

# Analysis of determinants of low birth weight in Jalgaon, Maharashtra

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## Abstract

**Background:** Birth weight is a sensitive indicator for predicting the chances of both infant survival and healthy child growth. It is also documented that children with low birth weight (LBW) are at risk for reduced intelligence test scores when they have reached the school age, even if their birth weight is corrected infancy. **Objectives:** To examine the incidence of Low Birth Weight (LBW) and its association with the epidemiological factors in the study region. **Material and Methods:** The prominent factors associated with LBW such as maternal age, birth order of baby, proportion of pre-term babies, gender were studied in a community of Jalgaon district of Maharashtra. The total 3952 births in the Godavari Hospital, Jalgaon over the period Feb 2003 to Sept 2012 were analyzed in the study. **Results:** The average birth weight of all newborns was  $2.68 \pm 0.54$  Kg and 24.8% of newborns were low birth weight. **Conclusion:** There was no significant change in the average BW of babies in the last ten years in the study region.

**Keywords:** Low Birth Weight (LBW), Birth Order, Age of Mother.

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## INTRODUCTION

According to the World Health Organization (WHO) low birth weight babies are those born with less than 2500g with the measurement taken within the first hour of life, before significant postnatal weight loss has occurred.<sup>1</sup> Low Birth Weight is a major cause of infant mortality and is considered as a sensitive index of nation's health and development. A low birth weight infant is also at increased risk of being impaired physically or intellectually.<sup>2</sup> At full term, the average baby will be about 20 inches (51 cm) long and will weigh approximately 6 to 9 pounds (2700 to 4000 grams).

Worldwide, out of 139 million live births, about 23 million infants had low birth weight i.e., birth weight less than 2.5 kg.<sup>3</sup> In India, the prevalence of LBW is about 33%<sup>4</sup>, as compared to 4.5% in industrially developed countries.<sup>5</sup> The perinatal mortality among LBW infants is about 8 times higher than that in infants weighing more than 2.5kg.<sup>6</sup> People whose mothers were aged 25–30 years when they were born had a higher IQ than those born to younger or older mothers.<sup>7</sup> Persons had a higher mean birth weight, were less likely to be the firstborn child in the family.<sup>8</sup> Two studies suggest that the relation observed between birth weight and IQ might persist into adult life. Richards *et al* found a gradient relation of birth weight to covariate adjusted cognitive test scores from childhood through age 26 in the 1946 birth cohort. Sorensen *et al* linked birth records to cognitive test results among 4300 Danish men being evaluated for military service and found a positive relation for birth weights up to about 4200 g.<sup>9,10</sup> Globally the lowest mean birth weight has been reported from Asia. In the countries of the Indian sub-continent, the mean birth weight ranged from 2700 to 3000 gm with corresponding LBW rate of 30% to 40%. In contrast, in different developed countries range of mean birth weight is from 3300 to 3500 gm with

LBW rates ranging between 4 to 8 percent.<sup>11</sup> The children with lower mean birth weights showed more variability than the normal children. There is no appreciable association between birth weight and intelligence in the general population taken as a whole.<sup>12</sup> Total house hold income, maternal education and antenatal care were not found to influence the mean birth weight.<sup>13</sup>

**MATERIAL AND METHODS**

The present study was conducted at Godavari Hospital attached to the Urban Health Training Center (UHTC), the field practice area of the department of Community Medicine of Dr. Ulhas Patil Medical College, Jalgaon Maharashtra. Modern Jalgaon is now boasts of vast industrial area, educational institutes and good hospitals. The city is well developed with good roads, shopping centers, residential areas with good infrastructure in communication and transport. The present study includes all the 3952 births conducted in the hospital during the period from Feb 2003 to Sept. 2012. The case records were available in year wise bound books, incomplete case records were deleted. While conducting research ethical aspect has been taken into the consideration. Investigator had taken the prior permission from the respective authorities to conduct the proposed research. The information about the variables such as birth weight, order of birth, gender, age of mother at the time of delivery, Hemoglobin of mother was collected, analyzed and tested for statistical significance. Mother’s age at delivery was calculated in full years.

**Data Analysis**

Finally data entry and statistical analysis was done by using software SPSS. Frequency distributions were calculated for all variables. The various statistical techniques such as ‘t’ test, Chi-square test were used to analyse the data and to find out the association of birth weight with the variables under study.

**RESULTS**

**Table I: Descriptive Statistics for Characteristics of Mothers and Babies**

Categories	No. of cases	%	Mean BW	S.D.
<b>Sex</b>				
Male	2231	56.5	2.7	0.55
Female	1718	43.5	2.6	0.53
<b>Birth Order</b>				
1	2123	54.27	2.6	0.53
2	1297	33.15	2.8	0.51
3	375	9.59	2.7	0.60
4	86	2.20	2.7	0.64
5	28	0.72	2.5	0.73
6	3	0.08	2.1	1.68
<b>Hb (gm %)</b>				

<8	545	13.8	2.613	0.5603
8-<11	2710	68.6	2.6927	0.5311
≥ 11	694	17.6	2.596	0.5726
<b>BW in Kg</b>				
<1.5	117	3	1.05	0.29
1.5-2.4	890	23	2.09	0.17
2.5-3.4	2688	68	2.85	0.26
≥ 3.4	251	6	3.66	0.22
<b>Maternal age</b>				
<20	219	8	2.56	0.55
20-35	2537	91	2.69	0.52

The total numbers of births in the hospital were 3952 over the period 2003 to 2012. The maximum number of births 556 in the year 2004 and minimum number of births 295 in the year 2010 were reported. According to the 2011 census Jalgaon district has a population of 4,224,442. The average birth weight, in our data was 2.68 Kg with an SD of BW 0.54 Kg which remains unchanged through the period with some exceptions. The total number of twin births was 68 in the entire study with the average birth weight 2.04 Kg and S.D. of 0.56 Kg. Each of the twins has been entered separately for birth weight analysis. The 26.8% of twin babies have the LBW and 17.5 % have very low birth weight (i.e. <1.5 Kg). The data on the age of mother were available for 3947 cases. The 22.12% of the mothers were below 20 years of age.

**Table II: Distribution of LBW babies according to maternal age**

Maternal Age yrs	No. of New Borns	LBW (in Kg)		P Value
		No.	%	
<20	873	244	27.9	0.067 <sup>#</sup>
20-25	1635	398	24.3	
26-30	946	217	22.9	
31-35	478	114	23.8	
>35	15	4	26.7	
<b>Total</b>	<b>3947</b>	<b>977</b>	<b>24.8</b>	

<sup>#</sup> not significant at 0.05 level

Table No. II shows that more number of LBW babies (27.9%) born to mothers who were less than 20 years of age. The relationship between maternal age and LBW was not found to be statistically significant (p>0.05).The overall proportion of low birth weight (<2.5 Kg) babies in the defined period (3952 cases including all preterm babies) was 24.8%. There was significant effect of preterm deliveries on the birth weight of babies. Amongst normal weight babies majority (63.9%) were in the weight group of 2501-3000 gm and only 6.07% weighing more than 3.5 Kg. The ‘Z’ test for testing equality of means shows that the difference in mean birth weight for male babies (N=2231, mean BW=2.7 Kg) and female babies (N=1718, mean BW=2.6 Kg) is not significant (p value >0.05)

**Table III: BW in relation to Gender of newborns**

BW (in grams )	Male		Female	
	No	%	No	%
<1000	26	1.17	25	1.46
1001-1500	53	2.38	47	2.74
1501-2000	142	6.36	125	7.28
2001-2500	528	23.67	528	30.73
2501-3000	948	42.49	711	41.39
3001-3500	444	19.90	244	14.20
3501+	90	4.03	38	2.21

Table No. III. The average birth weight of babies remains constant in respect of birth order. The 87.42% of babies have the birth order 1 or 2, and only 0.80 % babies with birth order 5 or 6. At the time of delivery 68.6% of the mothers had hemoglobin between 8 gm to 11gm percent. A total of 837 mothers (21%) give the premature birth and 28.7% of them had low birth weight. The average BW of babies with premature birth was 2.19 kg i.e. below normal limits.

## DISCUSSION

The present study shows the incidence of LBW to be 24.8%. Trivedi *et al*<sup>5</sup> and Kamaladoss *et al*<sup>14</sup> had reported 20.37% and 24.6% LBW respectively in their studies. The mean birth weight of the present study was 2.68 Kg ( $\pm$  0.54 Kg) which was approximately same when compared to the study conducted by K. S. Negi but was quite low when compared to the study of Ramankutty *et al*<sup>15</sup>. The incidence of LBW was high among young mothers of age less than 20 years and more than 35, it was found to be significantly higher. Similar observations were also reported by K. S. Negi *et al*<sup>16</sup> and Anand *et al*<sup>17</sup>. There was no significant difference in the birth weights of males and females (Mean BWs 2.7 Kg Vs 2.6 Kg). Birth weights were significantly ( $p < 0.001$ ) greater in males than in females (mean 2600 grams vs. 2440 grams).<sup>18</sup> Thomas D Matte *et al* proved that, the mean IQ increased monotonically with birth weight in both sexes across the range of birth weight in a linear regression analysis of one randomly selected sibling per family (n =1683) with adjustment for maternal age, race, education, socioeconomic status, and birth order. The increase in childhood IQ with birth weight continues well into the normal birth weight range<sup>19</sup>. More recent studies, suggest that the weight to intelligence link extends to normal-sized babies as well. Most research in general indicated that higher birth weights meant slightly higher IQ. Studies have also shown that increasing birth weight kept on increasing IQ until the baby reached 4.2kg Analysis of maternal obstetric history revealed that those mothers who delivered before 37 weeks of gestation, had weight loss, and who did not receive additional diet during pregnancy had higher risk of delivering LBW babies and

the difference was statistically significant ( $p = 0.05, 0.01$ ) respectively.<sup>20</sup> The study shows incidence of LBW (<2.5 Kg) and very LBW (<1.5 Kg) was 20.6% and 2.5% respectively. In the study of Teshome D *et al*<sup>13</sup> it was 15.4% and 2.6% respectively. Similar findings were documented in multiple other studies. The mean birth weight and percentage of low birth weight were significantly different in both sexes ( $p < 0.01$ ).<sup>21,22</sup>

## CONCLUSION

The result of the present study reveal that there was not significant change in the average birth weight of the babies in the study region over the last ten years, similar to other reports from various studies. The findings suggest a positive association between the low birth weight and factors such as twin birth and premature deliveries. Analysis of maternal history revealed that those mother who delivered before 37 weeks of gestations had higher risk of delivering LBW babies.

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