Original Research Article

Maternal and fetal outcomes with increasing maternal age during pregnancy: a hospital-based study

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ABSTRACT

Background: In recent decades, delayed childbearing has become increasingly common due to socio-economic and professional factors, leading to a rise in pregnancies among women aged 30 years and above which may have an impact on obstetric and perinatal outcomes. Aim was to evaluate the association between increasing maternal age and adverse maternal and neonatal outcomes in singleton pregnancies beyond 30 years of age.
Methods: Total of 207 pregnant women aged >30 years were recruited and categorised into three age groups: 30-34 years, 35-40 years (AMA- advanced maternal age) and >40 years (VAMA- very advanced maternal age). Maternal and neonatal parameters were noted.
Results: The incidence of fibroid complicating pregnancy, thyroid disorders in pregnancy significantly increased with increase in maternal age. The risk of gestational diabetes, gestational hypertension was more with increase in age (AMA, VAMA group) but preeclampsia was noted more in age group of 30-34 years. Preterm delivery and induction of labour was more in 30-34 years of age. The rate of caesarean section showed a steady increase after 35 years of age. Postpartum hemorrhage was two times more and gestational hypertension was 5 to 7 times higher in AMA and VAMA groups compared to 30-34 years age group.
Conclusions: There was increase in fibroid complicating pregnancy and thyroid disorders in pregnancy in women >35 years of age. The association of GDM, gestational hypertension, the need for caesarean section was also high with increase in maternal age >35 years of age. In 30-34 years of age group preeclampsia, preterm delivery and induction of labour was found to be higher.

Keywords: Advanced maternal age, Caesarean rates, Maternal outcomes, Perinatal outcomes

INTRODUCTION

As modern societies evolve, more women are choosing to postpone childbearing until they are 30 years old or older, influenced by factors such as higher education, career growth, and economic independence. While this trend is particularly noticeable in industrialized nations, now it is becoming increasingly prevalent in developing countries like India. In many places, the maternal age at first childbirth has risen significantly.[1]

The International Federation of Gynecology and Obstetrics (FIGO) defines "advanced maternal age' (AMA) as pregnancies occurring at age 35 and older, while "very advanced maternal age" (VAMA) refers to pregnancies at age 40 and above. In these pregnancies, chronic illnesses and medical issues are more prevalent, placing these women in a high-risk category. Most research indicates that advanced maternal age raises the likelihood of hypertension, gestational diabetes mellitus (GDM), postpartum hemorrhage, preterm delivery,

caesarean delivery, foetal growth restriction, and perinatal mortality.[2]

In addition, AMA is associated with neonatal complications, including a low APGAR (appearance, pulse, grimace, activity, respiration) score, admission to the NICU (neonatal intensive care unit), preterm birth, LBW (low birth weight), birth defects, chromosomal anomalies, and perinatal death.

In developed and developing nations like India, there has been a rising trend in delayed motherhood. This demographic shift warrants detailed analysis, as the physiological, endocrine, and anatomical changes associated with aging potentially alter the course of pregnancy. Understanding the influence of maternal age on both maternal and neonatal outcomes is critical for improving antenatal care strategies and optimizing obstetric management. The evaluation of pregnancy complications and perinatal outcomes in relation to increasing maternal age reveals significant associations with adverse outcomes.

Aim

This study was aimed to evaluate the obstetrical and perinatal adverse outcomes in women aged above 30 years in our community. The results of this study were expected to guide us (maternal and child healthcare providers) in delivering health education to women who delay childbirth and in offering evidence-based information to support informed reproductive decisions. Additionally, it sought to assist health policymakers in curbing the rising trend of advanced maternal age and negative pregnancy outcomes when developing plans and strategies. It may aid in the creation of medical interventions and improved prenatal monitoring, especially preventive measures, to enhance pregnancy outcomes in women of advanced maternal age.

METHODS

It was hospital based longitudinal observational study conducted in K. S. Hegde Hospital, Mangaluru. Institution ethical clearance (Reg. No. EC/NEW/INST/2022/KA/0174) was obtained.

A total of 207 patients were recruited after obtaining informed consent between the period of June 2023 to November 2024.

Inclusion and exclusion criteria

Pregnant women with singleton pregnancy above the age of 30 years were included in this study. Multiple pregnancy, chronic illness like chronic hypertension, overt diabetes, renal disorders, cardiac diseases were excluded from the study as it may affect parameters of outcome.

Patients were categorised into 3 groups: group 1- maternal age 30-34 years, group 2- maternal age 35-40 years (AMA) and group 3- maternal age more than 40 years (VAMA). A detailed sociodemographic details, clinical history, previous medical history, obstetric history and obstetric examination were noted. These participants were followed up till delivery and their obstetric (antepartum, intrapartum and postpartum) and perinatal outcomes were recorded. Pregnancy complications like miscarriage, ectopic pregnancy, GDM, hypertensive disorders of pregnancy, antepartum hemorrhage (APH), preterm labour, fetal growth restriction (FGR), malpresentations, induction of labour, caesarean section, postpartum hemorrhage (PPH) were looked for. Neonatal complications of chromosomal anomalies, congenital structural defects, low birth weight (LBW)/macrosomia, perinatal morbidity and mortality, APGAR score and NICU admissions were noted.

Statistical analysis

Data was entered in SPSS (Statistical Package for Social Sciences) version 27 [IBM SPASS statistics (IBM corp. released 2011)]. Descriptive statistics of the explanatory and outcome variables was calculated by mean, standard deviation/median and IQR (based on normalcy test-Shapiro wilk test) for quantitative variables, frequency and proportion for qualitative variables. Chi-square test was applied to find the association of qualitative variables. P value of less than or equal to 0.05 was considered significant.

RESULTS

We had 69 participants initially in all 3 groups. In the 30-34 years group, the average age was 32.00±1.42 years, in 35-40 years group the average age was 36.94±1.39 years and for those >40 years, the average age was 42.26±1.75 years (40-49). Overall, the average age across all groups was 37.07±4.47 years. VAMA group had 2 first trimester miscarriages, hence only 67 participants were followed up till delivery. In 30-34 years of age group, one had ectopic pregnancy, 68 participants were followed up till delivery. In all three groups, most of the participants were educated till high school or pre-university course and mainly belonged to upper class in age group 30-34 years and lower class in AMA and VAMA group. In 30-34-year group majority of participants (53.6%) are para 1, whereas as the maternal age increased the parity obviously increased with AMA group mainly having para 2 and VAMA group with reaching up to para 6. Though majority of the participants conceived spontaneously, 10% of participants in VAMA group conceived with the help of artificial reproductive technique (ART). We did not find obesity increasing with maternal age as body mass index (BMI) was similar in all 3 groups (Table 1).

Table 1: Socio-demographic factors and first trimester variables among the three groups.

Variables	30-34 years 69 (%)	35-40 years 69 (%)	>40 years 69 (%)	Chi-square	P value
Education					
Primary	01 (01.4)	08 (11.5)	11 (15.9)		
High school/PUC	45 (65.2)	51 (73.9)	43 (62.3)		
Degree/postgraduation	23 (33.3)	10 (14.5)	15 (21.7)		
Socio-economic status					
Lower	17 (24.6)	27 (39.1)	30 (43.4)		
Middle	24 (34.8)	19 (27.5)	14 (20.2)		
Upper	28 (40.5)	23 (33.3)	25 (36.2)		
Parity					
Nulliparous	15 (21.7)	11 (15.9)	16 (23.2)		
Para 1	37 (53.6)	20 (29.0)	22 (31.9)	26.793	0.008
Para 2	15 (21.7)	22 (33.3)	16 (23.2)		
Para 3 and above	02 (02.8)	15 (20.0)	15 (21.7)		
BMI (mean±SD) Kg/m²	24.49+24.49	26.26+4.90	25.61+5.00	2.412 (F value)	0.092
Conception					
IVF	02 (02.9)	01 (01.4)	07 (10.1)		
Ovulation induction	04 (05.8)	03 (04.3)	01 (01.4)	8.077	0.089
Spontaneous conception	63 (91.3)	65 (94.2)	61 (88.4)		
First trimester loss					
Miscarriage	00 (00)	00 (00)	02 (2.9)	4.039	0.133
Ectopic	01 (01.4)	00 (00)	00 (00)	6.029	0.197

BMI-body mass index, IVF-Invitro fertilization, PUC-preuniversity college

Table 2: Antepartum variables among the three groups.

Antepartum variables		30-34 years 68 (%)	35-40 years 69 (%)	>40 years 67 (%)	Chi square	P value
Gestational hypertension	Yes	01 (1.5)	07 (10.1)	05 (7.5)	4.518	0.104
	No	67 (98.5)	62 (89.9)	62 (92.5)		
Preeclampsia	Yes	05 (7.4)	03 (4.3)	01 (1.5)	2.749	0.253
	No	63 (92.6)	66 (95.7)	66 (98.5)		
GDM	Yes	11 (16.2)	20 (29.0)	25 (37.3)	7.694	0.021
	No	57 (83.8)	49 (71.0)	42 (62.7)		
APH	Yes	00 (0)	02 (2.9)	02 (3.0)	2.041	0.360
	No	68 (100.0)	67 (97.1)	65 (97.0)		
Placenta previa abruption	Yes	01 (1.5)	00 (0)	01 (1.5)	1.033	0.597
	No	67 (98.5)	69 (100.0)	66 (98.5)		
Fibroid complicating pregnancy	Yes	01 (1.4)	09 (13.0)	16 (23.2)	14.867	0.001
	No	67 (98.6)	60 (87.0)	51 (76.8)		
Thyroid disorder complicating pregnancy	Yes	03 (4.3)	11 (15.9)	19 (27.5)	13.843	0.001
	No	65 (95.7)	58 (84.1)	50 (72.5)		
Gestational age at delivery	Preterm	13 (19.1)	08 (11.6)	04 (6.0)	5.467	0.065
	Term	55 (80.9)	61 (88.4)	63 (94.0)		
Foetal presentation	Cephalic	04 (5.9)	04 (5.8)	05 (7.5)	0.199	0.905
	Malpresentation	64 (94.1)	65 (94.2)	62 (92.5)		
Induction of labour	Yes	13 (19.1)	16 (23.2)	08 (11.9)	2.963	0.227
	No	55 (80.9)	53 (76.8)	59 (88.1)		

GDM-gestational diabetes mellitus, APH-antepartum hemorrhage.

Table 2 depicts fibroid complicating pregnancy was significantly high (p value 0.001) in VAMA and AMA group with 23.2% and 13.0% respectively. Similarly, thyroid disorder complicating pregnancy was significantly high in VAMA group of 27.5% and AMA group 15.9%. The prevalence of GDM was comparatively higher in VAMA group with the condition reaching as high as

37.3% and AMA group with 29.0%. Even 30-34 group had 16.2% of GDM which was more compared to normal incidence of 5-10% as Indians are more prone to diabetes mellitus. The percentage of gestational hypertension was higher in AMA and VAMA group whereas preeclampsia was more in 30-34 years age group. The percentage of preterm delivery was higher in 30-34 group with 19.1% compared to VAMA group on only 6%. There was no difference in APH or foetal malpresentation. The percentage of induction of labour was higher in AMA and 30-34 years age group. Table 3 shows the incidence of cesarean delivery was comparatively high in VAMA group of nearly 54.7% compared to 36.8% in 30-34 group. PPH was noted more in AMA and VAMA group nearly 15% compared to 5% in 30-34 years age group.

Table 3: Intrapartum variables among the three groups.

Intrapartum variables		30-34 years 68 (%)	35-40 years 69 (%)	>40 years 67 (%)	Chi square	P value
Mode of delivery	Vaginal	43 (63.2)	41 (59.4)	31 (46.2)	6.560	0.161
	LSCS	25 (36.7)	28 (40.5)	36 (53.7)		
Prolonged labour	Yes	01 (1.5)	01 (1.4)	04 (6.0)	3.206	0.201
	No	67 (98.5)	68 (98.6)	63 (94.0)		
PPH	Yes	04 (5.9)	11 (15.9)	10 (14.9)	3.885	0.143
	No	64 (94.1)	58 (84.1)	57 (85.1)		

LSCS-lower segment caesarean section, PPH-postpartum hemorrhage.

Table 4: Neonatal parameters among the three groups.

Neonatal variables		30-34 years 68 (%)	35-40 years 69 (%)	>40 years 67 (%)	Chi square	P value
Birth weight (kg)		2.85+0.60	2.95+0.37	2.96+0.48	1.064	0.347
APGAR <7	Yes	00 (0)	01 (1.4)	03 (4.5)	3.662	0.160
	No	68 (100)	68 (98.6)	64 (95.5)		
Foetal congenital anomaly	Yes	04 (5.8)	01 (1.4)	02 (2.9)	8.073	0.622
	No	64 (94.1)	68 (98.6)	65 (97.0)		
NICU admission	Yes	31 (49.6)	35 (50.7)	37 (55.2)	31.279	0.305
	No	37 (54.4)	34 (49.3)	30 (44.8)		
Neonatal death	Yes	02 (2.9)	01 (1.4)	01 (1.5)	0.510	0.775
	No	66 (97.1)	68 (98.6)	66 (98.5)		

APGAR-appearance, pulse, grimace, activity, respiration, NICU- neonatal intensive care unit

Table 5: Relative risk of certain variables of 35-40 years and >40 years compared to 30-34 years group.

Variables	Risk in 30-34 years	Risk in 35-40 years	RR of 35-40 years over 30-34	Risk in >40 years	RR of >40 years over 30-34 years
Fibroid	0.0145	0.1304	9	0.2319	16
Thyroid disorder	0.0435	0.1594	3.67	0.2754	6.33
Gestational hypertension	0.0147	0.1014	6.91	0.0746	5.08
GDM	0.1618	0.2900	1.79	0.3731	2.31
Vaginal delivery	0.6029	0.5510	0.91	0.4242	0.7
Caesarean section	0.3676	0.4058	1.1	0.5373	1.46
Prolonged labour	0.0147	0.0145	0.99	0.0597	4.07
PPH	0.0588	0.1594	2.71	0.1493	2.54

RR-relative risk, GDM-gestational diabetes mellitus, PPH-postpartum haemorrhage

The neonatal birth weight was similar in all 3 groups. There was no much differences noted among the 3 groups regarding foetal anomalies, neonatal mortality, NICU admissions and low APGAR score (Table 4).

Table 5 shows the relative risk of the conditions comparing VAMA group to 30-34 years age group and AMA group to 30-34 years age group. It clearly shows fibroid complicating pregnancy 16 times and 6 times more in VAMA and AMA group compared to 30-34 years age group. Similarly, thyroid complicating pregnancy was 6 times and 3 times more in VAMA and AMA group compared to 30-34 years age group. Gestational hypertension was 5 times and 7 times more in VAMA and AMA group. PPH was 2.5 times higher than 30-34 years age group. Prolonged labour was 4 times more in VAMA group compared to 30-34 years age group.

DISCUSSION

In our study, the analysis of parity distribution reveals significant increase in trend with maternal age, with younger women (30-34 years) predominantly having one or no children, while older women exhibit higher parity levels. The chi-square test indicates a statistically significant difference in parity across age groups, suggesting that as women age, their likelihood of having more children increases and so does the complications of multiparity. Jiang et al focused on the obstetric outcomes and perinatal outcomes in patients with AMA. Their study found a significant difference in parity distribution among age groups, reflecting increasing parity with age.[3] A study by Qublan et al also found a statistically significant increase in parity in older women. They also had an increase in the rates of caesarean deliveries due to higher parity.[4]

Our study data reveals that >10% conceived through invitro fertilisation in the >40 years age group, thus showing an increasing trend with the use of ART with increasing age. The study by Waynforth concluded that the use of artificial fertilization increased with maternal age and older mothers using ART were at higher risk of developing neonatal complications such as respiratory distress, infections and also delayed developmental milestone achievement.[5]

There was no discernible variation in the mean BMI among age groups in our study but other studies have shown increased BMI with increase in age and this extreme obesity has its own set of complications. In a study done by Neha et al, there was increased (88.8%) BMI (>25 kg/m^2) in pregnant women in >35 years of age.[6]

It was noted in this study, that age is a contributing factor for presence of fibroids and thyroid dysfunctions which can increase the complications in the pregnancy related to those. A study by Leung et al also described that advanced maternal age had significant effect on thyroid function.[7]

Only 2 participants in VAMA group had miscarriage which was not significant. The study by Das et al on the data from National Family Health survey noted that the likelihood of miscarriage jumps dramatically with age, from 10% for women in their 20-24 years to 51% for those in their 40–44 years.[8]

We found only 3% of placenta previa cases in this study in AMA and VAMA groups which was not significant. A retrospective study by Eichelberger et al evaluated 366 singleton pregnancies with placenta previa and no significant association was found between AMA and placenta previa.[9] There was no difference in APH, malpresentation, premature rupture of membranes (PROM), preterm premature rupture of membranes (PPROM) amongst the 3 groups in our study.

In our study, GDM showed an increase in trend with increase in age. This probably is attributed to age-related decline in insulin sensitivity and pancreatic β-cell function. The pathophysiology involves increased insulin resistance that characteristically emerges in pregnancy and is amplified in older women, thereby increasing the risk of GDM.

One of the most commonly observed complications in advanced maternal age is hypertensive disorders of pregnancy. As maternal age increases, vascular compliance and endothelial function may decline, predisposing women to gestational hypertension and preeclampsia. In our study, the rise in incidence of gestational hypertension was seen >35 years of age but was not statistically significant. We found preeclampsia was more in <35 years of age.

Here, we found preterm labour was more in younger age group with 19.1% in 30-34 years group than only 6% in VAMA group. Induction of labour was notably more in <40 years compared to >40 years of age mostly probably due to more of planned caesarean sections in >40 years of age.

The chances of having a vaginal delivery were more in younger age group compared to VAMA group. The percentage of LSCS was 53.6% in VAMA group compared to 40% in AMA group and 36% in 30-34 years group. groups. The physiological ageing of the uterine musculature and cervix, and lower threshold for surgical intervention due to anticipated complications in older women, could explain this pattern. Moreover, prolonged labour and increased induction rates may contribute to the elevated caesarean rate among these populations. There was no difference in vaginal birth after caesarean section (VBAC) and instrumental delivery in all the three groups. Prolonged labour was slightly high in VAMA group (4 times more) compared to 30-34 years age group.

The incidence of PPH increased with increase in age especially >35 years of age and was found two times more compared to 30-34 years age group.

Regarding neonatal outcomes, in this study we did not find much difference in these groups. The birth weights of neonates were similar in all the three groups. In terms of neonatal complications, the current study observed a slight increase in NICU admissions, and low APGAR scores in neonates born to mothers over 35 years which was not statistically significant. Regarding foetal congenital anomalies, in the 30-34 years group, 1 neonate had a Blake pouch cyst, 1 neonate had congenital diaphragmatic hernia, 1neonate had congenital talipes equinovarus and 1 had microcephaly. In the 35-40 years group, 1neonate had tetralogy of Fallot and in >40 years group, one more had congenital diaphragmatic hernia and another one had congenital talipes equinovarus. All anomalies were sporadic and non-conclusive. A retrospective data by Hadiwata et al collected in 3 hospitals in Indonesia

concluded increased incidence in hypertensive disorders, APH and intrauterine foetal demise (IUFD) in their cohort.[10]

This study demonstrates a clear correlation between advancing maternal age and heightened risk of complications such as thyroid disorders, fibroids, gestational hypertension, gestational diabetes, prolonged labour, PPH and caesarean deliveries. In women in the age group 30-34 years, this study demonstrated there is increased risk of preeclampsia, preterm deliveries, PROM/PPROM and induction of labour.

Although the study provides valuable insights, it has some limitations. Being a hospital-based study, findings may not be fully generalizable to community settings. Additionally, confounding factors such as socioeconomic status, parity, and access to prenatal care were not controlled. The sample size was less to get gross differences among the three groups.

The findings underscore the necessity of heightened antenatal surveillance and individualized obstetric care plans for women of AMA and VAMA. Comprehensive assessment during booking visits, regular monitoring for GDM and hypertensive disorders, early anomaly scans, and preparedness for possible operative delivery are key strategies to mitigate risks. Older women planning pregnancy should receive preconception counselling, specialized antenatal care, and a multidisciplinary approach. Increased frequency of visits and screenings are recommended. Proactive delivery planning in AMA and VAMA can reduce emergency interventions and associated morbidity. In parallel, awareness-raising campaigns on the decline in fertility from the age of 30 and increased complications should be promoted.

Women at an AMA should be encouraged to optimize their health when preparing for pregnancy; stop smoking and drinking alcohol, start physical activity, achieve normal body weight, take folic acid supplements and stabilize comorbidities. They also recommended prophylactic low dose aspirin, aneuploidy screening tests and induction at 39 weeks of gestation.[11]

A review study summarized that in contrast to the proven physical health risks for older age mothers and their offspring, it seems that advanced maternal age may play a protective influence on behavioural, social, and emotional difficulties for children which is beneficial component of advanced maternal age pregnancy.[12]

Research focusing on psychosocial aspects and long term maternal neonatal outcomes will also contribute significantly to this field.

CONCLUSION

Women over 35 years, and especially those above 40, are at significantly higher risk for fibroids, thyroid disorder,

gestational diabetes, gestational hypertension, prolonged labour, increased caesarean section rates and PPH. In 30-34 years of age group preterm delivery, preeclampsia and induction of labour was higher. These findings highlight the need for tailored obstetric care and early interventions to ensure safer pregnancies and better neonatal outcomes in older mothers.

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