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Original Research Article

Maternal-fetal obstetric outcomes in mothers of advanced maternal age: a cross-sectional analytical study at Saint-Joseph Hospital and the University Clinics of Kinshasa in the Democratic Republic of Congo

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ABSTRACT

Background: Pregnancy in advanced maternal age is any pregnancy occurring after the age of 35. Both late-term and early pregnancies carry a high risk of maternal and fetal morbidity and mortality and are a public health concern. The objective of this study is to identify obstetric outcomes associated with pregnancies in advanced maternal age at Saint-Joseph Hospital and the University Clinics of Kinshasa in the Democratic Republic of Congo.
Methods: This is a cross-sectional analytical study of the records of mothers aged 16 to 50 who gave birth in the maternity wards of Saint-Joseph Hospital and the University Clinics of Kinshasa from 01 January 2018, to 31 December 2022, using non-probability convenience sampling for case selection. Descriptive analyses, analysis of variance (ANOVA), Chi-square tests and logistic regression were used in statistical analyses.
Results: Pregnancies in women with advanced maternal age (AMA) are associated with the risk of pre-eclampsia (aOR: 2.5, p=0.02 for women aged 35-39 and aOR: 3.5, p=0.001 for those over 40) and gestational hypertension (aOR: 12.3, p=0.025 for those over 40), and fetal outcomes associated with pregnancies in women with AMA are prematurity (aOR: 2.7, p=0.001 for women aged 35-39 and aOR: 2.4, p=0.002 for women over 40), low birth weight (aOR: 2.5, p=0.0000 for women aged 35-39 and aOR: 2.4, p=0.002 for women over 40), and low birth weight (aOR: 2.5, p=0.0000 for women aged 35-39). women over 40 years of age) and admissions to neonatal intensive care units (aOR: 2.5, p=0.004 for women over 40 years of age).
Conclusions: Obstetric outcomes associated with pregnancy in older mothers are preeclampsia, prematurity, low birth weight, and admissions to neonatal intensive care units. Our results are useful for prevention through screening and other therapeutic measures of these obstetric and neonatal outcomes in women with AMA with a view to improving their care in our hospitals in Kinshasa.

Keywords: AMA, Obstetric outcomes, Fetal outcomes, Saint Joseph Hospital, University Clinics, Kinshasa

INTRODUCTION

Pregnancy at advanced maternal age (AMA) is defined as any pregnancy contracted from the age of 35 years.[1] Late pregnancy, like early pregnancies, are pregnancies with a high risk of maternal-fetal morbidity and mortality and are a public health concern.[2]

According to a World Health Organization (WHO) survey in three continents (Latin America, Middle East and

Africa) in 2010-2011, the global birth prevalence among mothers with AMA (prevalence of women with AMA) was 12.3%.[2,3] In Canada, the prevalence of women with AMA increased from 15% in 1998 to 18% in 2007 and 1 in 3 primiparas was over 35 years old.[4] In the USA, the reproductive age increased from the early twenties in 1970 to the late twenties in 2006.[4] In France, this prevalence increased from 19% in 2010 to 21% in 2016.[4] These prevalences also increased from 8.6% in 1990 to 25.9% in 2012 in Japan.[2] Similar trends have been observed in other developed countries in England and Australia.[5-7]

In Asia, the birth prevalence among women in AMA ranges from 3 to 31% and Japan has the highest birth prevalence among mothers in AMA (which is 31.0%) in the world.[2]

In Africa, the birth prevalence among women in AMA ranges from 8.0% to 18.0%.[2] Several African studies have reported a delay in the age at first pregnancy: this is the case in Cameroon in 2022 and Tanzania in 2017.[2] In the Democratic Republic of Congo (DR Congo), this prevalence is 18.0%, the highest on the African continent.[2]

The spread of schooling with the extension of the duration of studies, family planning and today the advent of assisted medical procreation (MAP) are associated with the evolution of this prevalence of women in AMA in several studies.[8]

Pregnancy complications in women in AMA are due to physiological changes and physical changes related to age, to which are added the morbid history of pregnant women such as uterine scars from myomectomy or caesarean section.[2,9] These obstetric complications or outcomes in AMA are maternal such as high blood pressure, gestational diabetes, abortions, and premature deliveries, and fetal such as intrauterine growth retardation, prematurity, postmaturity, fetal macrosomia, and neonatal distress.[2,9]

The lack of data on obstetric outcomes associated with pregnancies among elderly mothers in our city prompted us to conduct this study, the objective of which is to identify obstetric outcomes associated with pregnancies among elderly mothers at Saint-Joseph Hospital and the University Clinics of Kinshasa in the Democratic Republic of Congo.

METHODS

This is a cross-sectional analytical study of the records of mothers aged 16 to 50 who were followed and gave birth in the maternity wards of two hospitals in the city of Kinshasa: Saint-Joseph Hospital and Kinshasa University Clinics, from 01 January 2023 to 31 December 2024.

These two hospitals were chosen because of the presence of specialists in gynecology and obstetrics, which attract a high number of pregnant women from the city of Kinshasa, and the existence of a technical platform worthy of a second-referral hospital for Saint-Joseph Hospital and a third-referral hospital for the Kinshasa University Clinics.

Study population

Our study population consisted of records of mothers aged between 17 and 50, divided into two groups: the study group consisting of records of mothers of advanced age (over 35 years old) and the comparison group consisting of records of mothers aged 20 to 29 years' old who were monitored and gave birth in the maternity wards of two hospitals in the city of Kinshasa: Saint-Joseph Hospital and University Clinics of Kinshasa, from 01 January 2023 to 31 August 2024. The study group was subdivided into two subgroups: those aged 35-39 and over 40 years old, while the comparison group was 20 to 29 years old, according to the model of Shan et al in China.[9] Our sampling is non-probability of convenience. The sample size was dictated by the limitations of our study in time and space. The following criteria allowed us to include patients in the study: the records of pregnant women aged 17 to 50 years who attended prenatal consultations and delivered a preterm (28 to 36 weeks) and term (beyond 36 weeks) new-born in the obstetrics department of the UCK and at the HSJ during the period of our study. We excluded from this study the medical records of women who delivered twins and those who delivered before 28 weeks in the same setting and during the same study period. Our sample size was calculated using the following formula.

$$n = \frac{Z^2\, p(1-p)}{d^2}$$

Where n is the minimum sample size required, Z is 1.96 (95% confidence at the 0.05 significance level), p is 50% (assumed prevalence of obstetric outcomes in AMA), and d is 0.05 (desired margin of error).[9]

Our minimum sample size is 384 deliveries, and we increased it to 722 to make our results credible and increase their significance.

Data collection

Data were collected from a search of the deliveries' medical records and the maternity and operating room registers of these two hospitals, and recorded in the data collection record. The variables in our study were: delivery age, parity, gestational age, and maternal outcomes: preeclampsia, gestational diabetes, preterm delivery, placenta previa, retroplacental hematoma, cesarean section, and postpartum hemorrhage. and fetal outcomes such as stillbirth, prematurity, low birth weight (<2,500 g), macrosomia (≥4,000 g), intrauterine growth retardation, and the need for resuscitation (depressed APGAR at the 5th minute). Our data were collected as follows: we first identified the names of the pregnant women included in the study from the antenatal, maternity, and operating room registers of Saint Joseph Hospital and the University Clinics of Kinshasa, then searched the medical records

based on the names retained from the registers. Once the records were found, we transcribed the data from the file onto the data collection sheet.

Operational definition

The need for resuscitation corresponds to any newborn whose APGAR score is depressed at the 5th minute of life or birth.[9] This score includes five elements: appearance, pulse, grimace, muscle activity, and respiration.

Stillbirth is the death of a baby after 28 weeks of gestation, before or during delivery.[9]

Prematurity is the birth of a newborn between 28 and 36 weeks of gestation.[9]

Statistical analyses

Data were entered using Excel and exported to R software for statistical analyses. We used ANOVA tests to compare means, chi-square tests to compare proportions, and univariate logistic regression to assess the strength of association between obstetric outcomes and AMA. Odds ratios (OR) were adjusted for parity, history of hypertension, and education level. The significance of our results was set at $p<0.05$.

RESULTS

Preeclampsia was present in 82 cases, or 9.30% of all patient records, including 57 cases in women undergoing AMA, or 37 cases in the 35-39 age group, and 20 cases in those over 40. Hypertension during pregnancy was present in 860 cases, or 95.0% of records, including 353 cases in mothers undergoing AMA, or 265 cases in the 35-39 age group, and 88 cases in those over 40 (Table 1). Concerning fetal outcomes, stillbirth was present in 56 cases or 6% of all our files including 35 cases in mothers in AMA or 29 cases in the 35 to 39 age group and 6 cases in those over 40 years old while prematurity was in turn present in 122 cases or 13.5% of our patients' files including 73 cases in mothers in AMA or 54 cases in the 35-39 age group and 19 cases in those over 40 years old (Table 1).

Table 1: Obstetric outcomes associated with pregnancies in mothers of advanced age.

Variables	Maternal age (year) (%)						
	Total	≤19	20-29	30-34	35-39	≥40	P value
	n=905	n=24	n=296	n=195	n=285	n=105	
Mode of delivery							
Caesarean section	436 (48)	13 (54.2)	128 (43)	98 (50)	140 (49)	57 (54)	0.11
Vaginal delivery	469 (52)	11 (45.8)	168 (57)	97 (50)	145 (51)	48 (46)	
Instrumental delivery	4 (0.3)	0 (0)	0 (0)	0 (0)	4 (1.3)	0 (0)	0.2
PPH	6 (0.7)	0 (0)	4 (1.4)	0 (0)	2 (0.7)	0 (0)	0.4
Maternal outcomes							
Preeclampsia	82 (9.3)	5 (20.8)	17 (5.7)	14 (7.2)	37 (13)	20 (19)	<0.01
Pregnancy-induced hypertension	860 (95)	23 (95.8)	284 (97)	188 (97)	265 (93)	88 (84)	0.004
Gestational diabetes mellitus	7 (0.8)	1 (4.2)	2 (0.7)	2 (1.0)	0 (0)	2 (1.8)	0.4
Placenta previa	25 (2.6)	1 (4.2)	7 (2,4)	5 (2.6)	8 (2.7)	4 (3.5)	0.6
Retroplacental hematoma	20 (1.9)	0 (0)	5 (1.7)	3 (1.5)	10 (3.3)	2 (1.8)	0.7
Fetal outcomes							
Stillbirth	56 (6.0)	2 (8.3)	12 (4.1)	7 (3.6)	29 (10)	6 (5.3)	0.025
Prematurity	122 (13.5)	5 (20.8)	28 (9.5)	16 (8.2)	54 (19)	19 (18)	0.001
Low birth weight (<2,500 g)	148 (16.35)	5 (20,8)	46 (16)	22 (11)	48 (17)	27 (26)	0.029
APGAR score 5th min <7	70 (7.7)	2 (9.1)	24 (8.4)	8 (4.3)	21 (7.4)	15 (14.5)	0.129
Macrosomia, N (%)	47 (5.2)	0 (0)	14 (4.7)	9 (4.6)	20 (6.7)	4(3.5)	0.9
Admitted to neonatal intensive care unit	105 (11.6)	6 (25)	32 (11)	19 (9.7)	31 (11)	17 (16)	0.007
Newborn respiratory tract complications	9 (0.8)	0 (0)	1 (0.7)	0 (0)	6 (2.0)	2 (1.8)	0.2

Low birth weight was encountered in 148 cases or 16.35% of all our patient records, including 75 cases in mothers in AMA, i.e., 48 cases in the 35-39 age group and 27 cases in those over 40 years old, while admissions to the intensive care unit were recorded in 105 cases or 11.6% of all records, including 48 cases in mothers in AMA, i.e., 31 cases in mothers aged 35 and 39 years old and 17 cases in those over 40 years old (Table 1). Pregnancies in older mothers were significantly associated with pre-eclampsia, gestational hypertension on the maternal side, and stillbirth, prematurity, low birth weight and admission to the neonatal intensive care unit on the fetal side (Table 1).

Regression analyses allowed us to note a significant association between pregnancies in women of advanced maternal age and the risk of occurrence of pre-eclampsia and gestational hypertension on the maternal side, and of prematurity, low birth weight, stillbirth and admission to neonatal care units (Table 2).

Table 2: Assessment of the risk of occurrence of obstetric outcomes associated with pregnancy in AMA.

Maternal issues	Raw OR (95% CI)	Adjusted OR (95% CI)
Preeclampsia (years)		
20-29	1	
35-39	2.5 (1.3-5.0)[b]	2.5 (1.2-5.5)[b]
≥40	3.9 (1.7-8.9)[b]	3.5 (1.3-9.5)[b]
Pregnancy-induced hypertension (years)		
20-29	1	
35-39	2.0 (0.8-5.0)	1.2 (0.4-3.4)
≥40	5.3 (2.1-13.8)[b]	2.3 (1.7-7.8)[b]
Perinatal outcomes (years)		
Prematurity		
20-29	1	1
35-39	2.3 (1.3-4.0)[b]	2.7 (1.4-5.0)[b]
≥40	2.0 (0.9-4.5)	2.4 (1.0-6.1)[b]
FPN (years)		
20-29	1	1
35-39	1.1 (0.6-1.9)	1.3 (0.7-2.4)
≥40	1.9 (1.0-3.8)[b]	2.5 (1.1-5.6)[b]
Admitted to neotal intensive care unit (years)		
20-29	1	1
35-39	1.0 (0.5-1.9)	1.4 (0.7-2.8)
≥40	1.5 (0.7-3.4)	2.5 (1.0-6.3)[b]
Stillbirth (years)		
20-29	1	1
35-39	2.6 (1.2-5.8)[b]	1.6 (0.4-6.6)
≥40	1.3 (0.4-4.8)	1.0 (0.8-1.2)

[a]Odds ratio and CI adjusted for parity, presence of hypertension in previous pregnancies, and education; [b]designates age groups with a significant difference from the reference group because the p value was less than 0.05

DISCUSSION

Our results show a dramatic upward trend in the risk of preeclampsia and hypertension with advancing maternal age. Our results are consistent with those of the three Chinese studies, but are inconsistent with those of other studies conducted in the United States, the United Kingdom, Germany, and Israel.[5,6,9-13] Preeclampsia is significantly associated with pregnancies in older mothers in our setting. These pregnancies increase the risk of preeclampsia threefold in age group 4 and fourfold in age group 5 in our setting. Our results are consistent with those of Shan et al in China, Khalil et al in England, Dietl et al and Schimmel et al in Germany, and Timofeev et al in Israel.[6,9,12-14] The occurrence of preeclampsia during pregnancy in mothers of advanced age is explained by direct biological changes and environmental impacts (lack of socioeconomic support and intense psychosocial stress) accumulated with advanced age, partly based on inadequate maternal cardiovascular adaptations during pregnancy with reduced nitric oxide.[15-17] Due to these inadequate adaptations, dramatic hemodynamic changes to support the fetus cannot be guaranteed. It should be noted that animal studies have also shown that in elderly mothers, reduced nitric oxide bioavailability may impair endothelial function with loss of cardiovascular compliance, which results in more constrictive vascularization in the systemic and uterine circulation.[17,18] In addition, in older mothers, there is a limitation of trophoblast cell invasion capacity into the underlying decidua due to the altered decidual response and changes in microvillus architecture.[17] Ischemic placenta in older mothers may trigger a greater oxidative stress response, resulting in increased syncytiotrophoblast apoptosis and more immunological responses that determine the higher risks of hypertensive complications of pregnancy.[19,20]

The mode of delivery, including caesarean section, is not significantly associated with AMA in our setting. Our results are contrary to those of several studies conducted in Asian, European and American countries that have reported a significant caesarean section rate in older mothers ranging from 53.3% to 91.8%.[7,14,21,22] A study conducted in Boston found that mothers over 40 years of age were more likely to undergo elective caesarean section without medical indication.[23] This is not the case in our case series. A study conducted in Beijing in 15 hospitals reported a significant caesarean section rate of 66.3% in mothers aged 35 to 39 years and 74.8% in those aged over 40 years.[11] This is not the case in our case series.

AMA is not significantly associated with PPH in our setting. Our results are consistent with those of Shan et al in China but are contrary to those of studies conducted in the USA, the UK and Nigeria.[9,24-26] The low level of education among older mothers living in rural areas significantly increased the risks of many obstetric maternal complications including PPH in women with AMA according to Shan et al in China.[9] This is not the case in our case series. Our results can be explained by the predominance of university women living in urban areas of Kinshasa.

The risk of prematurity increases with maternal age from 35 years. AMA is significantly associated with prematurity because it multiplies the risk of prematurity by 3 in age group 4 and by 2 in age group 5 in a statistically significant manner. These results are consistent with those of Kenny et al and Khalil et al in England, those of other African studies such as those of Kaka et al in DR Congo, Bikila et al, Asefe et al and Mihret-Ab et al in Ethiopia, Hoque in South Africa and Ngowa et al in Cameroon.[5,6,27-30,32] This increased risk of prematurity in older mothers can be explained by the increased risk of pathologies that induce

prematurity such as pre-eclampsia and high blood pressure in these pregnant women in our environment.

Our results show a trend towards a decrease in the frequency of stillbirth in group 3 and an increase with advanced maternal age (age group 4 and 5). Our results are contrary to those of Shan et al in metropolitan China but are consistent with the results of the same authors in rural China.[9] Lack of compliance with prenatal care was the main cause. This may be the case in our urban areas of Kinshasa despite the awareness of the population (filled with poor people) to respect non-free prenatal care during the period of our study. According to Waldenstrom et al and Ben-David et al, natural selection, which means that only the healthiest embryos can survive, may explain the high risk of prematurity and stillbirth in older mothers.[22,33] This may also explain our results.

Pregnancies in older mothers are not significantly associated with stillbirth in our setting. Our results are consistent with those of Shan et al in China, Dietl et al and Kanungo et al in Germany but are contrary to those of other African studies such as those of Bikila et al, Asefe et al and Mihret-ab et al in Ethiopia, Hoque in South Africa, Ngowa et al in Cameroon and Odame et al in Ghana.[9,14,28-32,34,35] The characteristics of our study populations would explain the difference in our results.

The risk of low birth weight increases with advancing maternal age to reach the maximum in mothers aged over 40, in whom this risk is significantly multiplied by 3 in our environment. Our results corroborate those of Asefe et al and Mihret-ab et al in Ethiopia, Hoque in South Africa, Odame et al in Ghana and Ngowa et al in Cameroon.[29-32,35] The decrease in placental perfusion linked to induced hypertension and pre-eclampsia in elderly mothers could explain our results. Our results are contrary to those of Bikila et al in Ethiopia, and Alshami et al in developed countries.[28,36] This difference could be explained by the difference in study setting regarding the variation in clinical progress and obstetric practices as observed by Bikila et al in Ethiopia.[28]

The proportion of newborns admitted to the neonatal intensive care unit tends to decrease in age group 3 (23.17% of cases), then increases with advancing maternal age to reach the maximum in mothers aged over 40 years, in whom the adjusted risk is significantly multiplied by 3 in our setting. Our results meet those of Kaka et al in Kinshasa, those of Mihret-Ab et al in Ethiopia, those of Yılmaz et al in Turkey, those of Kamlesh et al in India and Arnold et al in Brazil.[27,30,37-39] These results could be explained by the fact that advanced maternal age is associated with the occurrence of pre-eclampsia and hypertension during pregnancy, two factors altering the fetal vital prognosis in these mothers in our environment. Iatrogenic prematurity and its associated complications can distort these results and be confused with the need for resuscitation as found by Mihret-Ab et al in Ethiopia.[30] Our results are contrary to those of studies conducted in Jordan and Malaysia which showed no association between newborns needing resuscitation and pregnancy at an advanced maternal age.[40,41] This would be due to a difference in sample size. Our results are useful for prevention, through screening and other therapeutic measures, of these obstetric and neonatal outcomes in women with AMA, with a view to improving their care in our Kinshasa hospitals.

The retrospective nature of this study design is a major limitation because it does not allow us to determine the cause of this late motherhood or the temporality of the variables, nor to include other independent factors such as the behaviour of older mothers, their knowledge, attitudes, and the presence of psychosocial stressors that may be risk factors for various adverse pregnancy outcomes.

The strengths of our study are that it is the first at University Clinics of Kinshasa and Saint Joseph Hospital to address this topic and that it serves as the basis for several more in-depth studies investigating the causes and other independent factors related to pregnancy outcomes in older maternal age.

CONCLUSION

It appears that maternal outcomes associated with pregnancies in women with AMA are preeclampsia and gestational hypertension, and fetal outcomes associated with pregnancies in women with AMA are prematurity, low birth weight, and neonatal intensive care unit admissions. Our results are useful for the prevention of these obstetric and neonatal outcomes in women with AMA through screening and other therapeutic measures, with a view to improving their care in our hospitals in Kinshasa.

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