The Effect of Maternal Age and Parity on Birth Weight Among Bengalees of Kolkata, India

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INTRODUCTION

Low Birth Weight (LBW), birth weight less than 2500 gm (WHO, 1984) and perinatal mortality are important public health problems in developing countries (Tafari, 1981; Edouard, 1985) particularly in the Indian subcontinent, where the LBW rates are 30-50%, which are among the highest in the world (UNICEF-ICMR, 1987). The national neonatal perinatal database reported that nearly about one third of all neonates born in major hospitals of India every year are LBW. Of all the neonatal deaths, nearly 82% occur among LBW (NNF, 1995), which is the highest in the world.

The LBW is a consequence of either preterm (<37 weeks of gestation) delivery or intrauterine growth retardation (IUGR) or of both (WHO, 1984). In addition to short-term consequences, such as high infant mortality and childhood growth failure among survivors (Pojda and Kelley, 2000), growth retardation is a major public health problem worldwide. Foetuses who suffer from growth retardation have higher perinatal morbidity and mortality (Williams et al., 1982; Villar et al., 1990; Balcazar and Haas, 1991), and are at an increased risk of sudden infant death syndrome (Oyen, 1995). During childhood they are more likely to have poor cognitive development (Low et al., 1992; Paz et al., 1995) and neurological impairment (Parkinson et al., 1981; Villar et al., 1984; Taylor et al., 1989).

The causes of LBW are multifactorial (Kamaladoss et al., 1992): it is associated with sex of baby (Oni, 1986; Kramar, 1987; Pakrasi et al., 1985), maternal hemoglobin level during pregnancy, hard manual labour (Ghosh et al., 1977), maternal nutrition (Fredrick and Adelstein, 1978), economic condition (Pakrasi, 1985; Dhall and Bagga 1995), maternal height, antenatal care (Kamaladoss et al., 1992, Rehan, 1982), parents education (Mukhija and Murthy, 1990), maternal weight (Mavalankar et al., 1994), tobacco consumption (Verma, 1983), place of residence (Mukhija and Murthy 1989), season of the year, ethnicity (Bantji, 1983), and most importantly mother's age and parity (Cramer, 1995).

MATERIALS AND METHODS

The cross-sectional retrospective study was conducted from April 26, 2002 to August 14, 2002. A total of 331 Bengalee mother-baby pairs were examined in the obstetric ward of M.R. Bangur Hospital. This hospital is located in South Kolkata that serves the needs of individuals belonging to the lower class socio-economic group. Written consents were obtained from all those who participated in the study. Data were collected from hospital records followed by personal interview of mothers for confirmation of age (completed years), ethnicity and reproductive history. Three criteria were used for the inclusion of subjects: (a) the mother tongue of women was Bengali language (b) singleton live born baby by normal vaginal delivery and (c) baby did not suffer from any congenital malformation or any sickness during the time of examination. Gestational age was assessed by Ballard's (Ballard et al., 1977) physical and neurological maturity scoring method within 24 hours of birth then matched with gestational age as calculated from maternal last menstrual period (LMP). In case of unavailability of LMP, the gestational ages were considered using Ballard's score for classification of maturity (preterm, term, post term) and weight-for-gestational age {small for date (SFD), appropriate for date (AFD) and large for date (LFD)}.

Birth weight was measured by triple beam balance without clothing under radiant warmer to the nearest 1gm. The scale was calibrated daily using standard weight and checks to ensure zero error before weighing each baby.

Data entry and statistical analyses was done using the EPI-INFO (Dean et al., 1995) package. ANOVA was used to study difference between groups for continuous variables. Odds ratio was calculated to measure the risk between the groups. Chi-square test was used to study the significance of difference between proportions of categorical outcomes.

RESULTS

Of the 331 singletons live born babies, 178 (53.8%) were boys and 153 (46.2%) were girls. The

overall mean (SD) birth weight was 2592 gm (371 gm). For boys it was 2658 gm (362 gm) while for girls it was 2515 gm (367 gm). Among all births 9.97% were preterm (< 37 weeks of gestation) and 90.03% were term (37- 41 weeks gestational age) neonates. The SFD neonates were 11.48%, and AFD neonates were 87.92%. Overall, only two (0.6 %) babies were LFD. Similarly, among all LBW babies, 80.16% were term (IUGR-LBW) and 19.84% were preterm. The SFD neonates were 31.4% and AFD neonates were 68.6%, whereas the prevalence of LBW (< 2.5 kg and all gestational age) was 36.56%.

The mean (SD) age of mother was 21.7 years (3.44 years) and the mean parity of mother was 1.5. The mean gestational age was 38.5 (3.03) weeks by last menstrual period and 38.3 (1.38) weeks by Ballard's physical and neurological maturity-scoring methods.

The distribution of birth weight according to age group of mothers is presented in Table 1. The rate of LBW decreased with the increasing age of mothers after 18 years. The rate of LBW increased slightly after the age of 28 years. The table shows that the young mothers (age < 19 years) delivered a higher rate of LBW baby than those mothers aged 19 year onwards. The mean birth weight was higher in the age group of 24-28 years whereas lower mean birth weight was observed in the age group of less than 19 years. The difference of mean birth weight between < 19 years and 19-23 years was 143 gm, between 19-23 years and 24-28 years it was 100 gm, while the difference of mean birth weight was 47 gm between 24-28 and 29+ years of maternal age. The highest difference of mean birth weight was 243 gm: between < 19 years and 24-28 years age group. The difference in mean birth weight was statistically significant ($p < 0.005$).

Table 2 presents the relationship between birth weight and parity. It can be seen that the rate of LBW decreased with increasing parity. The difference of mean birth weight between first and second parity was 145 gm, while that between second and third parity was 72 gm. The highest difference in mean birth weight was observed between first and third parity, i.e., 217gm. The difference in mean birth weight between different parity was statistically high significant ($p < 0.001$).

Table 3 showed that the young mothers had 2.9 (95% CI: 1.53-5.65, $p < 0.001$) times more risk than those mothers aged between 19-28 years of delivering LBW babies. Similarly, young (< 19 years) mothers had three times more risk of delivering LBW babies compared with older (29+ years) mothers. The odds ratio (OR) between first parity and second parity onwards was 2.45 (95% CI 1.48-4.06, $p < 0.001$). Therefore, first parity had 2.4 times more risk of LBW

Table 1: The distribution of birth weight by maternal age group.

Age group (years)	*Birth weight (gm)*									
	Observation		*<2500*		*≥2500*		χ^2 *p*	*Mean (gm)*	*SD (gm)*	*Anova (p)*
	n	*%*	*n*	*%*	*n*	*%*				
<19	53	16.0	31	58.5	22	41.5	13.8	2450	381	<0.005
19-23	198	59.8	67	33.8	131	66.2	<0.005	2593	340	
24-28	64	19.3	18	28.1	46	71.9		2693	407	
29 +	16	04.8	05	31.2	11	68.8		2646	440	
Total	331	100.00	121	36.6	210	63.4		2592	371	

Table 2: The distribution of birth weight by parity

Parity	*Birth weight (gm)*									
	Observation		*<2500*		*≥2500*		χ^2 *p*	*Mean (gm)*	*SD (gm)*	*Anova (p)*
	n	*%*	*n*	*%*	*n*	*%*				
1st	185	55.9	84	45.4	101	54.6	14.8	2522	361	<0.001
2nd	119	35.9	32	26.9	87	73.1	<0.001	2667	363	
3rd +	27	08.2	05	18.5	22	81.5		2739	380	
Total	331	100.00	121	36.6	210	63.4		2592	371	

+ (Only one case in 4th parity)

Table 3: Odds ratio of risk factor for predicting low birth weight neonates

Risk factor	*OR*	*95% CI*	*Inference*
Mother's Age:			
<19 years v ersus 19+	2.94	1.54-5.64	p<0.001
<19 versus 19-28 years	2.93	1.53-5.65	p<0.001
29+ versus 19-28 years	0.95	0.27-3.10	p<0.860
<19 versus 29 + years	3.10	0.83-12.11	p<0.104
Parity:			
Parity 1 versus 2	2.26	1.34-3.84	P<0.002
Parity 1 versus 2 +	2.45	1.48-4.06	P<0.001
Parity 2 versus 3 +	1.62	0.52-5.35	P<0.511
Parity 1 versus 3 +	3.66	1.24-11.56	P<0.014

OR = Odds ratio.
CI = Confidence Interval.

than second parity and above. Similarly, first parity had highest odds ratio (OR: 3.66, 95% CI: 1.24-11.56, $p < 0.014$) for being LBW compared with third parity and above. Figure I presents the relationship of maternal age and parity with birth weight.

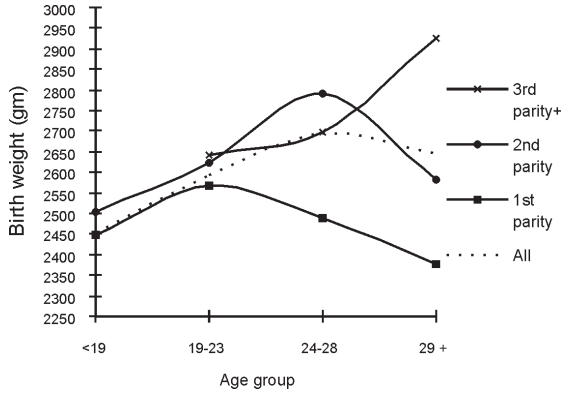

Fig. 1. Distribution of mean birth weight by maternal age group and parity.

DISCUSSION

The last half-century has witnessed many changes in the reproductive habits of population, the technologies and management of childbirth. However, during the last three decades there have been no changes in mean birth weight as well as the rate of LBW among Bengalees of Eastern India. In the previous study from Kolkata Chakraborty et al. (1975) reported that the mean birth weight was 2572 gm in Bengalee newborns. Another study from the same population (Pakrasi et al., 1985) documented that the mean birth weight was 2587 gm and the prevalence of LBW was more than 46% using the weight criterion of 2.5 kg or less. In an earlier study, (Mondal, 2000) reported from North East India a mean birth weight of + 85 g but a frequency of LBW of - 4.5% compared to the present study. The national average of LBW as reported by UNICEF (2004) was 30%.

During the last three decades the effect of maternal age and parity on different anthropometric and genetic markers has been a subject of great interest. Several studies relating the effect of mother's age and parity on birth weight indicate that parity is the more important factor of the two (Karn and Penrose, 1951; Millis and Seng, 1954; Neel and Schull, 1956; Warburton and Naylor, 1971). A possible explanation of lower birth weight among first-born infants could be a consequence of biological immaturity as compared to later-born infants.

It is now universally acknowledged that maternal age is an important factor influencing the incidence of LBW. Moreover, the rate of LBW decreases significantly with the increasing age of mother after 18 years of age. In the present study, the higher incidences of LBW rate were observed mothers aged less than 19 years. Earlier studies have also reported that the young (< 20 years) mothers had higher incidence of LBW than older (> 30 years) mothers (Chakraborty et al., 1975; Pakrasi et al., 1985). Teenage (13-19 years) pregnancies are a common phenomenon in India, in spite of legal constraints (legal age of marriage for women being 18 years as per amendment of 1978). The Government of India also recommended that the first childbirth should not be before 20 years of maternal age (Ministry of Health and Family Welfare, 1992). In the present study, more than 29% mothers delivered their baby before they attained 20 years of age. Among these mothers nearly 44% gave birth to LBW neonates. In an earlier study from the same hospital Verma and Das (1997) found that 35% neonates were LBW among teenage mothers and 23% LBW among older mothers (20-29 years). In this context, Haiek and Lederman (1988) also showed that the rate of LBW babies were much higher in the teenage mothers. In the present study teenage mothers (< 20 years) had 1.5 times more risk of delivering LBW babies compared with mothers aged 20 years and above.

The rate of LBW infant was seen to decrease significantly with increasing parity. Similar results have been seen in other studies (Dowding, 1981; Murphy and Mulcahy, 1971; Dougherty and Jones, 1982; Van Roosmallen, 1988). The first parity had the higher incidence of LBW. Similar findings have also been reported in a previous study of Bengalee

population from Kolkata (Pakrasi et al., 1985). Dougherty and Jones (1982) and Van Roosmallen (1988) reported that the mean birth weight of neonates born to primipara mothers was less than that for multipara mothers by 104 gm and 100 gm, respectively. However, in the present study, the observed the difference in mean birth weight was 158 gm between primipara and multipara (2+) mothers.

The main conclusion, which can be inferred from the findings of the present study, is that teenage pregnancies should be actively discouraged in this ethnic group so as to reduce the incidence of LBW. The concerned authorities should formulate appropriate health awareness and health promotion programmes to encourage late (non teenage) motherhood and discourage early pregnancies among individuals. Effective implementation of such programmes would be beneficial in reducing the rate of LBW among the Bengalee ethnic group. Further studies are needed to fully understand the confounding factors responsible for early motherhood. Lastly, studies similar to the present one should be undertaken among various other ethnic groups of India.

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ABSTRACT A cross-sectional retrospective study was conducted from April 26, 2002 to August 14, 2002. A total of 331 Bengalee mother-baby pairs were examined in the obstetric ward of M.R. Bangur Hospital. This is a hospital located in South Kolkata that serves the needs of individuals belonging to the lower socio-economic group. The overall mean (SD) birth weight (BW) was 2592 gm (371 gm). Among boys, mean BW was 2658 gm (362 gm) while among girls it was 2515 gm (367 gm). The present study found that the overall incidence of low birth weight (LBW) was 36.6% among Bengalee population. The highest incidence of LBW was found in young (< 19 years of age) mothers. Mother's age increased significantly ($p < 0.005$) with the decrease in LBW. Adolescent mothers (< 20 years of age) had 1.5 times more risk of delivering LBW baby. The highest occurrence of LBW was found in mothers with first parity. The rate of LBW weight decreased significantly ($p < 0.001$) with increasing parity. Mean age ($p < 0.05$) and parity ($p < 0.0001$) were also significantly different between mothers who delivered LBW and normal birth weight (NBW) infants. Furthermore, the difference in mean birth weight was statistically significant in case of maternal age group ($p < 0.005$) and parity ($p < 0.001$).

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