FACTORS AFFECTING BIRTH WEIGHT
IN A SUB-URBAN COMMUNITY: A STUDY
IN A SECONDARY LEVEL HOSPITAL IN DELHI

Neeraj Agarwal* and V.P. Reddaiah**

ABSTRACT

The study was conducted to assess the impact of various factors like maternal age, parity, gestational age, ante-natal care and anaemia on birth weight. Twenty seven per cent of the new-borns were found to have a low birth weight. Low birth weight babies were born more to the mothers with age below 20 years (30.8%) as compared to women more than 20 years of age (25.3%). Neonates with a gestation period of less than 37 weeks were more prone to low birth weight. The subjects who were not availing of ANC services had more number of low birth weight babies as compared to those who received ANC services (29.3% and 25.5% respectively). Female babies were more prone to low birth weight as compared to the male babies. The adjusted odds ratios were 1.36 for maternal age less than 20 years, 1.58 for period of gestation (POG) less than 37 weeks, 1.23 for non-utilizers of ANC and 1.32 for female babies. The authors suggest that marriage beyond 18 years of age for the girls and increase the coverage of ANC to cent per cent for pregnant women may be promoted.

Keywords: Birth weight, Maternal age, Ante-natal care, Marriage and Period of gestation.

Birth weight is the single most important factor determining the survival chances of the new-born. Many of the new-borns die during their first years of life. The infant mortality rate is about 20 times higher for all low birth weight babies than other babies¹. The lower the birth weight, the lower is the survival chance of the new-born. Many of the low birth weight new-borns become the victims of protein energy malnutrition (PEM) and infection.

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According to the international agreement, low birth weight has been defined as "birth weight of less than 2,500 grams (2.1/2 kg)." The birth weight of the infant is preferably measured within the first hour of its birth and before the postnatal weight loss is significantly occurred.

Low birth weight is one of the most serious challenges for mother and child health (MCH) in developing countries. It has a number of public health consequences such as mental retardation, high-risk of peri-natal and infant mortality as well as morbidity and the very high cost of special care and intensive care unit (ICU). It has been revealed that half of all peri-natal and one-third of all infant deaths occur due to low birth weight.

The infant mortality rate (IMR - rate of mortality cases per thousand live-births) in India was 67.6 in the year 1993-98 as estimated by NFHS-2. It varies from 86.7 in Uttar Pradesh to 16.3 in Kerala. According to NFHS-2, the infant mortality rate was higher among children born to mothers below 20 years than children born to mothers of 20-29 years of age. As per the findings of NFHS-2, infant mortality rate was 93 in case of mothers below 20 years as compared to 63 in the case of mothers above 20 years of age. The IMR was more in the case of first child (74.9) in comparison to the third child (61.7). IMR increases as the size of baby decreases. Thus, there was an extra contribution of about 10-15 deaths per thousand births (in IMR) by low birth weight babies.

22.7 per cent of babies born each year are LBW as estimated by the World Summit (1998-99). The incidence of low birth weight is still high in India. Prevention of Low Birth Weight would help in the reduction of high infant morbidity and mortality.

It has been observed in some studies that low birth weight is influenced by certain factors like period of gestation ante-natal care maternal age, parity, anaemia, etc. 42 per cent of the new-borns had low birth weight and 90 per cent of the neonate deaths had occurred in the low birth weight babies, a study in a tribal area revealed.

OBJECTIVE

This current study was conducted with an objective of assessing the impact of various factors like maternal age, parity, gestational age, ante-natal care, anaemia, etc. on the birth weight of the infant. This relationship might offer some ways and means for initiating public health measures which may help in increasing the birth weight of the newborns and reducing their morbidity and mortality.
METHODOLOGY

This is a hospital-based study conducted at a secondary level hospital of CRHS Project, Ballabgarh, a rural field practice area of Center for Community Medicine (CCM), All India Institute of Medical Sciences, New Delhi. This is a sub-district hospital catering the services to about one lakh population where around 1300 to 1500 deliveries take place in a year. The details of all the in-patients were encoded in a computerized medical record system using Dbase IV. There were 2,903 deliveries in this sub-district hospital from January 2000 to December 2001. From the 2,903 deliveries, 2,807 singletons were included in the study for analysis while the sixty-two twin and other cases with missing data were excluded from the study. Information was derived from the case-sheet of mother and new-born record. Appropriate analysis was carried out using Epi Info-2000 and STATA packages. Fifty-one (51) females were not able to recall their date of last menstruation period (LMP), so they were excluded from analysis during multivariate analysis. The weights of the new-borns were measured on a digital weighing scale soon after the birth without clothes. The precision of the machine was up to one gram with a capacity to measure a minimum weight of 40 grams and a maximum weight of 10 Kgs. A baby with a weight of less than 2,500 kg was defined, as low birth weight. The mother's age was coded as filled in the case sheet and the cut-off date of 20 years was selected for the study. The dividing point for the period for gestation was 37 weeks. The criterion for anaemia was taken as per the findings of the clinical examination at the time of delivery.

FINDINGS

Out of the 2,807 new-borns included in the study, 1,513 (54%) were males and 1,294 (46%) were females. The mean weight of the new-borns was 2.68kg. 745 new-borns (26.5%) were, having a birth weight of less than 2,500gms (2\frac{1}{2}kg). It was seen that 22.7 per cent of the mothers were below the age of 20 years. About 39 per cent of the women were bearing child for the first time. Out of the 2,807 mothers, 2,049 (73%) had received at least one round of ante-natal care during their pregnancy. 35 per cent of the women were found to be anaemic at the time of their delivery. The period of gestation was not ascertained in 51 women. Hence, out of the 2,757 mothers, only 14 per cent of them had delivered their baby in less than 37 weeks of intrauterine life.

The findings of the study show that low birth weight babies were more common to mothers with an age of less than 20 years (30.8%) as compared to mothers above 20 years of age (25.3%). The unadjusted odd ratio (OR) for age was 1.32 (35% CI, 1.08-1.61) and adjusted OR was 1.36 (95% CI, 1.11 - 1.61). The period of gestation (POG) also showed an impact on birth weight as 34.7 percent of the
mothers had low birth weight babies with a POG of less than 37 weeks in comparison to only 25.3 per cent of mothers delivering LBW babies with complete POG. The unadjusted OR for POG less than 37 weeks was 1.57 (95% CI, 1.24 - 1.99) and adjusted OR was 1.58(95% CI, 1.25 - 1.99). Though the first birth (zero parity) had a higher percentage of Low Birth Weight which was not found to be statistically significant after adjustment.

The non-utilizers (29.3%) of ante-natal care (ANC) had more number of low birth weight babies as compared to those who had received ANC (25.5%). The unadjusted OR for non-utilization of ANC was 1.21 (95% CI, 1.00 -1.46) and adjusted OR 1.23 (95% CI, 1.02 - 1.48). The findings of the study reveal that anaemia was not significantly affecting the birth weight at the time of delivery. Further, the findings show that more number of female babies (29.4%) were more prone to low birth weight as compared to male babies (24.0%). The unadjusted odds ratio for females was 1.32 (95% CI, 1.11 -1.57) and for adjusted OR was 1.32 (95% CI, 1.11 -1.56) (Table .1).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Low B.Wt.</th>
<th>Normal B.Wt.</th>
<th>p - Value</th>
<th>Unadjusted (95% CI) OR</th>
<th>Adjusted (95% CI) OR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mother's Age</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(&lt;= 20Yrs)</td>
<td>197</td>
<td>440</td>
<td>69.2</td>
<td>X²=7.82, p=0.005</td>
<td>1.32 (1.08-1.61)</td>
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<tr>
<td>(&gt;21 yrs)</td>
<td>548</td>
<td>1622</td>
<td>74.7</td>
<td></td>
<td>1.36 (1.11-1.56)</td>
</tr>
<tr>
<td><strong>Period of Gestation (POG)</strong></td>
<td></td>
<td></td>
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<tr>
<td>&lt;37 weeks</td>
<td>134</td>
<td>252</td>
<td>65.3</td>
<td>X²=15.04, p=0.001</td>
<td>1.57 (1.24-1.99)</td>
</tr>
<tr>
<td>&gt;37 weeks</td>
<td>600</td>
<td>1771</td>
<td>74.7</td>
<td></td>
<td>1.58 (1.25-1.99)</td>
</tr>
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<td><strong>Parity</strong></td>
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<tr>
<td>0</td>
<td>317</td>
<td>781</td>
<td>71.1</td>
<td>X²=5.23, p=0.07</td>
<td>1.18 (.97-.140)</td>
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<td>1-3</td>
<td>409</td>
<td>1217</td>
<td>74.8</td>
<td></td>
<td>NS</td>
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<tr>
<td>&gt;3</td>
<td>19</td>
<td>64</td>
<td>77.1</td>
<td></td>
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<tr>
<td><strong>Ante-natal Care (ANC)</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Not Taken</td>
<td>222</td>
<td>536</td>
<td>70.7</td>
<td>X²=4.02, p=0.045</td>
<td>1.21(1.00-1.46)</td>
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<tr>
<td>Taken</td>
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<td>1526</td>
<td>74.5</td>
<td></td>
<td>1.23(1.02-1.48)</td>
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<tr>
<td><strong>Sex of Baby</strong></td>
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<tr>
<td>Female</td>
<td>381</td>
<td>913</td>
<td>70.6</td>
<td>X²=10.38, p=0.001</td>
<td>1.32 (1.11-1.57)</td>
</tr>
<tr>
<td>Male</td>
<td>364</td>
<td>11.49</td>
<td>76.0</td>
<td></td>
<td>1.32(1.11-1.56)</td>
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<tr>
<td><strong>Anaemia</strong></td>
<td></td>
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<tr>
<td>Present</td>
<td>255</td>
<td>717</td>
<td>73.8</td>
<td>X²=0073, p=0.79</td>
<td>0.97 (0.82 -1.12)</td>
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<tr>
<td>Not Present</td>
<td>490</td>
<td>1345</td>
<td>73.3</td>
<td></td>
<td>NS</td>
</tr>
</tbody>
</table>

*pog: n=2,756; In 51 cases, POG couldn't be ascertained due to Non-recall of exact date of last menstruation period (LMP)
DISCUSSION

Mother's age

The study results establish that the prevalence of low birth weight is significantly associated with the mother's age. More number of mothers below 20 years of age had delivered more LBW babies which was statistically significant (p=0.005). This association still persisted even after controlling other factors-as shown by adjusted odd ratio, Similar findings have also been seen in studies conducted in Banglore and some other places.

In India, 34 per cent of the women in the age group of 15-19 years are married and contribute to 19 per cent of births a year with a variation of 5.9 per cent to 21.4 per cent in Goaand Madhya Pradesh respectively (NFHS-2). The law to prevent marriage of females before the age of 18 years in India has not been found successful. So, it is highly desired that the concerned authorities should take appropriate initiatives to implement the right age of marriage for females in letter and sprit. It must be seen that females should bear child after they are 20 years old. This initiative would help in reducing the high IMR which is high in the case of younger mothers, specifically the mothers below 20 years of age.

Period of Gestation

It was found that the period of gestation (<37 weeks) was statistically associated with LBW (p=0.0001). Similar results were also observed by Felke Y et al at St. Pauls Hospital in Addis Ababa. Ganguli et al showed that mothers delivering heavy weight babies had an average gestation period of one to five weeks longer than the mothers delivering normal weight or LBW babies.

Though there is less scope to improve the gestational period through public health measures but improvement in other maternal factors like literacy, birth-spacing and reduced smoking level might improve the period of gestation and consequently improve the birth weight of the baby.

Parity

Parity was not statistically associated with birth weight in the present study which is in contrast to the observation made by Felke Y et al and Pinherio et al who found a significant association between birth weight and parity. Parity and age
go together and when controlled for age, parity might have lost its impact independently. NFHS-2 also showed that birth order tends to have U-shaped relationship with death with first births and higher order (4+) having elevated IMR (74.9..61.7, and 101.1 for birth order of 1,3 and 6+respectively).

**Ante-natal Care**

Non-utilization of ante-natal care during pregnancy was independently and significantly associated with low birth weight (p<0.05) which is in agreement with the findings of Pinherio.A et al, Nadiaye 0 et al, Abu-Heija et al and Gortzak-uzan. Only 65 per cent of the mothers, in India received at least one ante-natal check-up during the three years preceding the survey (NFHS-2). This varied from 99 per cent in Goa to 34.6 per cent in Uttar Pradesh. The awareness to avail of this facility will improve the utilization and decrease the percentage of low birth weight babies and infant mortality. There is a greater need to increase the coverage of ANC for all pregnant women.

**Sex of Baby**

Female baby was significantly prone to low birth weight (p=0.001) and the same was also reported by Felke et al.

**Anaemia**

Anaemia in mother at the time of delivery was not significantly associated with low birth weight of the baby. In the studied mothers, the prevalence of anaemia was much lower and half (26%) of the national average (52%). The investigators perceive that this may be due to high coverage of prophylactic iron supplementation in this population.

**LIMITATION**

Factors like type of food (veg Vs non-veg), location of residence (rural Vs urban) and frequency of ante-natal care may also contribute to low birth weight occurrence. But this being a hospital-based study, focus was given to the factors which might offer opportunity for initiating public health measure.
CONCLUSION

Out of the four factors statistically associated with low birth weight, mother's age and ANC can be considered immediately for public health action. There is a need to promote right age at marriage (minimum 18 years) and increase the coverage of ANC to cent per cent pregnant women. Period of gestation may be improved through different contraceptive methods of spacing. But in the Ballabgarh area, these methods are not popular and mothers prefer sterilization rather than spacing the births. Though anaemia was not found to be associated with LBS in the current study, there is a greater necessity to increase the coverage of iron and folic acid prophylaxis to prevent severe anaemia.

REFERENCES


