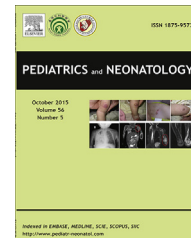




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ORIGINAL ARTICLE

Nationwide Twin Birth Weight Percentiles by Gestational Age in Taiwan



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Key Words

birth weight;
gestational age;
intrauterine growth;
percentile;
twin

Background: Nationwide birth weight norms for twins have been reported in several countries across different ethnicities, but such data have not been established in Taiwan. The purpose of this study was to develop reference growth charts that are population-based and contain the information of birth weight percentiles by gestational age for twin neonates in Taiwan.

Methods: In this study, we collected nationwide birth weight data for twins by sex and gestational age through the Taiwan Birth Registry. Percentiles, means, and standard deviations of birth weight for each 1-week increment of gestational age from 21 weeks of gestation were estimated and smoothed using weighted polynomial models.

Results: The 10th, 50th, and 90th percentiles of birth weight born at the 37th gestational week were 2174 g, 2580 g, and 3125 g for male twins, respectively, and they were 2100 g, 2500 g, and 3000 g for female twins, respectively. The 10th, 50th, and 90th percentiles of birth weight born

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at the 40th gestational week were 2326, 3285, and 3790 g for male twins, respectively, and they were 2200 g, 2770 g, and 3690 g for female twins, respectively.

Conclusion: This is the first nationwide birth weight norm for twins in Taiwan, which is particularly useful for investigation into the predictors and outcomes of altered fetal growth through twin studies in the Taiwanese population.

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1. Introduction

Twin births account for 2–3% of all births in Taiwan¹ and 2–4% worldwide.^{2–4} Twin birth is an established risk factor of perinatal morbidity and mortality as well as long-term disability.^{5–8} Although twin births are associated with low birth weight and preterm delivery, two other risk factors of perinatal morbidity,^{5,6} the extent to which degree these associations explain twin-related risks is not clear. Indeed, previous studies have suggested a complex pattern of growth and developmental trajectories among twins different from singletons,^{5,8} and it might not be appropriate to estimate twin-related risks using singleton-based growth reference.

Birth weight standards for twins have been published and updated in several countries including Argentina, Australia, Canada, Japan, and Norway.^{9–13} By contrast, birth weight for twins has not been established in Taiwan since a single-center report using data from births in the period of 1980–1991.¹⁴ This study aimed to develop a national birth weight norm for twins by sex and gestational age through the Taiwan Birth Registry.

2. Materials and methods

The Taiwan Birth Registry in the Ministry of the Interior was established in 1970, and since 1994 birth certificates of all live births have been directly reported to the Household Registration Office by obstetricians or well-trained midwives as well as guardians. Considering the steadiness, we used live births in Taiwan during 1998 to 2002 in this study. We excluded live twin births for whom birth weight was either missing or registration was made > 3 months after the date of birth. To avoid data entry errors, we further excluded twin births with extreme registered birth weight at both ends beyond the range of median $\pm 2 \times$ (interquartile range) within twin births born at the same gestational age in weeks. We then estimated the distribution of birth weight for each 1-week increment of gestational age from 21 weeks of gestation, presented in percentiles (the 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles), using weighted polynomial model for data smoothing. Analysis was carried out by using SAS, version 9.1 (SAS Institute, Inc., Cary, NC, USA). Twin births born beyond 41 weeks of gestational age were combined into one group. We tested the model from the second to the fifth degree and judged the suitability based on R^2 and the empirical shape. All results were analyzed and reported by sex.

3. Results

From 31,703 twin babies born in 1998–2002 who were identified in the Taiwan Birth Registry with birth weight that was recorded within 3 months after the date of birth, we excluded 248 (0.7%) extreme outliers within each corresponding gestational age beyond the range of median $\pm 2 \times$ interquartile range. Subsequently, 31,455 live-born twin babies were included in the analyses. Birth and demographic characteristics of twin births by year are shown in Table 1. The male/female ratio was 1.04. In both sexes, we found increasing percentages of foreign maternal nationality over time during 1998–2002. We also found downward trends for mean birth weight (–86 g, 3.5%), upward trends for low birth weight (< 2500 g) increasing by 7.5%, and preterm deliveries increasing by 11%. After adjustment for parity and with stratification by gestational age, birth weights of male twins were significantly higher than those of female twins.

Despite the trends in maternal nationality and preterm deliveries, we found little difference in birth weight across years after stratification by gestational age. Therefore, we established the national standard for birth weight in twins using pooled data across 1998–2002, stratified by sex. We decided to smooth the birth weight curves by gestational age using fourth-degree polynomial model, which was found to be most explanatory based on R^2 and the empirical shape as shown in Tables 2 and 3. We also plotted the smoothed curves along the 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles, as shown in Figures 1 and 2.

4. Discussion

The distribution of birth weight may vary between populations and over time. An international comparative study showed large variations in birth weight of up to 11% between different populations.¹⁵ A comparison of twin birth weight data from Australia, United States, The Netherlands, Japan, and South Korea showed the difference between Western and Eastern countries to be > 40%, and it was concluded that variations in phenotypic variances of birth weight within Caucasians and within East Asians were mainly attributable to differences in nonshared environmental variances.¹⁶ These findings underline the importance of the development of national birth weight standards. Reference birth weight was also calculated from population-based data in countries such as Norway and Canada.^{11,13} Our study

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