin pregnancies.

The exclusion criteria included:

1) Major fetal anomalies.
2) Intrauterine fetal demise.
3) Pregnancy losses occurring before 28 weeks of gestation.

### 2.3. Statistical Analysis

The statistical analysis utilized the chi-square test for independence, considering a P value of less than 0.050 as significant. The data collected underwent a comprehensive review for completeness before being entered, edited, and cleaned. The subsequent analysis was performed using Microsoft Office Excel software.

## 3. Results

### 3.1. Maternal Characteristics

The study encompassed 106 pregnant women, divided evenly into two groups: 53 women of advanced maternal age (mean age 36.9 years) and 53 adult women (mean age 24.8 years). The comparison between these two groups revealed noteworthy distinctions in terms of parity and antenatal complications. Parity exhibited a significant association with maternal age ($p = 0.017$). Within the advanced maternal age group, 12.3% were nulliparous, compared to only 3.8% in the control group of adult women. Conversely, 37.7% of women in the advanced age group were multiparous, whereas this was notably higher at 46.2% in the younger age group. These findings indicate that women of advanced maternal age are more likely to be experiencing their first pregnancy compared to their younger counterparts. When examining antenatal complications, a significant difference was observed between the two groups ($p = 0.022$). Preeclampsia was more prevalent in the advanced maternal age group, affecting 14.5% of the women, compared to 7.5% in the younger age group. Chronic hypertension was reported in 1.9% of women with advanced maternal age, which is slightly higher than the 0.9% observed in the control group.

The occurrence of gestational diabetes mellitus (GDM) was 4.7% in the advanced age group, with no cases reported among the younger women. Additionally, 0.9% of the advanced age group had Type 1 or Type 2 diabetes mellitus, while there were no such cases in the control group. Antepartum hemorrhage was observed in 8.5% of women of advanced maternal age, compared to 6.6% in adult women. The data in table (1) from this study underscores that advanced maternal age is associated with a higher incidence of various antenatal complications, highlighting the need for specialized care and monitoring for this demographic to manage and mitigate risks effectively.

Table 1. Maternal baseline information and antenatal complications

| Maternal baseline information | Study group n=53 (advanced maternal age) | Control group n=53 (adult women) | p value |
|---|---|---|---|
| Mean age | 36.9 years | 24.8 years | |
| Parity | | | 0.017 |
| Nulliparous | 13 (12.3%) | 4 (3.8%) | |
| Multiparous | 40 (37.7%) | 49 (46.2%) | |
| Antenatal complications | | | 0.022 |
| Preeclampsia | 15 (14.5%) | 8 (7.5%) | |
| Chronic hypertension | 2 (1.9%) | 1 (0.9%) | |
| Gestational DM | 5 (4.7%) | 0 (0.0%) | |
| DM (Type 1 or 2) | 1 (0.9%) | 0 (0.0%) | |
| Antepartum hemorrhage | 9 (8.5%) | 7 (6.6%) | |

### 3.2. Advanced Maternal Age

The study included 106 pregnant women, divided into two groups of 53, each one group comprising women of advanced maternal age (AMA) and the other consisting of younger adult women. The analysis focused on the mode of delivery and preterm deliveries among these groups, revealing significant differences in several aspects. Regarding normal delivery, a notable difference was observed, with 8.5% of the AMA group experiencing normal deliveries compared to 2.8% in the younger age group, indicating a higher likelihood of vaginal deliveries among older women (p = 0.010).

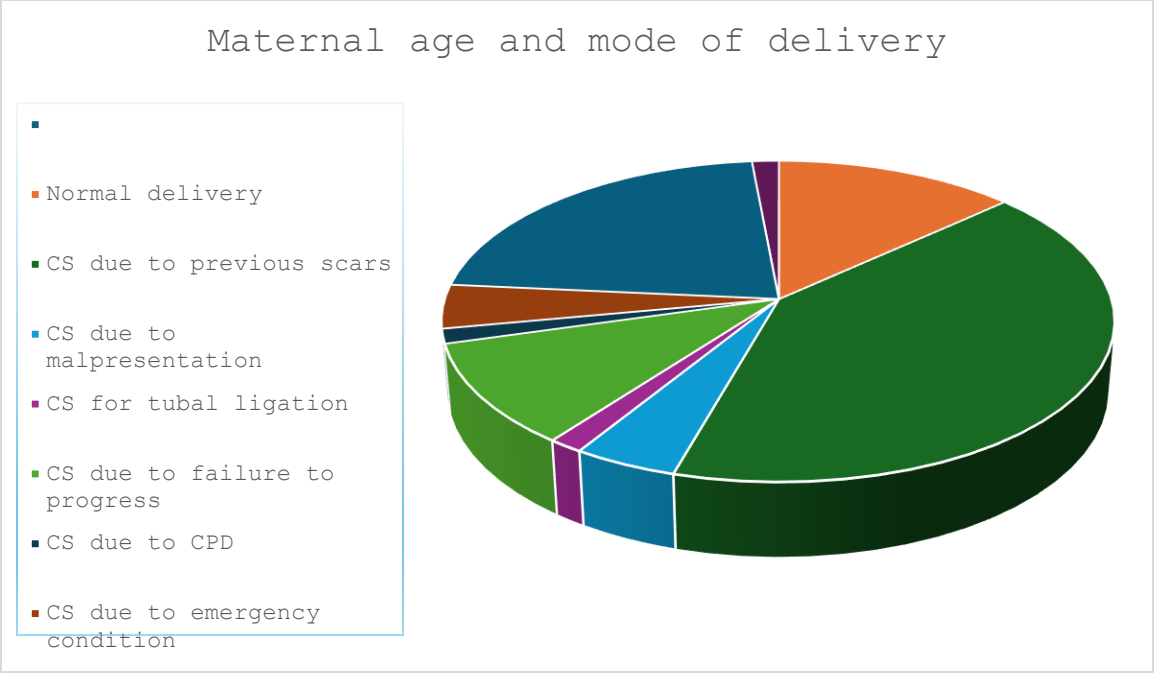



Figure (1). Type of delivery of study and control groups

When examining cesarean sections (CS), several distinct patterns emerged. Caesarean sections due to previous scars were more prevalent in the AMA group at 26.4%, compared to 17.0% in the younger age group. CS due to malpresentation was slightly less common in the AMA group (2.8%) versus 3.5% in the

control group. Tubal ligation-related CS occurred only in the AMA group (0.9%), while cesarean sections due to failure to progress were observed in 6.6% of the older women compared to 8.5% of the younger women. Cephalopelvic disproportion (CPD) was a more common indication for CS in the control group, with 9.4% compared to just 0.9% in the AMA group. Emergency CS rates were slightly higher in the AMA group (2.8%) compared to the younger group (1.9%). IVF-related CS was recorded only in the younger group (0.9%). Furthermore, preterm deliveries were significantly associated with advanced maternal age, occurring in 14.2% of the AMA group compared to 5.7% of the younger group ($p = 0.028$). The rate of twin deliveries was identical in both groups, with each having one case (0.9%), showing no significant difference ($p = 1.000$, not significant).

These results highlight that women of advanced maternal age have different delivery patterns and are at a higher risk for certain complications, such as preterm delivery, indicating the necessity for specialized obstetrical care in this population.

Table 2. Maternal age and mode of delivery

| Type of delivery | Study group n=53 (advanced maternal age) | Control group n=53 (adult women) | P value |
|---|---|---|---|
| Normal delivery | 9 (8.5%) | 3 (2.8%) | 0.010 |
| CS due to previous scars | 28 (26.4%) | 18 (17.0%) | |
| CS due to malpresentation | 3 (2.8%) | 9 (3.5%) | |
| CS for tubal ligation | 1 (0.9%) | 0 (0.0%) | |
| CS due to failure to progress | 7 (6.6%) | 9 (8.5%) | |
| CS due to CPD | 1 (0.9%) | 10 (9.4%) | |
| CS due to emergency condition | 3 (2.8%) | 2 (1.9%) | |
| CS IVF pregnancy | 0 (0.0%) | 1 (0.9%) | |
| Preterm delivery | 15 (14.2%) | 6 (5.7%) | 0.028 |
| Twin delivery | 1 (0.9%) | 1 (0.9%) | 1.000(NS) |

### 3.3. Maternal Age and Perinatal Outcomes

The study investigated perinatal outcomes among 106 pregnant women, divided evenly into two groups: 53 women of advanced maternal age (AMA) and 53 younger adult women. The analysis revealed several observations relating to the gender of the newborns, gestational age at delivery, birth weight, neonatal death, admission to the neonatal care unit (NCU), and APGAR scores. In terms of neonatal gender, there was no statistically significant difference between the groups ($p = 0.697$). The AMA group had 24.5% male and 25.5% female newborns, while the control group had 22.6% male and 27.4% female newborns.

Regarding gestational age at delivery, no significant difference was observed between the groups ($p = 0.104$). In the AMA group, 34.0% of births occurred at 37-42 weeks, 15.1% before 37 weeks, and 0.9% after 42 weeks. In the control group, 42.5% of births occurred at 37-42 weeks, 6.6% before 37 weeks, and 0.9% after 42 weeks. Birth weight analysis also showed no significant difference ($p = 0.089$). In the AMA group, 43.4% of newborns weighed ≥2500g, 3.8% weighed between 2000-2400g, and 3.8% weighed less than 2000g. In the control group, 42.5% of newborns weighed ≥2500g, 6.6% weighed between 2000-2400g, and none weighed less than 2000g.

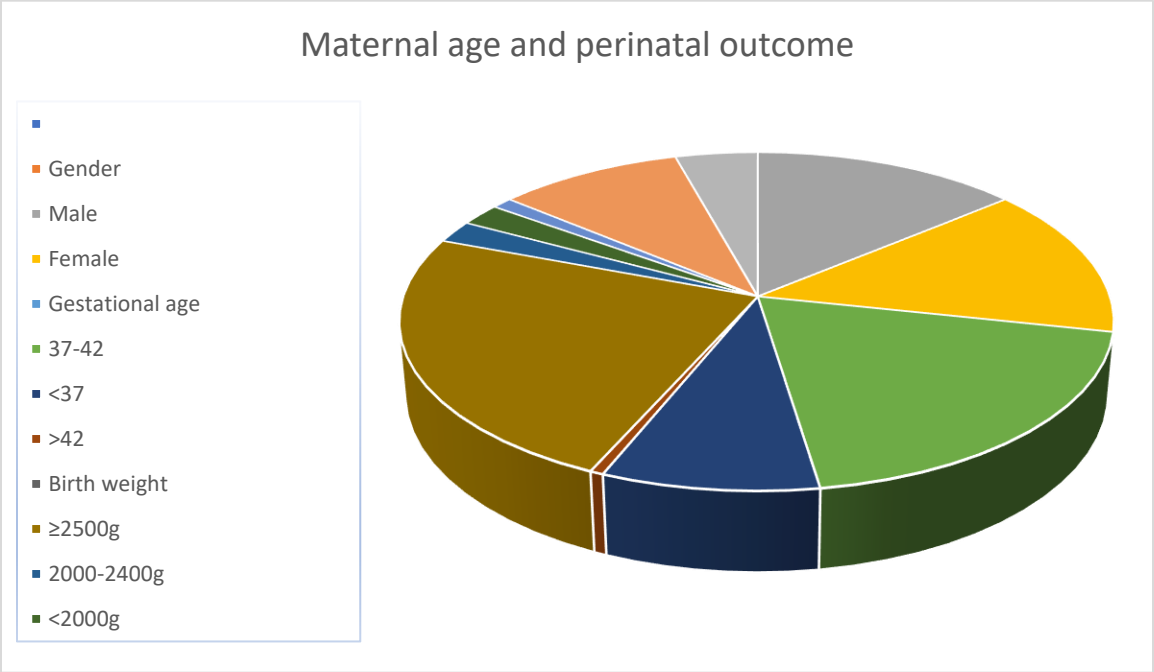



Figure (2). Maternal age and perinatal outcome of study and control groups.

Neonatal death rates were similarly low and not significantly different between the groups (p = 0.558), with 1.9% in the AMA group and 0.9% in the control group. Admission to the NCU was also comparable between the groups (p = 0.839), with 17.0% of AMA group newborns and 17.9% of control group newborns requiring admission. Lastly, APGAR scores of less than 7 at 5 minutes of life did not differ significantly (p = 0.566), occurring in 7.5% of the AMA group and 5.7% of the control group, the study found no significant differences in perinatal outcomes such as gender, gestational age, birth weight, neonatal death, NCU admissions, and APGAR scores between women of advanced maternal age and younger women, suggesting that with appropriate prenatal care, perinatal outcomes can be comparable across these age groups.

Table 3. Maternal age and perinatal outcome

| Variables | Study group n=53 (advanced maternal age) | Control group n=53 (adult women) | P value |
|---|---|---|---|
| Gender | | | |
| Male | 26 | 24 | 0.697(NS) |
| Female | 27 | 29 | |
| Gestational age | | | |
| 37-42 | 36 | 45 | |
| <37 | 16 | 7 | 0.104(NS) |
| >42 | 1 | 1 (0.9%) | |
| Birth weight | | | |
| ≥2500g | 45 | 46 | |
| 2000-2400g | 4 | 7 | 0.089(NS) |
| <2000g | 4 | 0 | |
| Neonatal death | 2 | 1 | 0.558(NS) |
| Admission to NCU | 18 | 19 | 0.839(NS) |
| Apgar score < 7 at 5mins of life | 8 | 6 | 0.566(NS) |

## 4. Discussion

Recent trends indicate a significant increase in delayed childbearing, a phenomenon well-documented over the past decades (M. Carolan, 2013). The study explores the correlation between advanced maternal age (AMA) and adverse obstetrical and perinatal outcomes when compared to younger age groups. It becomes evident from this research that advanced maternal age is a critical risk factor associated with numerous obstetrical and perinatal complications. The study highlights that AMA is notably linked to higher rates of nulliparity, with 12.3% of advanced-age women being nulliparous.

Moreover, antenatal complications such as hypertensive disorders of pregnancy, gestational diabetes mellitus (GDM), and antepartum hemorrhage are significantly associated with advanced maternal age. These findings are consistent with a case-control study by Bekir Kahveci et al. [15] conducted in Turkey, which involved 957 women categorized into three age groups. Their research revealed an association between maternal age and hypertensive disorders during pregnancy, concluding that women under 35 exhibited a significantly lower risk of pregnancy-induced hypertension and pre-eclampsia (B. Kahveci et al., [15]. Conversely, a retrospective paired cohort study by Favilli et al. [16], compared women aged 40 years and older with those younger than 30, finding similar rates of hypertensive disorders of pregnancy across both age groups (A. Favilli et al., [16].

The study found that cesarean deliveries due to previous scars or emergency conditions are significantly associated with advanced maternal age (AMA), whereas factors like malpresentation, failure to progress, or cephalopelvic disproportion (CPD) were not. Notably, AMA was identified as a crucial risk factor for iatrogenic preterm delivery, with 14.2% of cases being affected. However, this contrasts with findings by Schummers et al. [17], who reported no such association between maternal age and the risk of iatrogenic preterm delivery. Furthermore, women aged 35 years and older are often generalized as being at "higher risk" solely based on age, even in the absence of other risk factors. This broad categorization can negatively impact the level of antenatal care and follow-up these women receive, contributing to a rise in cesarean sections for non-medical reasons [18,19,20,21]. In women of advanced maternal age (AMA), there has been a notable rise in the use of assisted reproductive technology (ART) [22, 23, 24], corresponding with the proportional decrease in fertility as women age. However, it is important to recognize that ART introduces its own set of increased risks for adverse pregnancy outcomes [25, 26]. The study indicates a significant connection between AMA and the likelihood of cesarean sections (CS) following in vitro fertilization (IVF) pregnancies. Additionally, placenta previa was found to be significantly associated with AMA, with 8.5% of the cases developing this condition. This association contributes to higher rates of iatrogenic preterm delivery and cesarean sections.

Pregnancy complications in women of advanced maternal age are primarily due to placental insufficiency. This condition is indicated by lower ratios of placental weight to birth weight, reduced volume in the uteroplacental spiral vasculature, and abnormal levels of hormones and biomarkers derived from the placenta [27].

In this study, the primary motivation for women to pursue pregnancy at an advanced age was the desire for a male child. However, only 24.5% of these women had male babies, suggesting that this ratio was not statistically significant. Regarding neonatal outcomes, the study found that maternal age was a notable factor in low birth weight (<2000g), though this difference was not statistically significant. These results are consistent with research conducted in Brazil and a comprehensive study encompassing 29 middle and low-income countries, both of which identified advanced maternal age (AMA) as a risk factor for low birth weight [28].

Additionally, advanced maternal age (AMA) was identified as a significant risk factor for small gestational age at birth, with 15.1% of women aged 35 and older delivering babies before 37 weeks. However, this

finding was not statistically significant. In terms of the 5-minute APGAR score, the study found no correlation between AMA and low scores (less than 7). This outcome aligns with research from Jordan and Malaysia, which similarly did not observe any association between low fifth-minute APGAR scores and pregnancies in older women [29, 30].

Conversely, research conducted in Turkey, India, and Brazil found a linear correlation between low APGAR scores at 5 minutes and pregnancies in women of advanced maternal age, likely due to varying sample sizes [31, 32, 33]. Moreover, maternal age did not significantly influence the rates of neonatal death or admissions to the neonatal care unit (NCU).

## 5. Conclusion

The findings of this study indicate that women of advanced maternal age experience a higher incidence of hypertensive disorders of pregnancy and gestational diabetes mellitus (DM), have a greater likelihood of delivering via cesarean section, and show an increased incidence of preterm deliveries. Regarding neonatal outcomes, advanced maternal age is correlated with higher rates of low birth weight and small-for-gestational-age neonates. However, there was no significant association with the birth of male children, low APGAR scores at 5 minutes, or admissions to the neonatal care unit (NCU). Future research should focus on developing medical interventions and enhanced pregnancy monitoring, particularly preventive strategies aimed at improving outcomes for patients with advanced maternal age. Larger studies are needed to further assess these obstetrical and perinatal adverse outcomes. Given the impact of decreased fertility and the increased need for assisted reproductive technologies (ART) among women of advanced maternal age, it is recommended to establish a fertility and IVF center in Diyala to better identify and follow up with women who are more likely to conceive at an advanced age, ensuring more precise and effective care.

## Findings

1) Women of advanced maternal age experienced a significantly higher incidence of hypertensive disorders of pregnancy ($p = 0.022$) and gestational diabetes mellitus ($p = 0.017$) compared to younger women.
2) The rate of cesarean sections was significantly higher in women with advanced maternal age (31% vs. 18.9%), particularly due to previous scars, tubal ligation, and emergency conditions related to IVF pregnancies. Vaginal deliveries were more common in women with advanced maternal age (8.5% vs. 2.8%).
3) Advanced maternal age was significantly associated with an increased incidence of preterm deliveries, with 14.2% of advanced-age women having preterm births compared to 5.7% in younger women ($p < 0.05$).
4) Although advanced maternal age was correlated with a higher rate of low birth weight and small-for-gestational-age neonates, these differences did not reach statistical significance. There was no significant association between advanced maternal age and low APGAR scores at 5 minutes, neonatal death, or admission to the neonatal care unit (NCU).
5) The development of pregnancy complications in women of advanced maternal age is mainly attributed to placental insufficiency, characterized by lower placental weight-to-birth weight ratios and decreased uteroplacental spiral vasculature volume, leading to adverse obstetrical outcomes.

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