

Risk of low birth weight in relation to advanced maternal age at an Egyptian tertiary center

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Abstract: Background and objective: Low birth weight is defined as the live births with less than 2.5 kg weight. Birth weight is the key factor of infant survival and development. Low birth weight infants are at an increased risk of having a disability and for diseases as cerebral palsy, visual, learning and respiratory problems. To reduce the low birth weight deliveries, the effect of advanced maternal age on birth weight and its impact on fetus was studied. **Patients and Methods:** This was a retrospective cross sectional study that was done at Ain Shams University Maternity Hospital. The study included 50,000 women who were admitted to Ain Shams University Maternity Hospital for delivery, over a 7-year period, between January 2003 and December 2009. Data was collected from patient records available at "Patient Records Department" at Ain-Shams University Maternity Hospital. Missing data was collected through phone calls or direct contact with the patients or their relatives. **Results:** A total of 50,000 deliveries were studied. Prevalence of LBW in those below and above 35 years was 7.2% and 10.1% respectively. There was a highly significant association between advanced age of mother with LBW was noted. **Conclusion & recommendations:** advanced maternal age contribute substantially to LBW. There is a need of ensuring proper antenatal care and also highlighting the need both for basic supportive care facilities and improved disease prevention strategies.

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1. Introduction

Advanced maternal age is considered to maternal age of 35 years at the estimated date of delivery. In the last decades, a trend of shifting family planning and childbearing towards advanced maternal age became more widespread. Moreover, more women defer pregnancy to the fifth decade of their life and even further by taking advantage of the artificial reproductive technologies. As a result, the live birth rate for women of advanced maternal age have increased steadily over the past years.¹ Advanced age pregnancy and childbearing is a pressing social concern in Egypt. An enormous quantity of research has shown that advanced age childbearing is linked to a host of negative social, economic and medical consequences for both mother and child as low birth weight. It is a well-established fact that fecundity decreases and the risk for miscarriage increases with age.² However, the enormous advances in reproductive medicine have compensated, to some extent, for this natural decrease in fecundity, and nowadays even postmenopausal women have become pregnant through oocyte donation.⁷ The influence of advanced maternal age and delayed childbearing on perinatal outcome has previously been studied, but most studies have evaluated outcome in women aged 35 years or older.³ It has been shown that pregnant women aged 35 years or older experience an increased risk of intrauterine fetal death, pregnancy-induced

hypertension, gestational diabetes, and delivery by cesarean.⁴

Most studies that have dealt with advanced maternal age are hospital-based; there are very few population-based studies.⁵ Two hospital-based studies have investigated women aged 45 years or older.⁶ The aim of this national population-based study was to investigate the influence of maternal age on perinatal and obstetric outcome in women aged 35 years or older.

2. Patients and Methods:

Informations are collected by the staff responsible for the care of the patients and include demographic data, reproductive history, and complications during pregnancy, delivery, and the neonatal period. Copies of the standardized individual antenatal, obstetric, and pediatric records are forwarded to the Birth Registry, where the informations are automatically entered into a database and stored. The register has been validated and quality is controlled on a yearly basis. Maternal complications during pregnancy are considered to be of acceptable quality.

Women included in the study are part of the homogenous, low-risk population, term and singleton pregnancy with no medical disorders. Exclusion criteria: Pre-existing maternal diseases, medical complications in pregnancy, teenage pregnancy, multiple pregnancy and preterm labor. Intercurrent illness was defined as the presence of a prepregnancy

history of existing hypertensive disease, diabetes, inflammatory bowel disease, and these were recorded at the first antenatal visit. Complication during pregnancy was defined as a history of gestational diabetes, pregnancy-induced hypertension, or preeclampsia during the pregnancy.

Pregnancy outcomes, such as stillbirth, birth weight, gestational age at delivery, and infant gender, are recorded in the delivery or pediatric records. Validation of the Birth Register has concluded that data on birth weight, gestational age, and stillbirth are correctly recorded. The Birth Register includes information on all live births, as well as stillbirths, occurring at 28 completed gestational weeks or later. Information necessary to determine maternal mortality was obtained from the national Causes of Death Register. From 2003 to 2009, 50,000 births were included in this study, 32,548 women aged 20 – 34 years and 17,452 women aged 35 years or older.

Gestational age was calculated by using information from date of birth and estimated date of delivery as determined in early pregnancy and ultrasound scan. More than 95% of pregnant women avail themselves of this opportunity.

Small for gestational age (SGA) was defined as a birth weight below 2 standard deviations from the mean weight corrected for gestational age and gender.⁶ *Large for gestational age* (LGA) was defined as a birth weight more than 2 standard deviations from the mean weight corrected for gestational age and gender.⁷

Dichotomous data were tested for Statistical analysis were performed with the use of SPSS 13.0 for windows (SPSS Inc. Chicago, IL). Student test was used to compare numerical variables. Data distribution

bronchial asthma, disseminated lupus erythematosus, or & frequency differences were analyzed with the person chi-square test. The significance level was set at $p < 0.05$ was used for all tests. The results was expressed as mean \pm SD.

3. Results

The current study was conducted on women delivered at Ain Shams University Maternity Hospital during the period between January 2003 and December 2009. The study included 2 groups of women: group I (control group) [n=32,548]: women who were aged 20 – 34 years, and group II (study group) [n=17,452]: women were age 35 years or older. The mean (\pm standard error) birth weight in group I and group II were 3.038 (\pm 0.781) and 2.756 (\pm 0.465) respectively while the incidence of low birth weight in group I was 7.2 and in group II was 10.1% with highly significant difference between the two groups. (Table 1)

The rate of malpresentations in group I and group II were 1.302 (4%) and 1.396 (8%) respectively with highly significant difference between the two groups. The cesarean delivery rate in group I was 8.489 (26.1%) and the rate for group II patients was 6.638 (38%). In the older group, the operative vaginal delivery rate (forceps and vacuum) was 1.997 (11.4%) and 2.897 (8.9%) for younger women. Rates of prolonged hospitalization, post partum hemorrhage, postpartum fever and neonatal intensive care unit admission were significantly higher among older women (1.197 (6.9%), 797 (4.6%), 726 (4.2%) and 1.873 (10.7%) respectively) compared with rates among younger women (1.057 (3.2%), 893 (2.7%), 817 (2.5%) and 2.117 (6.5%) respectively). (Table 2)

Table 1: showing the mean birth weight and incidence of LBW in studied groups

Maternal age	Number (%)	Mean birth weight	LBW (%) (< 2.5 kg)	T – value	P – value
20 - 34 years	32,548	3.038 (\pm 0.781)	7.2	43.73	$P < 0.01$
> 35 years	17,452	2.756 (\pm 0.465)	10.1		Highly significant

Table 2: showing obstetric outcomes in the study and comparison groups

Variable	20 -34 years (Group I)	35 years (Group II)	P - value
Malpresentations	1.302 (4%)	1.396 (8%)	< 0.001
Cesarean sections	8.489 (26.1%)	6.638 (38%)	< 0.001
Operative vaginal delivery	2.897 (8.9%)	1.997 (11.4%)	< 0.001
Prolonged hospitalization*	1.057 (3.2%)	1.197 (6.9%)	< 0.001
Post partum hemorrhage	893 (2.7%)	797 (4.6%)	< 0.001
Postpartum fever	817 (2.5%)	726 (4.2%)	< 0.001
Neonatal intensive care unit admission	2.117 (6.5%)	1.873 (10.7%)	< 0.001

*Hospitalization for more than 4 or 7 days after vaginal or cesarean delivery, respectively

4. Discussion

This study has demonstrated an increase in low birth weight rates in relation to maternal age in childbearing women from the last part of their fertile period, i.e. 35 years or older. Our data suggest that the increased occurrence of operative delivery cesareans, perinatal morbidity in older women could not be explained by the increased frequency of intercurrent illness or pregnancy complications observed in these women. One can, however, have possible reservations regarding the validity of this conclusion, if pregnancy complications had been underreported, but on the other hand, we see no reason why underreporting should differ between the various age groups.

One case control study was found comparing pregnancy outcomes of 24 aged 50-64 years with 99 of those aged 45-49 years and with the general population⁸. All women older than age 50 conceived via in vitro fertilization with oocyte donation. The authors report: "Women aged 50 years and older gave birth to significantly more low birth weight babies than those younger than age 50 years (61% versus 32%, $P=.002$)."

A retrospective study on all deliveries in the United States from 1997 to 1999 examined four maternal age groups of 20-29 (young), 30-39 (mature), 40-49 (very mature), and 50 or more years (older)⁹. The abstract notes. "RESULTS: A total of 539 deliveries among older mothers (aged 50 and above) were documented (four per 100,000). Among singleton gestations, the risks for low birth weight, preterm, and very preterm were tripled among older mothers, whereas the occurrence of very low birth weight, small size for gestational age, and fetal mortality were approximately doubled compared with those for young mothers. Older mothers also had greater risks for fetal morbidity and mortality than their immediate younger counterparts (40-49 year olds) except for very low birth weight. Among multiple gestations, the differences in risk between older and young mothers were lower than those noted among singletons. Still, compared with young mothers, older mothers had significantly higher risks of low birth weight, very low birth weight, very preterm, and small size for gestational age. Older mothers also had higher risk estimates for multiples than 40-49-year-old gravidas in terms of all fetal morbidity and mortality indices."

Results from a prospective database from a multicenter investigation of singletons, the FASTER trial, were reported in 2005¹⁰. Subjects were divided into 3 age groups: 1) less than 35 years, 2) 35-39 years, and 3) 40 years and older. Multivariable logistic regression analysis was used to assess the effect of age on outcomes after adjusting for race, parity, body mass

index, education, marital status, smoking, medical history, use of assisted conception, and patient's study site. The abstract notes:

"A total of 36,056 women with complete data were available: 28,398 (79%) less than 35 years of age; 6,294 (17%) 35-39 years; and 1,364 (4%) 40 years and older...Increased risk for abruption (adjOR 2.3), preterm delivery (adjOR 1.4), low birth weight (adjOR 1.6), and perinatal mortality (adjOR 2.2) was noted in women aged 40 years and older."

A population-based cohort study used prospectively collected data from the Swedish Medical Birth Register to investigate the effect of advancing maternal age on pregnancy outcome among 173,715 healthy nulliparous women aged 20 yrs and above with singleton births, after adjustment for demographic characteristics, smoking, history of infertility, and other medical conditions⁴. These investigators defined very low birth weight (VLBW) as less than 1500 g and moderately low birth weight (MLBW) as 1500 through 2499 g. "RESULTS: Compared with women aged 20 to 24 years, women aged 30 to 34 years had significantly higher adjusted odds ratios (ORs) of late fetal deaths (OR = 1.4); VLBW (OR = 1.2); MLBW (OR = 1.4); very preterm birth (OR = 1.2); and SGA infants (OR = 1.4). Among women aged 35 to 39 years, the adjusted OR was significantly higher for VLBW (OR = 1.9); MLBW (OR = 1.7); very preterm birth (OR = 1.7); moderately preterm birth (OR = 1.2); and SGA infants (OR = 1.7). Among women 40 years old and older, the adjusted OR was significantly higher for VLBW (OR = 1.8); MLBW (OR = 2.0); very preterm birth (OR = 1.9); moderately preterm birth (OR = 1.5); and SGA infants (OR = 1.4)."

A retrospective survey of Washington State birth certificates from 1984 through 1988 studied the consequences of delayed first childbearing in a large, population-based US sample, with separate analysis of women aged 40 years or more ($n=410$) and adjustment for socioeconomic factors, smoking, medical and reproductive conditions, and route of delivery¹¹. Outcome measures used were Low (< 2500 g) and very low (< 1500 g) birth weight and preterm delivery (< 37 weeks of gestation). These authors reported. "RESULTS: Adjusted odds ratios for delivering a low-birth-weight white infant increased progressively with each 5-year maternal age group, reaching 2.3 (95% confidence interval, 1.6 to 3.4) for women aged 40 years or more compared with those aged 20 to 24 years. The maternal age effects for very low birth weight and preterm delivery were similar; for each, the odds ratio was 1.8 for the oldest group."

A hospital-based data analysis of 9506 delivery records from 1998 to 2003 at the Liverpool Women's Hospital undertaken to assess pregnancy

outcomes in older women of reproductive age was published in 2008¹². The abstract states: “Overall, 2.4 % of mothers were >40 years of age (advanced), 5.6% were <20 years (adolescents), and 92% were between 20 and 40 years. The prevalence of low birthweight (LBW), preterm birth, and small for gestational age by maternal age category followed a U-shaped curve with nadirs in the middle age classes. The gestational age of older mothers was 1 week shorter than that for women aged 26-30 years ($p = 0.005$). Primiparaes >40 years were at higher risk for delivering a LBW (9.4% vs. 5.3%, $p = 0.005$) or a very preterm baby (8.9% vs. 4.4%, $p = 0.001$) than were multiparous mothers of the same age. There was an association between maternal advanced age and LBW (adjusted OR [AOR], 1.7, 95% CI 1.4-2.5, $p = 0.001$), preterm birth (AOR 1.4, 95% CI 1.1-2.4, $p = 0.04$), or very preterm birth (AOR 1.6, 95% CI 1.2-3.5, $p = 0.002$) after controlling for prenatal alcohol and smoking exposure, household deprivation, maternal anemia, obesity, parity, and single parenthood.”

Similarly, a retrospective cohort of 16,427 singleton pregnancies delivered between 1998 and 2001 compared obstetric outcomes in women aged 40 years or older versus women younger than 40 years in both nulliparous and multiparous women¹³. The abstract notes: “Of the 15,727 pregnancies (95.7%) that satisfied the inclusion criteria, 606 (3.9%) were in women aged 40 years or older. Advanced age was independently associated with cesarean delivery, birth and spontaneous preterm labor before 37 weeks, and low birth weight neonates in nulliparous women, but only with preterm birth before 37 weeks and cesarean delivery in multiparous women.”

Finally, a 1999 case-control study compared all women who delivered at age 40 or over with women who delivered between age 20 and 29 in a Californian population of approximately 1,160,000 women; 24,032 (2%) of these women were age 40 or older¹⁴. Of this latter group, 4777 (20%) were nulliparous. The abstract states: “Mean (+/- standard error) birth weight of infants delivered by older nulliparous women was 3201+/-10 g, significantly lower than that among nulliparous controls (3317+/-1 g), whereas mean birth weight in the group of older multiparas (3381+/-5 g) was no different than that among younger multiparous controls (3387+/-1 g).”

5. Conclusion

Women age 35 or over have a higher risk of operative delivery (cesarean, forceps, and vacuum deliveries: 49.4%) than do younger women (35%). This increase occurs in spite of lower birth weight and may be explained largely by the increase in other complications of pregnancy. The increased frequency at which women are having their first child at age 35

or over may reflect career choices that involve delaying childbirth until the fourth decade of life. These data will allow us better to counsel patients about their pregnancy expectations and possible outcomes.

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