Research Article

Estimation of average birth weight in term newborns: a hospital-based study in coastal Karnataka

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ABSTRACT

Introduction: Average birth weight (BW) of Indian babies is believed to be 2.8-3 kg. BW is a key predictor of newborn outcome and indicator of health trend of a child. This study gives an insight into BW in coastal Karnataka. The objective of the present study was to estimate the average BW in term newborns and to study its correlation with sex of the newborn and maternal conditions.

Methods: The retrospective study of data from medical records of births during May 2012-April 2014 in the Medical College Hospital. Multiple pregnancy, preterm and post-term were excluded. Parameters such as BW, gender, maternal age, parity, history of gestational diabetes mellitus (GDM), pregnancy-induced hypertension (PIH) were noted. Data were analyzed using Chi-square test.

Results: A data of 3882 babies was included. BW ranged from 1.92 kg to 4.45 kg. The mean BW was 3.07 ± 0.455 kg. Mean BW of male babies was 3.09 ± 0.41 and female babies was 3.03 ± 0.4 kg. Average BW in primi mothers was 3.02 kg, multipara was 3.08 kg and grand multipara was 3.18 kg. In babies of PIH and GDM mothers, BW was 2.87 and 3.48 kg respectively. BW was not related to age of the mother or gender of the baby. Anomalous babies were found more in small for gestational age and large for gestational age rather than appropriate for gestational age.

Conclusions: Average BW of term newborns is estimated as 3.07 kg. BW increased with parity of the mother and not with age of the mother or sex of the baby.

Keywords: Birth weight, Term newborns, Coastal Karnataka

INTRODUCTION

Average birth weight (BW) of Indian babies is believed to be 2.8-3 kg.[1] Average BW estimation is essential for creating standards for growth of children. BW is a key indicator of health trend of a child. Furthermore, the most commonly used indicator of the newborn maturity is BW. It is well-known that low BW is associated with increased risk of adverse health outcomes in childhood and adulthood. India is reported to have one of the highest rates of low BW. Low BW is considered to be a predictor of protein energy malnutrition.[2] It is the single most determinant of the chances of newborn to survive and experience healthy growth and development. It is, therefore, considered as a

subject of clinical and epidemiological investigation and target for public health interventions.[3]

The infant mortality rate is about 20 times higher for all low BW babies than other babies. Lower the BW, lower is the survival chance of the new-born.[4] The BW of the infant is preferably measured within the 1st h of its birth and before significant postnatal weight loss has occurred. World health organization has defined low BW as "BW of <2500 g."[5]

Most of the current standards are based on studies done years back, without eliminating risk factors. There are not many studies done on Karnataka population to estimate

average BW. This study helps to get an insight into BW in coastal Karnataka.

METHODS

This was a retrospective study. Data were collected from medical records. Details of 3882 live births during the period May 2012-April 2014 were collected. Multiple pregnancy, preterm and post term were excluded. The criterion for a preterm baby was below 37 weeks of gestation and for post term baby was more than 42 weeks. The weights of the newborns were measured without clothes on a digital weighing scale soon after the birth. Gestational age was calculated from last menstrual period and Ballard scoring. Categories like small for gestational age (SGA), appropriate for gestational age (AGA), large for gestational age (LGA) were determined.

Data collected include BW, gender of the baby, maternal age and parity. History of pregnancy induced hypertension (PIH) and gestational diabetes mellitus (GDM) in mothers and details of antenatal visits were noted. Data collected was analyzed by mean, percentage. Chi-square was applied to test the association. $p < 0.05$ was considered to be significant.

RESULTS

A total of 3882 babies were included, out of which 1997 (51.4%) were males, and 1885 (48.6%) were females. Estimated average BW was 3.07 ± 0.455 kg. Mean BW of male babies was 3.09 ± 0.41 kg and female babies was 3.03 ± 0.4 kg (Table 1). Majority of the population belonged to Muslim religion (71.8%). Hindu and Christian religions formed 17.2% and 11% respectively. About 66% had regular antenatal visits. Out of 3882 mothers, 12.6% (491) had PIH/GDM or both. Mean BW of babies of PIH mothers was 2.87 kg and GDM mothers was 3.48 kg.

Among 3882 term newborns, 3566 (91.9%) belonged to AGA category, 254 (6.5%) belonged to SGA and 62 (1.6%) to LGA. Maximum number of babies were seen in the group 3-3.5 kg (41.8%) followed by 2.5-3 kg (38%) group. Out of 254 low BW babies 124 (48.8%) were males and 130 (51.2%) were females (Table 2).

With parity correlation was found to be significant ($p < 0.001$) not to age of the mother (Table 3). Average BW of babies of primi mothers was 3.02 ± 0.37 kg, multipara was 3.08 ± 0.41 kg and grand multipara was 3.18 ± 0.51 kg.

No correlation was found with gender of the newborns. With anomalies, significant correlation was found (Table 4). Anomalies observed were congenital heart diseases, cleft lip and palate, skeletal anomalies.

DISCUSSION

This study was done in an urban area in Karnataka. Average BW of 3882 newborns was estimated, and BW was studied

Table 1: Average BW of each group.

Category	Average weight (kg)	SD
Term (n=3882)	3.07	0.455
Males (n=1997)	3.09	0.41
Females (n=1885)	3.03	0.40
Term newborns of PIH mothers (n=218)	2.87	0.548
Term newborns of GDM mothers (n=183)	3.48	0.563
Term newborns with both PIH and GDM in mothers (n=90)	2.92	0.915
Term newborns without PIH and GDM in mothers (n=3391)	3.06	0.449

GDM: Gestational diabetes mellitus, PIH: Pregnancy induced hypertension, SD: Standard deviation, BW: Birth weights

Table 2: Gender distribution in each BW group.

BW (kg)	Male n=1997 (%)	Female n=1885 (%)
<2	3 (0.1)	2 (0.1)
2-2.5	121 (6.1)	128 (6.8)
2.5-3	706 (35.4)	768 (40.7)
3-3.5	854 (42.8)	771 (40.9)
3.5-4	274 (13.7)	193 (10.2)
>4	39 (1.9)	23 (1.3)

BW: Birth weights

with newborn and maternal conditions. Mean BW was found to be 3.07 kg that is slightly high compared to other Indian studies. Though we did not take the socioeconomic status into account, being a private sector hospital extreme poor patients are unlikely and overall socioeconomic and education status of this coastal area is considered to be better. Males (mean 3.09 kg) were found to be more heavier (60 g) than female babies (mean 3.03 kg). The largest one among the group was 4.45 kg and smallest one 1.92 kg. Babies of PIH mothers had lower weight, and GDM mothers had higher weight as expected. Joshi et al.[4] did a retrospective study in Bhopal in 2012 with 441 newborns and found that the mean weight was 2.72 ± 0.41 kg. A recent study in South India by Kumar et al.[6] reported that the mean BW were 2.934 kg and 2.889 kg respectively in males and females. The male babies of term firstborn were found to be 45 g heavier than female babies. A study by Prasad et al.[3] in Karnataka found that the mean BW was 2.823 ± 0.417 kg.

Out of 3882 newborns 6.5% of newborns were found to have low BW. 48.8% of low BW babies were males and 51.2% were females. Incidence of low BW in term newborns was 10.37% in a study in Bhopal[4] and 30.2% in Uttar Pardesh.[7] Hospital based studies by Agrawal and Reddaiah[8] and Thomre and Borle[9] reported the incidence of low BW as 26.5% and 18.1% respectively. In community-based studies such as NFHS-3,[10] Jha[11] found a prevalence of 21.5% and 27.9% of low BW babies.

Table 3: Relation of BW with age and parity of mother.

BW category	AGA *n*=3566 (%)	SGA *n*=254 (%)	LGA *n*=62 (%)	*p* value
Age				
<20 years	331 (9.3)	26 (10.2)	2 (3.2)	0.318
20-35 years	3070 (86.1)	215 (84.6)	59 (95.2)	
>35 years	165 (4.6)	13 (5.2)	1 (1.6)	
Parity				
Primi	1596 (44.8)	120 (47.2)	12 (19.4)	<0.001*
Multipara	1799 (50.4)	117 (46.1)	41 (66.1)	
Grand multipara	171 (4.8)	17 (6.7)	9 (14.5)	

*Statistically significant, SGA: Small for gestational age, AGA: Appropriate for gestational age, LGA: Large for gestational age, BW: Birth weights

Table 4: Relation of BW with gender and anomalies of the newborn.

BW category	AGA *n*=3566 (%)	SGA *n*=254 (%)	LGA *n*=62 (%)	*p* value
Gender				
Male	1834 (51.4)	124 (48.8)	39 (62.9)	0.138
Female	1732 (48.6)	130 (51.2)	23 (37.1)	
Anomalies				
Present	23 (0.6)	17 (6.7)	4 (6.5)	<0.001*
Absent	3543 (99.4)	237 (93.3)	58 (93.5)	

*Statistically significant, BW: Birth weights

In this study, an increase in average BW with an increase in parity was observed. An increase of 160 g from primi mothers to grand multipara mothers was observed. Out of 254 SGA babies 47.2% were born to primi mothers. No observation between parity and BW was observed in the study by Joshi et al.[4] Study done by Prasad et al.[3] in Karnataka reported that the mean BW was lowest in primi (2.767 ± 0.407 kg) and highest in grand multipara (2.897 ± 0.404 kg). Correlation was found in the study of Deshmukh et al.[12] in an urban area of Nagpur district and Boratne et al.[13] in which low BW was more common in first order babies by almost 50% when compared to babies whose birth order was two or more. Mathai et al.[1] found that first born babies were on the average 130 g lighter than later born babies. Studies done outside India also showed a correlation of parity with BW. A study in Vietnam concluded that the parity was positively associated with BW, independent of the association with the other covariates. The adjusted parameter estimate indicates that the mean BW of newborns to women with two previous deliveries was 216-552 g higher than those of women with no previous deliveries.[14] But study by Kaushal et al.[7] in Uttar Pradesh showed that proportion of low BW increased with parity.

In this study no statistically significant correlation was observed between BW and sex of baby or maternal age. No correlation between maternal age and BW was observed in many studies.[4,15] This is in contrast to the findings of Mathai et al.[1] who found that maternal age was a significant factor affecting BW. Another Indian study showed that BW improved with an increase in maternal age but females above 30 years also constituted a risk factor for low BW.[7] Many

studies have observed correlation between gender and BW, Boratne et al.[13] reported that prevalence of low BW was more among females than in male babies.

Anomalous babies were found more in small or LGA group rather than AGA. In SGA group 6.7% and in LGA group 6.5% babies had anomalies. Study by Mili et al.[16] found that the risk of birth defects is high in low BW group. The percentage of birth defect observed was 6.2% for newborns weighing from 2000 g to 2499 g, 3.2% for newborns weighing from 2500 g to 3999 g, and 2.8% for newborns weighing 4000 g or more. In our study anomalous babies were found more in LGA group also. Those babies had congenital heart diseases associated with diabetic mothers.

There are a few limitations in this study. Many factors like nutritional status that influence BW of babies were not studied. Moreover, this study was done in a single hospital, where most of the patients (>70%) belonged to one community. Hence, we recommend multicentric study that represents the population better to establish the determinants of BW.

This study concludes as estimated average BW of term newborns is 3.07 kg. BW increased with parity of the mother and not with age of the mother or sex of the baby.

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