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Obstetric and perinatal outcomes in women ≥40 years of age: Associations with fetal growth disorders

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ABSTRACT

Background: Evidence indicates that advanced maternal age is associated with adverse obstetric and perinatal outcomes. The purpose of this study was to evaluate pregnancy outcomes in women of advanced maternal age (≥40 years).

Methods: Using a prospective study design, data were collected by the Department of Obstetrics at the San Joan de Deu Hospital of Barcelona during the 1 June 2009 to 31 May 2012 period. The results were compared across three maternal age groups (≥40 [$n = 654$], 35–39 [$n = 2781$], and <35 [$n = 7893$] years).

Results: Of the 11328 births recorded during the study period, pregnancy-related complications were more common in women ≥40 years of age. The most common disorder was diabetes (8.5% in the ≥40, 5.3% in the 35–39, and 3.0% in the <35 years age groups). The women ≥40 years of age also had significantly more premature births ($p = 0.001$) and cesarean sections (17% in the ≥40, 12.5% in the 35–39, and 7.9% in the <35-year age groups; $p = 0.001$). Intrauterine growth retardation was significantly more frequent in women aged ≥40 years (17.4% in the ≥40, 15% in the 35–39, and 14.0% in the <35-year age groups; $p = 0.03$). Fetal macrosomia was significantly more common in women ≥40 years (15.4% in the ≥40, 12.6% in the 35–39, and 12% in the <35-year age groups; $p = 0.03$).

Conclusion: Maternal age ≥40 years was associated with poorer obstetric and perinatal outcomes and increased the risks of cesarean section, intrauterine growth retardation, and fetal macrosomia.

1. Introduction

Women are postponing motherhood at increasing rates, especially in developed countries [1,2]. In Spain, the average age of women giving birth increased from 30.87 years in 2008 to 31.5 years in 2012 [3]. The reasons for delayed childbearing are an emphasis on career priorities and increased availability of assisted reproductive technology. These social trends have resulted in a growing population of women who conceive after 35 years of age [4]. Pregnancy after 40 years of age is no longer uncommon. However, the decision to postpone motherhood has a considerable effect on the public health system because of the resulting increased maternal and perinatal risks [5,6].

Advanced maternal age has been linked to an increase in concurrent conditions (e.g., hypertension, type 2 diabetes mellitus) and complications related to pregnancy that affect perinatal outcomes (e.g., preterm birth, low or very low birth weight, low Apgar scores, instrument delivery, and cesarean sections) [7,8]. However, the results published on this subject are contradictory. It is unclear whether advanced maternal age alone is associated with adverse pregnancy outcomes.

Given the growing number of women that are delaying pregnancy, the objective of this study was to investigate the hypothesis that women ≥40 years of age are more likely to experience adverse pregnancy outcomes.

2. Materials and methods

We performed a prospective study of women >20 years of age who gave birth in the obstetrics department of the Hospital San Joan de Déu (Barcelona, Spain). The hospital is a tertiary referral center that performs >4000 deliveries annually. It accepts referrals from almost 300 health centers. The ethics committee of the Fundació Sant Joan de Deu approved the study. Data from each delivery recorded over a 3-year (1 June 2009 to 31 May 2012) period were included in the analysis, except for the deliveries with missing data. Multi-fetal pregnancies were excluded from the analysis.

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Table 1
Pregnancy-related complications ($n = 11.328$ births), by maternal age.

	Maternal age			*p* Value	*p* Value (35–39 vs ≥40)
	<35 y $n = 7893$	35–39 y $n = 2781$	≥40 y $n = 654$		
Gestational hypertension, n (%)	127(1.7)	56 (2.1)	24(3.7)	0.007	0.01
Gestational diabetes, n (%)	229(3.0)	143(5.3)	55(8.5)	0.001	0.002
Threatened preterm birth, n (%)	390(5.1)	146(5.4)	49(7.7)	0.016	0.02

χ [2].

Data were collected from clinical records stored in the decentralized hospital information system and laboratory databases. All data were entered into an Access (Microsoft Office 2010, Microsoft, Redmond, WA, USA) database that was purpose-designed for the study. The women were divided into three age groups according to age at the time of delivery (<35, 35–39, and ≥40 years). Maternal choice was not an indication for cesarean section.

Obstetric outcome and perinatal outcome variables were analyzed. Obstetric outcome variables were gestational diabetes (DG; glucose intolerance during pregnancy detected using a screening test, plasma glucose ≥140 mg/dl 1 h after consumption of a 50 g glucose solution, confirmed by consumption of 100 g oral glucose test [i.e., ≥2 high plasma glucose values]) [9], hypertensive disorders of pregnancy (hypertension present after 20 weeks gestation), abnormal fetal weight (intrauterine growth retardation [IUGR], birth weight less than the 10th percentile for gestational age) and excess weight (macrosomia weight >4000 g), prematurity (<37 weeks delivery), cesarean section rate, and fetal exitus.

Perinatal outcome variables were cord PH, fetal distress (permanent or temporary, including diverse etiologies characterized by hypoxia, hypercapnia and consequent acidosis, and other abnormalities of homeostasis and maternal fetal to placental gas exchange level), and hospital admission and reasons for admission (i.e., respiratory distress, malformation, prematurity, and IUGR).

2.1. Statistical analysis

We performed a descriptive analysis of the data that included calculation of the values for means and proportions. Age was assessed quantitatively and qualitatively. Analysis of variance was used for a between-group comparison of the mean values of the quantitative variables. For categorical variables, the Chi-square test was used to compare proportions and the Mantel-Haenszel test was used to examine the associations between mode of delivery and age adjusted for parity. The exact non-parametric Kruskal-Wallis and Fisher tests were used where appropriate for quantitative and categorical data, respectively. The follow-up analyses, excluding patients <35 years of age, were repeated to compare outcomes for women 35–39, and ≥40 years of age. All analyses were performed using SAS 9.3 statistical software (SAS Institute, Cary, NC, USA). A p value <0.05 was considered to indicate a statistically significant result.

3. Results

We included 11,328 births in the analysis; 7893 (69.68%) were from women <35, 2781 (24.55%) were from women 35–39, and 654 (5.77%) were from women ≥40 years of age.

Women in the ≥40 years age group had a higher frequency of pregnancy-related disorders in every category analyzed (i.e., hypertensive states, gestational diabetes, threatened preterm birth; Table 1). The most common disorder was gestational diabetes, which affected 55 (8.5%) of women in the oldest age group compared with 229 (3%) of those <35, and 143 (5.3%) of those aged 35–39 years (Table 1). The between-group differences were statistically significant ($p = 0.001$).

The results for obstetric outcomes revealed that preterm delivery, induced delivery, and elective cesarean sections were significantly more common in the ≥40 years age group ($p = 0.001$). Intrapartum cesarean section was also significantly more common in this age group (19.8%) compared with the <35 years (15%) and the 35–39 years (17.5%) groups ($p = 0.001$). The difference remained significant when the ≥40 group was compared with the women aged 35–39 years ($p < 0.05$), and after an adjustment for age ($p = 0.002$) (Table 2).

Table 2
Obstetric outcomes ($n = 11.328$ births), by maternal age.

	Maternal age			*p* Value	*p* Value (35–39 vs ≥40)
	<35 y ($n = 7893$)	35–39 y ($n = 2781$)	≥40 y ($n = 654$)		
Gestational age[a]				0.01	0.02
No.	7865	2773	650		
Mean	38.81	38.72	38.39		
SD	2.21	2.43	2.82		
Gestational age at birth[b], n (%)				0.001	0.003
Preterm	791 (10.1)	304 (11)	108 (16.6)		
Term	7007 (89.1)	2448 (88.3)	538 (82.8)		
Post-term	67 (0.9)	21 (0.8)	4 (0.6)		
Initial mode of delivery[b]				0.001	0.005
Spontaneous	5188 (66.2)	1620 (58.6)	333 (51.3)		
Induced	2031 (25.9)	797 (28.8)	203 (31.3)		
Cesarean section	616 (7.9)	346 (12.5)	113 (17.4)		
Actual delivery[b,c], n (%)				0.001	0.002
Vaginal	4727 (60.0)	1562 (56.2)	323 (49.5)		
Instrument-assisted	1470 (18.7)	447 (16.1)	100 (15.3)		
Elective cesarean section	501 (6.4)	281 (10.1)	101 (15.5)		
Intrapartum cesarean section	1179 (15.0)	487 (17.5)	129 (19.8)		

[a] Analysis of variance.
[b] χ^2.
[c] Mantel-Haenzsel test (χ^2 adjusted for parity) $p = 0.001$ $p = 0.003$.