

Birth Weight Reference for Triples in Korea

An estimation of the baseline value of birth weight depending on gestational age is helpful for reducing morbidity and mortality following the early diagnosis and treatment of intrauterine growth retardation. In Korea, there are established baseline values for singletons and twins. But no definite criteria exist for triplets yet. Given the above background, we obtained the baseline value of birth weight depending on the gestational age in triplets with a gestational age of 27-38 weeks using a raw data about birth records which had been obtained during a 10-yr period from 1998 to 2007. This baseline value was compared with those of singletons and twins. During the 10-yr period, the total number of newborns who were born between gestational age 27 and 38 was 1,330,822. Of these, the number of singletons, twins and triplets was 1,330,822, 90,245, and 840, respectively. A mean gestational age was 37.3 ± 1.5 weeks, 36.0 ± 2.0 weeks and 33.3 ± 2.4 weeks in the corresponding order. A mean birth weight was $3,071 \pm 490$ g, $2,414 \pm 455$ g, and $1,836 \pm 454$ g in the corresponding order. A comparison of the birth weight depending on the gestational age of triplets was made with the normal value of singletons and twins. According to this, in the overall gestational age ranging from weeks 27 to 38, it was relatively smaller as compared with the birth weight of twins and singletons. The current study was of significance in that it first obtained the normal value of birth weight of triplets in the overall gestational age ranging from weeks 27 to 38, whose results are expected to be helpful for studies or treatments of triplets.

Key Words : *Triples; Birth Weight; Gestational Age; Korea*

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INTRODUCTION

With the introduction of ovulation-inducing agents in the late 1960s and assisted-reproductive techniques in the 1970s, the frequency of multiple pregnancies and multiple birth have been increasing (1-5). In Korea, the frequency of twins has recently been increased by three times for the past 20 yr (6). To date, however, no studies have been conducted to examine the triplets. In cases of multiples, as compared with singletons, the morbidity and mortality of fetus or newborns were relatively high. This has therefore been of increasing interest (5-8). Particularly in cases of multiples with the intrauterine growth retardation, the morbidity and mortality have been reported to be relatively high (9, 10).

According to Blickstein (9, 10) there were differences in the intrauterine growth pattern between singletons, twins and triplets. The author therefore noted that the differential criteria for birth weight depending on the gestational age should be established. In addition, criteria for birth weight depending on the gestational age vary depending on coun-

try, ethnicity and sex. Accordingly, the differential criteria for birth weight depending on the gestational age should be established. In Korea, there are established baseline values for singletons and twins (11-14). But no definite criteria exist for triplets yet. We conducted this study to establish the normal value of birth weight depending on the gestational age in Korean triplets.

MATERIALS AND METHODS

Of the data about the population status, which was collected by The Korean National Statistics Office, we used a raw data about birth records of a 10-yr period from January 1 1998 to December 31 2007. The total number of newborns who were born during this period was 5,278,646. Of these, excluding 20,519 newborns (0.4%) with unknown gestational age, birth weight or plurality, 840 triplets, aged between gestational weeks 27 and 38, were finally enrolled in the current study. The number of triplets, whose gestational age was short-

er than 27 weeks, as present at an extremely small. Accordingly, these triplets were not enrolled in the current study. Triplets whose gestational age was longer than 38 weeks were also not enrolled in the current study. We obtained mean birth weight, standard deviation and 10th, 25th, 50th, 75th, and 90th percentile values for each gestational age group by one week increment. Then, we investigated the birth weight distribution of each gestational age group by the normal Gaussian model. To establish final standard value of birth weight distribution by gestational age, we used the finite mixture model to eliminate erroneous birth weights for respective gestational age (15-18). Then we made percentile curve of birth weight distribution by gestation for triples.

A baseline value of birth weight depending on the gestational age in triplets, which was established as described herein, was compared with 10th, 50th, and 90th percentile values in singletons and twins (12). A comparison was also made with criteria for triplets which have been established in other countries (19, 20).

A statistical analysis was performed using STATA 8.0E (Stata Corp., College Station, TX, USA) for an analysis and an estimation of finite mixture model.

RESULTS

During a 10-yr period from 1998 to 2007, the total number of newborns who were born between gestational weeks

27 and 38 was 1,330,822. Of these, the number of singletons, twins and triplets was 1,330,822, 90,245, and 840, respectively. A mean gestational age was 37.3 ± 1.5 weeks, 36.0 ± 2.0 weeks, and 33.3 ± 2.4 weeks in the corresponding order. A mean birth weight was $3,071 \pm 490$ g, $2,414 \pm 455$ g, and $1,836 \pm 454$ g in the corresponding order. These results indicate that gestational age and birth weight decreased depending on the plurality (Table 1). Mean age of mothers was 29.7 yr in cases of singletons, 30.2 yr in cases of twins and 30.5 yr in cases of triplets. These results indicate that age of mother increased significantly depending on the plurality (Table 1). The birth rate of triplets was increased from 0.06% in 1998 to 0.1% in 2007.

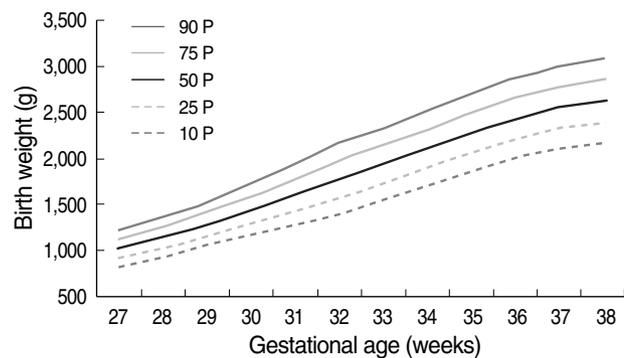


Fig. 1. Percentile curves of birth weight distribution by gestational age for triplets. P, percentile.

Table 1. Comparison of birth outcome by plurality

Factors	Singletons	Twins	Triples	P value
Total birth	1,330,822	90,245	840	
Mean GA (weeks)	37.3 ± 1.5	36.0 ± 2.0	33.3 ± 2.4	<0.05
Mean BW (g)	$3,071 \pm 490$	$2,414 \pm 455$	$1,836 \pm 454$	<0.05
Sex (male)	0.55	0.51	0.5	<0.05
Mean maternal age (yr)	29.7 ± 4.1	30.2 ± 3.9	30.5 ± 3.6	<0.05

GA, gestational age; BW, birth weight.

Table 2. The baseline value of birth weight depending on gestational age for triplets

Gestational age (weeks)	Observations (Numbers)	Mean (g)	Standard deviation	Percentile				
				10th	25th	50th	75th	90th
27	9	1,014	139	829	909	1,012	1,115	1,207
28	27	1,126	179	923	1,024	1,139	1,253	1,357
29	38	1,276	188	1,039	1,153	1,280	1,407	1,522
30	41	1,426	183	1,154	1,289	1,437	1,586	1,720
31	60	1,612	301	1,264	1,425	1,604	1,783	1,943
32	122	1,770	300	1,390	1,570	1,771	1,971	2,151
33	120	1,932	312	1,540	1,728	1,937	2,146	2,335
34	112	2,106	316	1,701	1,894	2,108	2,322	2,515
35	145	2,284	322	1,861	2,059	2,279	2,499	2,697
36	111	2,457	342	2,004	2,207	2,433	2,659	2,862
37	40	2,575	337	2,110	2,317	2,549	2,781	2,990
38	15	2,639	349	2,170	2,381	2,621	2,861	3,079

Table 3. The value of birth weight depending on by gestational age in triplets between male and female

Gestational age (weeks)	Male			Female		
	10th	50th	90th	10th	50th	90th
28	942	1,048	1,154	943	1,099	1,255
29	1,025	1,163	1,301	988	1,172	1,396
30	1,143	1,327	1,512	1,074	1,310	1,577
31	1,281	1,516	1,752	1,198	1,487	1,784
32	1,391	1,684	1,977	1,344	1,648	1,950
33	1,478	1,828	2,177	1,486	1,779	2,069
34	1,576	1,969	2,359	1,592	1,896	2,198
35	1,694	2,115	2,521	1,672	2,014	2,358
36	1,856	2,251	2,628	1,755	2,135	2,517
37	2,068	2,369	2,670	1,837	2,246	2,655

Table 4. Comparison of birth weight depending on gestational age in triplets by plurality

Gestational age (weeks)	Singletons			Twins			Triplets		
	10th	50th	90th	10th	50th	90th	10th	50th	90th
27	849	1,062	1,275	829	1,012	1,207	674	969	1,264
28	935	1,188	1,441	923	1,139	1,357	858	1,072	1,311
29	1,034	1,329	1,624	1,039	1,280	1,522	994	1,191	1,410
30	1,151	1,485	1,819	1,154	1,437	1,720	1,111	1,338	1,571
31	1,284	1,661	2,038	1,264	1,604	1,943	1,237	1,499	1,762
32	1,428	1,871	2,314	1,390	1,771	2,151	1,357	1,652	1,946
33	1,586	2,105	2,624	1,540	1,937	2,335	1,468	1,793	2,118
34	1,777	2,338	2,900	1,701	2,108	2,515	1,572	1,929	2,286
35	1,999	2,565	3,131	1,861	2,279	2,697	1,679	2,062	2,446
36	2,239	2,798	3,352	2,004	2,433	2,862	1,811	2,202	2,593
37	2,472	3,023	3,560	2,110	2,549	2,990	1,936	2,357	2,778
38	2,660	3,194	3,720	2,170	2,621	3,079	2,019	2,528	3,037

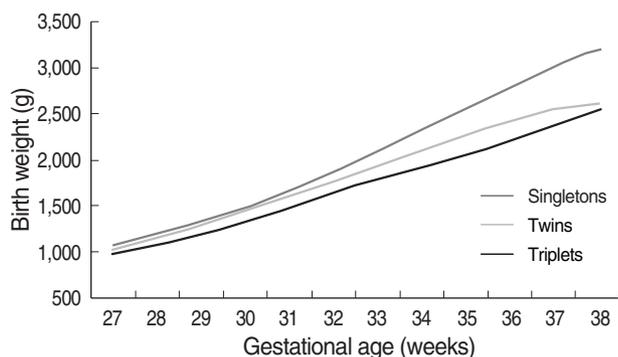


Fig. 2. Comparison of the 50th percentile curve by plurality.

Table 2 and Fig.1 presents birth weight percentiles for gestational age in triplets. A mean gestational age of male triplets was 33.3 ± 2.6 weeks and that of female triplets was 33.3 ± 2.3 weeks. This difference did not reach a statistical significance ($P=0.388$). However, mean birth weight of male babies was $1,872 \pm 495$ g and that of female babies was $1,799 \pm 407$ g. This difference reached a statistical significance ($P=0.001$).

In addition, birth weight percentile for gestational age was compared between male and female triplets. This showed

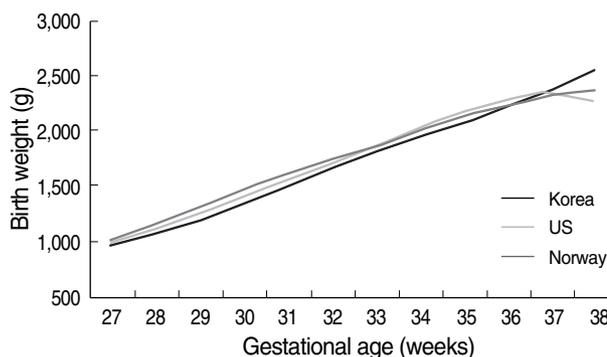


Fig. 3. Comparison of the 50th percentile curve among different countries.

that male triplets had a significantly greater birth weight percentile for the gestational age as compared with female triplets in overall gestational age (Table 3).

Birth weight percentile for gestational age in triplets was compared with the normal value which we obtained using the same methods in singletons and twins in our previous study (12). According to this, in the overall gestational age ranging from gestational week 27 to 38, it was relatively smaller as compared with birth weight obtained from twins and sin-

gletons (Table 4, Fig. 2).

And we compared 50th percentile curve of Korean triplets with those of USA and Norway, it was smaller than those in the USA and Norway (Fig. 3).

DISCUSSION

In Korea, the birth rate has been annually decreasing. However, with the advancement of assisted reproductive techniques such as ovulation-inducing agents, the birth of multiples has been increased. With the well-trained neonatal intensive care unit personnel treating newborns and the well-equipped facility, the survival rate of premature birth has also been increased (6, 21).

Multiples show a higher degree of the mortality of newborns as compared with singletons. They also are associated with such problems as premature birth, intrauterine growth retardation and low birth weight (5-8). Although multiples have been of increasing interest, few studies have been conducted to examine triplets in Korea. The current study was conducted using a raw data about birth records which was collected during the recent 10-yr period by the Korean National Statistics Office. And it would be of significance in that it first obtained the normal value of birth weight depending on the changes in the plurality of triplets, mean gestational age, mean birth weight, mean age of mothers and gestational age.

According to a review of English literature, triplets have been abruptly increased during the recent 20- to 30-yr period (1, 3-5). According to the current study, however, it was shown that triplets were increased by approximately two times during a 10-yr period from 1998 to 2007 in Korea. Other studies have shown that the birth rate of multiples was increased as mothers' age was increased (1, 4). In Korea, it has also been shown that mean age of mothers of singletons, twins and triplets was increased. These reports suggest that the increased birth rate of triplets originated from the increased age of mothers and the development of assisted reproduction technology.

In the present study, birth weight was significantly greater in male triplets when compared with female triplets at the same gestational age. These results were in agreement with the previous reports (22, 23). This implies that an intrauterine growth pattern may vary genetically between male and female triplets.

Triplets had a lower birth weight as compared with singletons or twins, which was also in agreement with the previous reports (22, 24-26). In particular, from gestational week 32 on, there was a great different from singletons (Table 3). In regard to this, other authors noted that no growth acceleration occurred during the third trimester of pregnancy due to the limitation of intrauterine space (9, 10, 22, 27). Other authors noted, however, that there was no significant differ-

ence in the birth weight between singletons, twins and triplets prior to the third trimester of pregnancy. According to the present study, however, there was a significant difference in mean birth weight from gestational week 27. This deserves further studies.

When 50th percentile of birth weight of Korean triplets was compared with those of USA and Norway (19, 20), it was smaller than those in the USA and Norway during a period from gestational week 28 to 36. This may suggest that an ethnic difference is present in triplets. It might be due to an insufficient amount of the data, however, that the normal value was relatively greater during a period ranging from gestational week 37 to 38 in Korea. In cases of triplets, however, the proportion of cases in which a delivery occurred at gestational week 36 or later was approximately 10% (28). This data could be applied to a clinical setting.

Limitations of the current study are as follows: 1) In a statistical analysis of the birth records which were collected during a 10-yr period in Korea, the number of triplets aged gestational week 27 or earlier was extremely small. Accordingly, there was a lack of the data about these triplets. 2) The data which was collected from triplets aged gestational week 37 or later was also problematic. Despite these limitations, the current results are of significance in that it first obtained the normal value of birth weight during a period ranging from gestational week 27 to 38, which is clinically important, in Korean triplets. It is expected that the current results would be of help for the studies and treatment of triplets.

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