

# Maternal Age And Birth Weight Characteristics of Twins Born to Nulliparous Mothers: A Population Study

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In order to examine birth weight characteristics of twins delivered to nulliparous mothers in relation to maternal age, we used a population-based cohort of Israeli twins delivered between 1993-98 to select all 4793 (37.6%) nulliparas who delivered twins. Maternal age was subdivided as less than 20 years, 20-24, 25-29, 30-34, 35-39, and 40 years or more. We counted the frequencies of each total twin birth weight (twin A + twin B) in each of three categories (less than 3000, 3000-4999, and more than 5000 g) and the frequency of very low birth weight (VLBW, less than 1500 g) neonates in each of the six maternal age categories. There were significantly more nulliparas in the twin population at age groups less than 30 years and significantly less at ages 30 years or more. We found a highly significant inverse correlation between the proportion of nulliparas and maternal age group, decreasing from 71.8% at less than 20 years to 18.6% at age 35-39 years (% nulliparas =  $85 - 13.7 \times \text{age group}$ , Pearson  $R^2 = 0.98$ ). However, this trend changed abruptly to the observed figure of 25.9% nulliparas aged 40 years or more instead of the expected 2.8%. We failed to reveal any significant difference in birth weight characteristics between the maternal age groups (all  $p > 0.05$ , all confidence intervals included 1.0). The more than tenfold deviation of the observed from the predicted frequency of nulliparas aged 40 years or more suggests that a different relationship between parity and age occurs at this age group. Maternal age of nulliparas is not associated with different birth weight characteristics of their twins.

Over the millennia, age and parity directly correlated during women's reproductive life, with nulliparas and multiparas characterizing the lower and upper range of the reproductive years respectively. However, the availability of effective infertility treatment to compensate for reduced fecundity during advanced reproductive age changed the natural relationship between age and primiparity. Social trends to postpone first childbirth until older age and successful treatment of infertility established at the beginning of the 1980s the entity of the so-called "mature" nullipara/primipara (Blickstein et al., 1987; Edge and Laros, 1993; Ezra et al., 1995; Kessler et al., 1980; Kirz et al., 1985; Prysak et al., 1995; Scholz et al., 1999). With the further progress of assisted procreation, however, the upper limit of maternal age became quite flexible, and a newer entity emerged – the "geriatric gravida", a somewhat

derogatory term to distinguish this elderly group beyond reproductive age (Didly et al., 1996; Evans et al., 1997).

The inevitable increased need for assisted reproduction with increasing maternal age has also inevitably increased the frequency of twins and higher-order multiples. Thus, nulliparas have a greater chance to deliver twins than before. In a recent study using the same population, we postulated that the primigravid uterine environment is less favorable for twin growth and showed that the risk of having at least one VLBW infant was 1:5 nulliparas and 1:12 multiparas, and the risk of having two VLBW twins in nulliparas (1:11) was twice higher than in multiparas (Blickstein et al., 2000). While older age has been clearly associated with increased frequency of LBW singletons (Cnattingius et al., 1992; Lehmann & Chism, 1987; Prysak et al., 1995), it is unknown to what extent maternal age is associated with different birth weight characteristics in nulliparous twin mothers.

## Subject and Method

We used data from the Israeli Birth Registry obtained through the Central Bureau of Statistics, which includes, as required by law, all deliveries in Israel. The database does not include information about gestational age, smoking, and the use of illicit drugs. The database of 12,748 live born twin pairs during the period 1993-1998 was used to select a complete cohort of 4793 (37.6%) nulliparas who delivered twins. Maternal age was subdivided as less than 20 years, 20-24, 25-29, 30-34, 35-39, and 40 years or more. Birth weight discordance in this cohort was evaluated previously (Blickstein et al., 2000).

To analyze differences in maternal age distributions we compared the study cohort at each maternal age group and respective frequency of multiparas ( $n = 7955$ ) in the entire population ( $n = 12748$ ). We used the Microsoft Excel® program (Microsoft Corporation, Redmont, WA) to calculate

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Manuscript received 16 December 2000, accepted 18 December 2000.

the total twin birth weights (twin A + twin B) and to further subdivide the total twin birth weight into three categories: less than 3000, 3000–4999, and more than 5000 g. Very low birth weight (VLBW) was defined as less than 1500 g.

The hypothesis in this study was that birth weight characteristics of twins delivered to nulliparous mothers change with maternal age. To test this hypothesis, we counted the frequencies of each total twin birth weight category and the frequency of VLBW neonates in each of the six maternal age categories. We used True EPISTAT Software (Math Archives, Round Rock, TX) for statistical analysis. The power of our sample size, owing to the large database, was more than 90%. The  $\chi^2$  test was used to compare categories, with *p*-values less than 0.05 considered significant.

**Results**

The distribution of maternal ages among nulliparous mothers of twins showed an expected significant shift towards younger age as compared with multiparous mothers (Table 1). Specifically, there were significantly more nulliparas in the twin population at age groups less than 30 years and significantly less at ages 30 years or more. At the same time, there was a highly significant inverse correlation between the proportion of nulliparous mothers of twins and maternal age group, decreasing from 71.8% at less than 20 years to 18.6% at age 35–39 years (% nulliparas = 85 – 13.7 x age group, Pearson  $R^2 = .98$ ). This decreasing trend

changed abruptly from 18.6% to 25.9% nulliparas among mothers of twins aged 40 years or more (Table 2).

A cross-tabulation between birth weight parameters in the six maternal age groups is also shown in Table 2. We failed to reveal any significant difference between the maternal age groups (all *p*-values > 0.05, all confidence intervals included 1.0).

**Discussion**

Numerous hospital-based studies have addressed the issue of singleton births in nulliparas, particularly in those aged 35 years or more (Blickstein et al., 1987; Edge & Laros, 1993; Ezra et al., 1995; Kessler et al., 1980; Kirz et al., 1985; Prysak et al., 1995; Scholz et al., 1999). However, in a PubMed MedLine query (<http://www.ncbi.nlm.nih.gov>) for papers published in the last three decades, we did not find any publications dealing specifically with nulliparas delivering twins.

Previous studies showed that nulliparas are at significant risk of delivering lighter twins in general (Blickstein et al., 1995; Rydhström, 1992) and of delivering more VLBW twins in particular (Blickstein et al., 2000) as compared with parous parturients. It could be argued, however, that growth patterns of the twins attributed to parity may be a result of maternal age differences and not of parity *per se*. Our study focused on the possible association that may exist between maternal age and birth weight parameters of twins delivered to nulliparas who are at the highest risk of

**Table 1**  
Comparison of Nulliparas and Multiparas Delivering Twins by Maternal Age

Maternal age (yrs)	Nulliparas N = 4793	Multiparas N = 7955	Total N = 12748	<i>p</i> -value	OR	95% CI
< 20	107(2.2)	42 (0.5)	149	< .001	4.3	3.0, 6.2
20–24	1105 (23.0)	811 (10.2)	1916	< .001	2.6	2.4, 2.9
25–29	2038 (42.6)	2192 (27.5)	4230	< .001	1.9	1.8, 2.1
30–34	1014 (21.2)	2804 (32.2)	3818	< .001	0.5	0.4, 0.6
35–39	395 (8.2)	1722 (21.6)	2117	< .001	0.3	0.3, 0.4
40 +	134 (2.8)	384 (4.8)	518	< .001	0.6	0.5, 0.9

OR = odds ratio, CI = confidence interval.

**Table 2**  
Birth Weight Parameters of Twins Delivered to Nulliparous Mothers by Maternal Age

Maternal age (yrs)	Total	< 20 N = 149	20–24 N = 1916	25–29 N = 4230	30–34 N = 3818	35–39 N = 2117	40 + N = 518
Nulliparas	4793 (37.6)	107 (71.8)	1105 (57.7)	2038 (48.2)	1014 (26.6)	395 (18.6)	134 (25.9)
Total twin birth weight (g)							
< 2999		16 (14.9)	119 (10.8)	211 (10.3)	107 (10.5)	47 (11.9)	13 (9.7)
3000–4999		67 (62.6)	635 (57.5)	1166 (57.2)	589 (58.1)	219 (55.4)	82 (61.2)
5000 +		24 (22.5)	351 (31.7)	661 (32.5)	318 (31.4)	129 (32.7)	39 (29.1)
Frequency of VLBW							
VLBW– VLBW		13 (12.1)	99 (8.9)	167 (8.2)	79 (7.8)	35 (8.9)	9 (6.7)
LBW– VLBW		7 (6.5)	58 (5.2)	148 (7.3)	81 (8.0)	37 (9.4)	13 (9.7)
At least one VLBW		20 (18.6)	157 (14.2)	315 (15.4)	160 (15.8)	72 (18.2)	22 (16.4)

LBW= low birth weight (< 2500 g), VLBW= very LBW (< 1500 g).

delivering VLBW twins. We used a population-based data set, which is usually compiled to achieve sufficiently large samples to make sound statistical deductions about any association between study variables of interest (Kiely, 1998). As with most other population-based cohorts, our database lacks variables such as gestational age at birth and detailed maternal and perinatal complications. Nevertheless, the large sample allows two inferences.

Firstly, the data indicate that parity and maternal age correlate also in twin gestations, with significantly more nulliparous than multiparous twin mothers at less than 30 years of age and a converse relation thereafter. In fact, the 0.98 Pearson's  $R^2$  of the linear regression permits accurate prediction of the frequency of nulliparas at any given age group except the last, where the expected frequency at age 40 years or more was 2.8%, whereas the observed figure was 25.9%. This more than tenfold deviation from the predicted frequency suggests that new determinants are operative at this age group. The most likely reason is assisted reproduction which currently helps nulliparas aged 40 years or more to have their first baby while women of similar age who delivered in the 1960s were multiparas having their last (Cunningham & Leveno, 1995).

The second conclusion is that maternal age of nulliparas is not associated with different birth weight characteristics of their twins. This observation differs from studies on singletons that showed a higher incidence of LBW infants in older women as compared with younger controls (Cnattingius et al., 1992; Lehmann & Chism, 1987; Prysak et al., 1995). This discrepancy may not be explained by the factors examined in this study. However, it might be possible that older nulliparous women with twins, who presumably conceived more often by assisted reproductive technologies, are considered as premium pregnancies and get better perinatal care. In a recent study by Moise and co-workers (1998), the perinatal outcome of 40 IVF twins was compared with that of 80 control twins, matched for maternal age, parity and ethnic origin. IVF twins had a significantly lower mean birth weight and the frequency of very low birth weight infants was much higher. It is therefore possible that assisted reproductive technology could confound our analysis because our study did not control for the impact of the mode of conception.

Although nulliparas are disadvantaged as compared with multiparas regarding birth weight of their twins, this study provides some reassurance about their age at birth. Because nulliparity is a given fact that cannot be changed, it follows that the age factor does not change the risk of delivering lighter or VLBW twins, and therefore maternal age *per se* is not critical as far as birth weight characteristics of the twins are concerned.

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