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## ORIGINAL STUDY

# Adverse pregnancy outcomes among elderly primigravida women at Al-Galaa Maternity Teaching Hospital

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## Abstract

**Backgrounds:** Pregnancy at advanced maternal age (AMA) is seen as a risk factor for poor maternal and perinatal outcomes. However, pregnancies with AMA have become more common in recent decades. This is attributable to increased employment options for women, a shift in sex norms, and improved reproductive medicine.

**Objectives:** Reviewing and assessment of the adverse pregnancy outcomes in elderly primigravida women compared with those with younger age.

**Methodology:** A case-control research study was conducted on patients who had attended for delivery at Al-Galaa Maternity Teaching Hospital during the period of 1 year from January 2022 to January 2023. The study included two groups, the elderly group: aged 35 years and older as the study group, and the younger age group: aged 20–34 years as a control group. Comparisons were made in the maternal demographics, major antenatal complications, outcome of labor, mode of delivery, and perinatal complications.

**Results:** The Elderly had a higher incidence of medical disorders including PIH, Pre-eclampsia, and gestational diabetes when compared with the young group with a highly significant difference. Also, cesarean deliveries were found to be higher in the elderly group (41.3% vs. 31.5.9%;  $P = 0.000$ ) with a rising incidence in correlation with age. Moreover, placental problems including Placenta previa, retained placenta and placental abruption in addition to obstetric complications including Perineal tear and postpartum hemorrhage, all showed a higher incidence in the elderly group as well. The elderly group showed an increased incidence of small for gestational age and NICU regarding perinatal outcomes with a significant difference.

**Conclusion:** Elderly primigravida women should be considered high-risk pregnancies. They are at increased risk of maternal and perinatal complications.

**Keywords:** Advanced maternal, Neonatal outcome, Obstetric outcome, Primigravidae

## 1. Introduction

Demographic transition is a global phenomenon, although its timing and speed have differed significantly between countries and regions. Resulting in massive changes in the population age distribution and other associated demographic trends, including the postponement of marriage and childbearing to later ages, as well as changes in the size, composition, and living arrangements of families, thus have an important implication for the

health and education of children and youth, the size and productivity of the labor force, the sustainability of financial systems, and economic growth [1].

Maternal age at marriage is an important demographic indicator for the determination of the health and well-being of mother as well as their children. A lot of studies have documented that maternal age at marriage has a significant association with reproductive health, sexually transmitted infections including HIV, intimate partner violence, and maternal morbidity and mortality. These

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problems and negative outcomes include both maternal and fetal issues [2].

The name 'Elderly Primigravida' first appeared in 1950. Some research revealed that primiparity was more likely to be associated with worse maternal outcomes, whereas others discovered a mutual influence of both age and parity [3].

Because of these risk factors, several studies suggest that increased maternal age (35 years or older) is considered a high-risk pregnancy with an increased risk of maternal morbidity, obstetric complications, and adverse pregnancy outcomes, which is an issue of concern to health professionals, women, and their families [4].

In the current investigation, we focused on controversial conclusions concerning the impact of advanced maternal age (AMA) on maternal and neonatal outcomes.

## 2. Aim

The current study aims to analyze and estimate the poor pregnancy outcomes in elderly primigravida women compared with those with younger ages.

## 3. Methodology

The study is based on a case-control research study designed to compare the adverse maternal and fetal outcomes of pregnancy for elderly Primigravida with those with younger ages. The study was performed at Al-Galaa Maternity Teaching Hospital during the period of one year from January 2022 to January 2023. This hospital was selected because it is the only specialized obstetrical and gynecological hospital in Egypt and one of the oldest and biggest teaching and medical hospitals in Egypt and the Middle East.

A purposive sample of elderly Primigravida women from 35 years and above is considered as a case compared with younger Primigravida women from 20 years to less than 35 years. Women's data was extracted from the predesigned data collection forms of the admission and discharge registered in Al-Galaa Maternity Teaching Hospital which includes detailed information about demographic data, past medical history, family history, maternal complications during pregnancy like preeclampsia, gestational diabetes (GDM), perennal trauma, mode of delivery and also fetal complication like fetal distress, admission to the neonatal unit.

### 3.1. Inclusion criteria

(a) Primigravida women aged 20 to less than 35 years old (control group)

(b) Primigravida women aged 35 years old and above (study group)

(c) Free from any chronic diseases before pregnancy (DM, hypertension (HTN), etc.).

Written approval was received from the Committee of Scientific Research Ethics at the general organization for teaching hospitals and institutes. In addition, official permission to conduct the proposed study was obtained from the directors of Al-Galaa Maternity Teaching Hospital. Written formal consent was obtained from the participants after explaining to them the aim of the study and the data collection tools.

Data was recorded in a specially designed sheet including obstetric and neonatal information for 2002 patients (983 in the Elderly group and 1019 in the young group). Medical disorders during pregnancy include: pregnancy-induced HTN (blood pressure equal to 140/90 mmHg or more), pre-eclampsia (Urine analysis by Alburtis for diagnosis of proteinuria), and GDM (The diagnosis based on any one of the following values: Fasting plasma glucose = 5.1–6.9 mmol/l (92–125 mg/dl) 1 h post 75 g oral glucose load greater than or equal to 10.0 mmol/l (180 mg/dl) 2 h post 75 g oral glucose load 8.5–11.0 mmol/l (153–199 mg/dl)).

All retrieved data were noted down in pre-determined specially designed maternal and neonatal tables and subjected to statistical analysis. The obtained data were kept confidential especially the name and address of the parturient women and the collected data were used for the study purpose only.

### 3.2. Statistical analysis

The collected data was coded and entered into Statistical Package for Social Sciences Windows software, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Categorical data was expressed in number (%) whereas continuous data was expressed as mean  $\pm$  SD.

The comparisons between two groups with categorical data were calculated using the  $\chi^2$  test, whereas comparisons between two groups with continuous data were calculated using Student's *t*-test. Correlation between variables with continuous data was tested using the correlation coefficient test. Statistical significance was set at *P* less than 0.05, and a highly statistical significance was considered at *P* less than 0.001.

## 4. Results

Pregnancy-induced HTN, pre-eclampsia, and GDM are more prevalent in the Elderly group as

compared with the young group with a highly significant difference (Fig. 1).

When compared with the younger group, older women had a significantly greater incidence of cesarean section deliveries. The table also shows that there was a significant variation in the incidence of vaginal deliveries between the young and old groups.

When compared with the younger group, there was a very significant difference in the senior group's incidence of placenta previa and retained placenta. The data also shows that there was a substantial variation in the incidence of placental abruption between the old and young groups.

When comparing the old group to the young group, there was a significant difference in the incidence of postpartum hemorrhage and a higher incidence of perineal tears in the young group (Fig. 2).

When comparing the elderly group to the young group, there was a significantly significant difference in the incidence of small for gestational age (SGA) and NICU.

There is nearly a linear increase in the relationship between maternal age and the rate of cesarean section delivery in childbearing years (Fig. 3).

## 5. Discussion

Poor maternal and perinatal consequences are thought to be increased by pregnancy at an AMA (>35 years old). However, due to greater employment prospects for women, pregnancies of AMA have become more common over the previous few decades [5].

The total number of cases was 2002 including 983 primigravida aged greater than 34 years old (Elderly group) and 1019 primigravida with an age ranging between 20 and 34 years old (young group). All cases were term (Table 1).

Regarding preeclampsia, the current study results suggested that elderly pregnant women acquired it more frequently, at a statistically significant difference from young women (10.2% vs. 6.9%, respectively) at ( $P = 0.008$ ) (Table 2).

Multiple possible mechanisms had been hypothesized for the relationship of AMA and the increased PET occurrence, including impaired maternal hemodynamic adaptation during pregnancy, uterine blood artery loss of compliance, and concomitant illness [6]. Numerous authors have advised using low-dose aspirin as a prophylactic

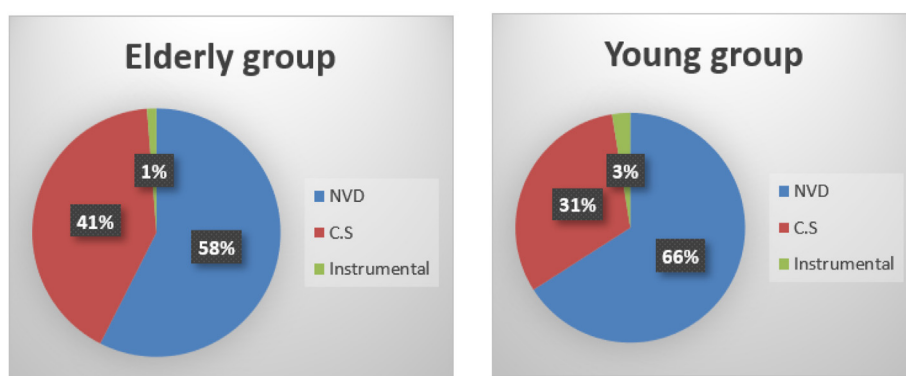


Fig. 1. Mode of delivery in both groups. CS, caesarean section; NVD, normal vaginal delivery.

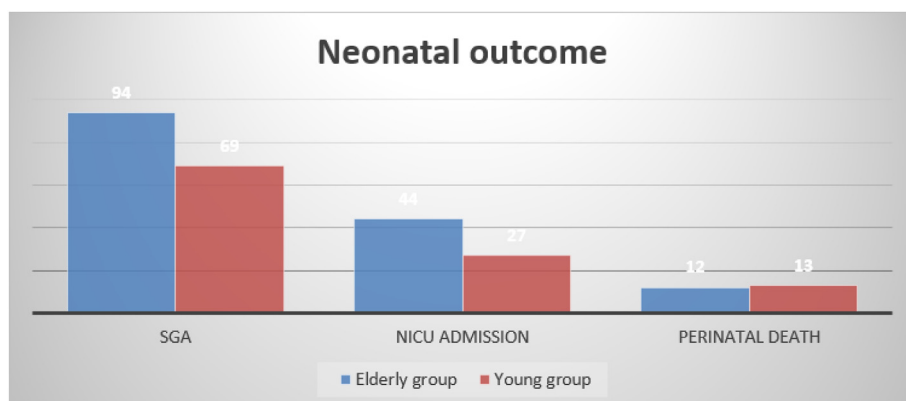


Fig. 2. Neonatal outcome in both groups. SGA, small for gestational age; NICU, neonatal intensive care unit.

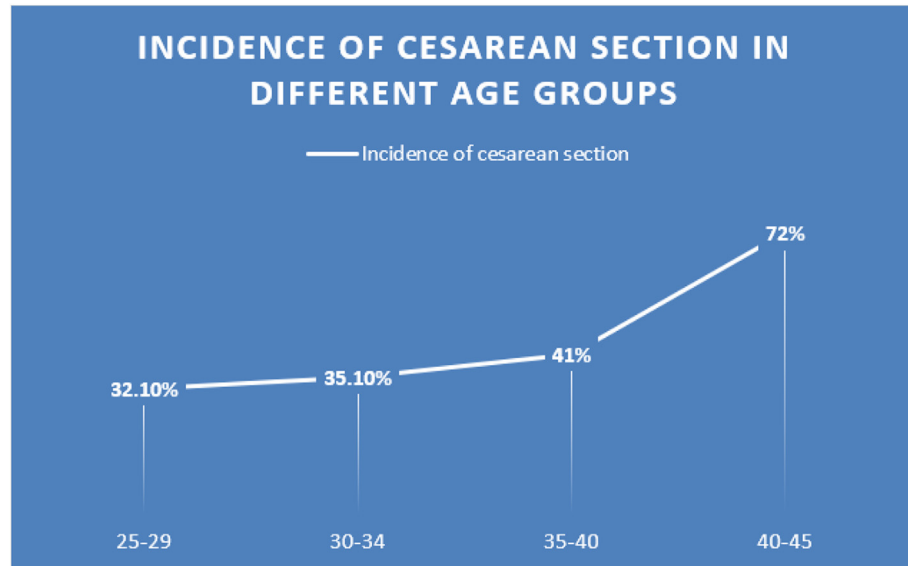


Fig. 3. Percentage of cesarean section delivery according to maternal age.

Table 1. Demographic characteristics of pregnant women in the studied groups.

	Elderly group (Number 983)	Young group (Number 1019)
Age	>35 years old	20 to <35 years old
Parity	Primigravida	Primigravida
Mothers no	983	1019
Gestational age	Term	Term

Table 2. Age-related medical disorders in the studied groups.

Variable	Elderly group (Number 983) N (%)	Young group (Number 1019) N (%)	P value
Pregnancy-induced hypertension	133 (13.5)	82 (8)	0.000
Pre-eclampsia	100 (10.2)	70 (6.9)	0.008
Gestational Diabetes	86 (8.7%)	32 (3.1%)	0.000

therapy to minimize the incidence of Pre-Eclampsia Toxaemia (PET) in AMA women [7].

This finding is supported by a systematic analysis of 92 cohort studies, done in 2016, involving more than 1000 women in each research, which indicated an elevated relative risk of 1.2 (95% CI 1.1–1.3) and 1.5 (95% CI 1.2–2.0) with AMA [8].

Nieto *et al.* discovered an increased risk of PET at AMA (OR 3.32, 95% CI 1.78–6.21) in a retrospective study comparing AMA to a control group of women under 30 years old using univariate analysis. However, after applying a multivariate logistic regression for confounding factors (obesity, use of ART, smoking, chronic HTN, and parity), there was no significant connection between age and PET [9].

Regarding DM, the current study found a considerable rise in GDM in the elderly group compared with the young group (8.7% vs. 3.1%, respectively), with a highly significant difference at ( $P = 0.000$ ) (Table 2). Reduction in insulin sensitivity and impairment of pancreatic B-cell activity appear to be key explanations for the increased incidence of GDM with age [10].

A retrospective study by Khalil and associates found a higher GDM incidence of 1.62 (95% CI 1.43–1.83,  $P < 0.001$ ) and 2.1 (95% CI 1.74–2.55,  $P < 0.001$ ) in AMA compared with women under 35 years [11]. The risk of GDM remains higher in older ages, even after adjusting for confounding variables such as ethnicity and obesity [12].

The present study results showed a higher incidence of cesarean delivery (CD) in the Elderly group when compared with the young group (41.3% vs. 31.5%, respectively) with a significant difference at ( $P = 0.000$ ) (Table 3). These results were consistent with study, which indicated that the incidence of primary CD was 20.0% for 25–34 years old (referent group); the incidence was 25.9% for the AMA group, with a relative risk = 1.25 (95% CI 1.20–1.29) [13].

There are various possible explanations for this tendency. Treacy *et al.* and Waldenstrom *et al.*

Table 3. Impact of age on mode of labor in the studied groups.

	Elderly group (Number 983) N (%)	Young group (Number 1019) N (%)	P value
NVD	565 (57.5)	672 (65.9)	0.000
C.S	406 (41.3)	321 (31.5)	0.000
Instrumental	12 (1.2)	26 (2.6)	0.032

Bold defines significant difference.



discovered that AMA is a risk factor for labor dystocia, resulting in increased rates of CD in this parturient population [14,15].

Rydahi and colleagues found an increased incidence of cesarean section delivery at AMA (OR 2.18, 95% CI 2.11–2.26) compared with women under 30. This suggests that the rising rate of cesarean section delivery is attributable to maternal preferences and a lower treatment threshold for intervention. Apparently, all three postulated mechanisms are valid, therefore the increased rate of cesarean section delivery can be explained by any of them, or by all of them together [16].

Furthermore, several studies explain the reduction in myometrial function with aging as a factor for the higher rate of cesarean section delivery in women with AMA [17]. Goldman *et al.* reported a decrease in the effectiveness of myometrial gap junctions and numerically fewer but also less sensitive myometrial oxytocin receptors, which consequently diminished the effectiveness of labor [18].

Older women appear to have a higher risk of labor not progressing normally. The roughly linear link between the mother's age and uterine dysfunction has a continuing influence throughout the child-bearing years [19]. This linear relationship appeared clearly in Fig. 3.

Placental pathology, such as placenta previa, is more common among older women [20]. However, age and parity appear to be independent risk factors for placenta previa. Nulliparous elderly women have a tenfold greater incidence of placenta previa compared with nulliparous women aged 20–29 years, while the absolute risk is minimal (0.25 and 0.03%, respectively) [21]. This is consistent with our study, which demonstrated a considerably greater frequency of placenta previa in the older group (Table 3).

Also, we found controversial statements in the existing literature regarding premature placental abruption. While this serious complication in our study population was not detected by some studies [22], we found the risk of premature placental abruption increased with advanced age with a significant difference (Table 3). This is consistent with most studies [23]. The explanation provided by Lean *et al.* for the risk premature placental abruption that increased, that existing pathologies of the placentas with AMA [24]. An association, reported by Jahromi *et al.* and Usta *et al.*, between the age and increased hypertensive disease and the uterine vessels natural aging of [25,26].

In order, the increased risk of retained placenta to be explained in advanced maternal age, Hsieh *et al.*

investigated a decreased uterine perfusion due to increased sclerotic lesions, intramyometrial, in comparison to younger ages which consequently, uteroplacental vasculopathy and reduced blood flow during labor may result in problems with uterine vascularization because of sclerotic lesions in the myometrial arteries [27]. Our findings also revealed a substantial difference in the incidence of retained placenta in the elderly group.

Miller and colleagues describe how hypertensive problems contribute to a higher prevalence of retained placenta in women over the age of 35. Endothelial damage to uterine arteries caused by HTN may increase adhesion [28].

There was a considerably higher rate of birth injuries in the nulliparous young group (Table 4). Ogunyemi *et al.* identified a risk factor that younger age, in addition to vaginal surgical births, and attributed their findings to tighter and more easily ruptured connective tissue [29].

In this study, we had also discovered that younger nulliparous women have a higher risk of perineal injury. As the danger of vaginal and/or perineal injuries rises during operative vaginal deliveries, this is a probable explanation for the increased number of birth injuries.

The current study's findings demonstrated a statistically significant difference in postpartum hemorrhage rates among old and young mothers (3.2% vs. 5.4%, respectively) (Table 5). This is consistent with other studies that have demonstrated an increased risk of postpartum hemorrhage in elderly women [30].

On the contrary, Pawde and colleagues discovered no significant increase in postpartum hemorrhage in women with advanced maternal age. This could be explained by greater intramyometrial sclerotic lesions in comparison to younger years [31].

Table 4. Placental problems in both age groups.

Variable	Elderly group (Number 983) N (%)	Young group (Number 1019) N (%)	P value
Placenta previa	67 (6.8)	13 (1.3)	0.000
Retained placenta	40 (4.1)	21 (2.1)	0.009
Placental abruption	27 (2.7)	14 (1.4)	0.039

Italics defines significant difference.

Table 5. Obstetric complications in both age groups.

Variable	Elderly group (No. 983) N (%)	Young group (No. 1019) N (%)	P value
Perineal tear	41 (9.2)	64 (5.1)	0.000
Postpartum Hemorrhage	56 (5.7)	31 (3)	0.04
Maternal death	3 (0.3)	0	0.035

Recently, a study compared AMA patients with PET to patients aged 20–34 years with PET, in terms of maternal and perinatal outcomes. They discovered that PET is an independent risk factor for postpartum hemorrhage in women with an AMA (OR = 3.89, 95% CI 1.16–13.03). The link between SGA and maternal age is thought to be a positive dose-response association. Kenny and her colleagues conducted population-based cohort research in the UK and revealed that AMA was not related to an elevated risk of SGA after adjusting for major cofactors [32]. Kozuki *et al.* observed similar findings in a meta-analysis [33].

On the contrary, Khalil *et al.*, as well as our study, found a greater incidence of SGA among women with AMA (OR 1.46, 95% CI 1.27–1.69) [11] (Table 6). Furthermore, Lean *et al.* in a comprehensive recent systematic review and meta-analysis revealed higher incidences of SGA (birth weight below the 10th percentile) newborns among women with AMA (OR 1.16, 95% CI 1.06–1.27) [24].

Additionally, Odibo *et al.* also found a positive dose-response relationship between increased risk of Fetal Growth Restriction and AMA [34]. Although the specific mechanism of the relationship between AMA and SGA has not been shown, it has been proposed that impaired oxygen exchange may be the underlying reason [35].

The current study similarly shows an increase in NICU admissions as maternal age increases (Table 6). Previous research had yielded different outcomes to this problem. The increase appears to be caused by the increased risk of comorbidities as maternal age rises [34].

Kahveci and colleagues studied the effect of AMA on prenatal and neonatal outcomes of nulliparous singleton pregnancies in Turkey. They discovered that admission to the NICU was more common in the AMA group (OR 1.68, 95% CI 1.42–2.15,  $P < 0.01$ ) [35].

Regarding worldwide fetal demise, a study showed that patients with 35 years or more have a significantly higher risk, in comparison with younger women, of fetal death [36]. These findings are consistent with our findings where the perinatal

death risk for patient aged 35 years or less, 35 years and more was 3.73, and 6.41, respectively, per 1000 ongoing pregnancies, (Table 6).

It is supported by a systematic review of nearly 100 studies that estimated that maternal age more than 35 years was associated with a 65% increased fetal death risk compared with maternal age less than 35 years. Moreover, the risk is estimated to continue to increase with maternal age increase, being higher than those more than 40 years [36].

Even after accounting for risk variables such as repeated gestations, smoking, antepartum hemorrhage, DM, HTN, and other risk factors, older women continued to incur excess perinatal mortality, primarily from unexplained fetal deaths [37].

Based on available study results, elderly primigravidae should be considered high-risk pregnancies, that require certain medical and antenatal care to avoid adverse maternal events. This would also help us to avoid adverse neonatal outcomes.

### 5.1. Conclusion

Based on the findings of this study, we recommend that older primigravida women be evaluated as high-risk pregnancies. Women have a higher risk of maternal and perinatal complications.

### 5.2. Recommendations

- AMA women should be urged to improve their health in preparation for pregnancy, including taking folic acid supplements and stabilizing comorbidities.
- Future research should clearly define risk by age category for evidence-based recommendations.
- Close antenatal care for such cases during all stages of pregnancy and delivery helps us avoid adverse maternal outcomes.

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### Ethics information

All methods were in agreement with our hospital research committee's ethical requirements. The Ethics Committee of the Scientific Research, GOTH, Ministry of Health, Egypt (No. HG000077).

### Author contribution

Data collection, scientific writing and statistical analysis: Sherif M. Safwat, Marwa R. Shahin.

Table 6. Impact of age on neonatal outcome in the studied groups.

Variable	Elderly group (Number 983) N (%)	Young group (Number 1019) N (%)	P value
SGA	94 (9.6)	69 (6.8)	0.027
NICU admission	44 (4.5)	27 (2.6)	0.030
Perinatal death	18 (1.8)	8 (0.79)	0.048

NICU, neonatal intensive care unit; SGA, small for gestational age.

## Conflicts of interest

There are no conflicts of interest.

## Institutional Review Board (IRB) Approval Number

HG000077.

## References

- [1] UN. Changing population age structures and sustainable development. Department of Economic and Social Affairs; 2017. p. 33. ST/ESA/SER/E/CN.9/2017/2.
- [2] Paul P. Maternal age at marriage and adverse pregnancy outcomes: findings from the India human development survey, 2011-2012. *J Pediatr Adolesc Gynecol* 2018;31:620–4.
- [3] Shan D, Qiu PY, Wu YX, Chen Q, Li AL, Ramadoss S, et al. Pregnancy outcomes in women of advanced maternal age: a retrospective cohort study from China. *Sci Rep* 2018;8:1–9.
- [4] Sodje JDK. Fetal growth abnormalities: intrauterine growth restriction and macrosomia. In: *Contemporary obstetrics and gynecology for developing countries*; 2021. p. 103–15.
- [5] Springer C, Glick I, Kadish E, Rottenstreich M. Management of pregnancy in women of advanced maternal age: improving outcomes for mother and baby *Int J Wom Health* 2021;13:751–9.
- [6] Tessema GA, Tekeste A, Ayele TA. Preeclampsia and associated factors among pregnant women attending antenatal care in Dessie referral hospital, Northeast Ethiopia: a hospital-based study. *BMC Pregnancy Childbirth* 2015;15:1–7.
- [7] Frick AP. Advanced maternal age and adverse pregnancy outcomes. *Best Pract Res Clin Obstet Gynaecol* 2021;70: 92–100.
- [8] Engjom HM. Obstetric care in Norway-the role of institution availability and place of delivery for maternal and perinatal outcomes. *Population-based retrospective cohort studies*; 2018.
- [9] Claramonte Nieto M, Meler Barrabes E, Garcia Martínez S, Gutiérrez Prat M, Serra Zantop B. Impact of aging on obstetric outcomes: defining advanced maternal age in Barcelona. *BMC Pregnancy Childbirth* 2019;19:1–10.
- [10] Dong B, Yu H, Wei Q, Zhi M, Wu C, Zhu X, et al. The effect of pre-pregnancy body mass index and excessive gestational weight gain on the risk of gestational diabetes in advanced maternal age. *Oncotarget* 2017;8:58364.
- [11] Khalil A, Syngelaki A, Maiz N, Zinevich Y, Nicolaides KH. Maternal age and adverse pregnancy outcome: a cohort study. *Ultrasound Obstet Gynecol* 2013;42:634–43.
- [12] Fitzpatrick KE, Tuffnell D, Kurinczuk JJ, Knight M. Pregnancy at very advanced maternal age: a UK population-based cohort study. *BJOG An Int J Obstet Gynaecol* 2017;124:1097–106.
- [13] Richards MK, Flanagan MR, Littman AJ, Burke AK, Callegari LS. Primary cesarean section and adverse delivery outcomes among women of very advanced maternal age. *J Perinatol* 2016;36:272–7.
- [14] Treacy A, Robson M, O'Herlihy C. Dystocia increases with advancing maternal age. *Am J Obstet Gynecol* 2006;195:760–3.
- [15] Waldenström U, Ekéus C. Risk of labor dystocia increases with maternal age irrespective of parity: a population-based register study. *Acta Obstet Gynecol Scand* 2017;96:1063–9.
- [16] Rydahl E, Declercq E, Juhl M, Maimburg RD. Cesarean section on a rise—does advanced maternal age explain the increase? A population register-based study. *PLoS One* 2019; 14:e0210655.
- [17] Wang Y, Tanbo T, Åbyholm T, Henriksen T. The impact of advanced maternal age and parity on obstetric and perinatal outcomes in singleton gestations. *Arch Gynecol Obstet* 2011; 284:31–7.
- [18] Cleary-Goldman J, Malone FD, Vidaver J, Ball RH, Nyberg DA, Comstock CH. Faster Consortium. Impact of maternal age on obstetric outcome. *Obstet Gynecol* 2005; 105(5 Part 1):983–90.
- [19] Main DM, Main EK, Moore IIDH. The relationship between maternal age and uterine dysfunction: a continuous effect throughout reproductive life. *Am J Obstet Gynecol* 2000;182: 1312–20.
- [20] Martinelli KG, Garcia ÉM, Santos Neto ETD, Gama SGND. Advanced maternal age and its association with placenta praevia and placental abruption: a meta-analysis. *Cad Saúde Pública* 2018;34:e00206116.
- [21] Gilbert WM, Nesbitt TS, Danielsen B. Childbearing beyond age 40: pregnancy outcome in 24,032 cases. *Obstet Gynecol* 1999;93:9–14.
- [22] Sauer MV. Reproduction at an advanced maternal age and maternal health. *Fertil Steril* 2015;103:1136–43.
- [23] Mills TA, Lavender T. Advanced maternal age. *Obstetrics. Gynaecol Reprod Med* 2011;21:107–11.
- [24] Lean SC, Derricott H, Jones RL, Heazell AE. Advanced maternal age and adverse pregnancy outcomes: a systematic review and meta-analysis. *PLoS One* 2017;12:e0186287.
- [25] Jahromi BN, Hussein Z. Pregnancy outcome at maternal age 40 and older. *Taiwanese j obstet gynecol* 2008;47:318–21.
- [26] Usta IM, Nassar AH. Advanced maternal age. Part I: obstetric complications. *Am J Perinatol* 2008;25:521–34.
- [27] Liou JD, Hsu JJ, Lo LM, Chen SF, Hung TH. Advanced maternal age and adverse perinatal outcomes in an Asian population. *Eur J Obstet Gynecol Reprod Biol* 2010;148:21–6.
- [28] Miller DA, Chollet JA, Goodwin TM. Clinical risk factors for placenta previa—placenta accreta. *Am J Obstet Gynecol* 1997; 177:210–4.
- [29] Ogunyemi D, Manigat B, Marquis J, Bazargan M. Demographic variations and clinical associations of episiotomy and severe perineal lacerations in vaginal delivery. *J Natl Med Assoc* 2006;98:1874.
- [30] Jolly M, Sebire N, Harris J, Robinson S, Regan L. The risks associated with pregnancy in women aged 35 years or older. *Hum Reprod* 2000;15:2433–7.
- [31] Pawde AA, Kulkarni MP, Unni J. Pregnancy in women aged 35 years and above: a prospective observational study. *J Obstet Gynaecol India* 2015;65:93–6.
- [32] Kenny LC, Lavender T, McNamee R, O'Neill SM, Mills T, Khashan AS. Advanced maternal age and adverse pregnancy outcome: evidence from a large contemporary cohort. *PLoS One* 2013;8:e56583.
- [33] Kozuki N, Lee AC, Silveira MF, Sania A, Vogel JP, Adair L. Child Health Epidemiology Reference Group (CHERG) Small-for-Gestational-Age-Preterm Birth Working Group. The associations of parity and maternal age with small-for-gestational-age, preterm, and neonatal and infant mortality: a meta-analysis. *BMC Publ Health* 2013;13:1–10.
- [34] Odibo AO, Nelson D, Stamilio DM, Sehdev HM, Macones GA. Advanced maternal age is an independent risk factor for intrauterine growth restriction. *Am J Perinatol* 2006;23:325–8.
- [35] Kahveci B, Melekoglu R, Evruke IC, Cetin C. The effect of advanced maternal age on perinatal outcomes in nulliparous singleton pregnancies. *BMC Pregnancy Childbirth* 2018;18: 1–7.
- [36] Flenady V, Koopmans L, Middleton P, Frøen JF, Smith GC, Gibbons K, et al. Major risk factors for stillbirth in high-income countries: a systematic review and meta-analysis. *Lancet* 2011;377:1331–40.
- [37] Jacobsson B, Ladfors L, Milsom I. Advanced maternal age and adverse perinatal outcome. *Obstet Gynecol* 2004;104: 727–33.