Study of Low Birth Weight Infants in the Coastal Areas of Udupi Taluk, Karnataka, South India

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ABSTRACT

The pattern of low birth weight was studied among babies born at six Rural Maternity and Child Welfare (RMCW) homes from July 1985 to June 1989 in the coastal areas of Udupi taluk, Karnataka State, India. Delivery records of singleton liveborn babies only were analysed, with reference to the age of the mother, parity, gestational age, religion, sex of the babies and birth weight. Out of the 4,498 infants born during the study period 602 (13.3 %) were of Low Birth Weight (LBW) and only 18 (0.4 %) were of Very Low Birth Weight (VLBW). The incidence of LBW among teenage and primipara mothers was found to be 19.3% and 16.8 % respectively and it declined significantly with increase in age and parity of the mothers (P<0.001). The LBW rate was found to be inversely related to the period of gestation (r = 0.34, P<0.05). There was no statistical significant difference in incidence of LBW between male and female babies, or among different religions.

A number of indicators of the maturity of newborns are accepted worldwide, but there is no agreed overall definition. The most commonly used indicator of infant maturity is birth weight[1]. Birth weight is not only chosen as a reliable indicator of maturity but also one of the simplest measurements that can be made with reasonable accuracy under varying conditions throughout the world[2]. By international agreement, a low birth weight (LBW) baby is one with a birth weight less than 2500gms, the measurement preferably being taken within the first hour of life[1-3]. Other tests which are commonly used for LBW babies are small for date/small for gestational age and intrauterine growth retardation. In general, these indicators are defined as birth weight less than 2500gms and gestational age equal to or more than 37 weeks[1,4,5]. LBW infants could be premature if born before term.

Low birth weight is a major public health problem in many developing countries. It ranges from 3% to 5% in the developed countries to almost 50% in some of the least developed countries. About 30% of the babies born in India are of LBW as compared to 4% in some developed countries[6]. The causes of LBW have been the focus of many investigations in the last few decades. With the general availability of fairly accurate infant weighing devices, its determinants have come under intense global scrutiny. The causes of LBW are multifactorial[1]. In countries where the rate of LBW is high, most babies suffer from foetal growth retardation. In countries where the percentage of LBW infants is low, most of them are born pre-term.

Low birth weight infants have a high risk of dying not only during the neonatal period but also during the post-neonatal period. Most of them become victims of protein energy malnutrition and infections. Thus they contribute significantly to high perinatal and infant mortality, and poor child survival. In real life the LBW child has to compete on equal terms with his normal birth weight peers.

The proportion of infants born with LBW has been selected as one of the nutritional indicators for monitoring progress towards Health For All by the year 2000.

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As envisaged in the National Health Policy of India, the goal is to reduce the incidence of LBW infants in the country from 30% to 10% by the year 2000[7].

Information about LBW babies, especially in rural areas, is lacking in most of the developing world, including India. This study was undertaken with an objective to study LBW babies born in the coastal areas of Udupi taluk, Karnataka, a southern state of India.

METHODS

Udupi is one of the coastal taluks of Dakshina Kannada district, a relatively well developed district of Karnataka state. A network of six Rural Maternity and Child Welfare (RMCW) homes provide maternal and child health services to a population of 60,000 residing in a coastal area of Udupi taluk and is the field practice area of the Department of Community Medicine, Kasturba Medical College, Manipal. Description of the study area has been mentioned in an earlier publication of this journal[8]. Information regarding birth weight, and it correlates such as age of the mother, parity, period of gestation and religion, were obtained retrospectively by reviewing the antenatal records, delivery records and neonatal case sheets pertaining to the births that occurred in these six RMCW homes during the period July 1985 to June 1989. Birth records of singleton liveborn babies only were included in the study analysis. Deliveries at the centres were conducted by trained Auxiliary Nurse Midwives (ANMs) who have been in position for the last 18-20 years. They have been adequately trained to record birth weight accurately using UNICEF infant weighing machines (lever balance type) to the nearest 20 gms after correcting the zero error. All babies were weighed within one hour of delivery. The weighing machines were checked periodically and calibrated using a standard weight.

Data pertaining to birth weight was subjected to statistical analysis utilising statistical software package SPSS/PC+. P value less than 0.05 was considered significant.

The main limitation of this study is that the birth weight of newborns born at other hospitals was not included because of logistic constraints. The terms used in this study were defined as follows[3]:

1. *Low birth weight:* Any infant whose birth weight was less than 2500 gms (up to and including 2499 gms).
2. *Very low birth weight:* Any infant whose birth weight was less than 1500 gms (up to and including 1499 gms).
3. *Pre-term baby:* Any infant who was born before completion of 37 weeks of gestation (less than 259 days).
4. *Term baby:* Any infant who was born between 37 and 42 completed weeks of gestation (259 to 293 days).
5. *Post-term baby:* Any infant who was born after 42 completed weeks of gestation (294 days or more).

RESULTS

Table 1 shows the distribution of 4,498 infants according to their birth weight and sex. Low birth weight

Table 1
Distribution of Birth Weight among Male and Female infants
n=4498

Sex	*Birth Weight (Gms)*							
	<1500	*1500-1999*	*2000-2499*	*2500-2999*	*3000-3499*	*3500-3499*	*>/4000*	*Total*
Male	10 (0.4)	45 (1.9)	240 (10.3)	1040 (45.3)	790 (34.2)	160 (6.9)	23 (1.0)	2308
Female	8 (0.3)	48 (2.3)	251 (11.4)	1113 (50.8)	640 (29.2)	115 (5.2)	15 (0.8)	2190
Total	18 (0.4)	93 (2.0)	491 (10.9)	2153 (47.9)	1430 (31.8)	275 (6.1)	38 (0.8)	4498 (100)

Figures in parentheses indicate percentage

Table 2
Pattern of Low Birth Weight according to age of mothers n=4498

Age of mother (years)	*Birth Weight in gms* <2000	2000-2499	>2500	*Total*
< 19	18 (4.3)	63 (15.0)	329 (80.7)	410
20 – 24	23 (1.8)	145 (11.6)	1082 (86.6)	1250
25 – 29	43 (2.3)	191 (10.2)	1622 (87.5)	1856
30 – 34	22 (2.8)	62 (8.1)	680 (89.1)	764
>35	5 (2.2)	30 (13.7)	183 (84.1)	218
Total	111 (2.4)	491 (10.9)	3896 (86.6)	4498 (100.0)

$X^2 = 27.33$, df = 8, P<0.001
Figures in parentheses indicate percentage

(<2500 gms) accounted for 13.3%, while babies with a birth weight of <2000 gms constituted a mere 2.4% and Very Low Birth Weight (VLBW) babies (<1500 gms) accounted for only 0.4%. There were 38 (0.8%) of high birth weight (>4000 gms). Table 2 shows decline in the incidence of LBW babies with increase in maternal age up to 34 years. However, the incidence shows a rise in mothers of 35 and over. The results were found to be statistically significant (<0.0001).

Table 3 shows the pattern of birth weight in relation to parity. The incidence of LBW was highest among the primipara and showed a declining trend with increasing parity. This observation was found to be highly significant (P<0.0001). Table 4 shows that 329 (7.5%) were pre-term, 4,102 (91.2%) were term and only 57 (1.3%) were post-term babies. The incidence of LBW declined with an increase in period of gestation and was found to be statistically significant (P<0.001). There is an inverse relationship between incidence of low birth weight and the period of gestation, Correlation Coefficient (r=0.34, p<0.05).

Table 3
Distribution of Low Birth Weight Babies according to Parity n = 4498

Parity	*Birth Weight in gms* <2000	2000 - 2499	>2500	*Total*
1	35 (2.6)	190 (14.2)	1108 (83.2)	1333
2	37 (2.7)	133 (9.7)	1193 (87.6)	1363
3	19 (2.0)	91 (9.6)	834 (88.4)	944
4	15 (3.0)	50 (10.0)	433 (87.0)	498
>5	5 (1.3)	27 (7.5)	328 (91.2)	360

$X^2 = 36.45$, df = 8, P<0.0001
Figures in parentheses indicate percentage

Table 4
Pattern of Low Birth Weight Infants according to period of gestation n=4498

Gestation in weeks	*Birth Weight in gms* <2000	2000-2499	>2500	*Total*
Pre-term <37	96 (28.3)	184 (54.2)	59 (17.5)	339
Term 37–41	15 (0.3)	306 (7.4)	3781 (92.3)	4102
Post-term >42	– –	1 (1.9)	56 (98.1)	57
Total	111 (2.4)	491 (10.9)	3896 (86.7)	4498 (100.0)

$X^2 = 1829.04$, df = 4, P<0.0001
r = 0.34 P<0.001
Figures in parentheses indicate percentage

Table 5
Incidence of Low Birth Weight – Findings of different studies in India

Studies	*N*	*LBW Criteria* <2000g (%)	<2500g (%)
Mukherjee et al (1959)[9]	1054	–	15.3
Kapur S et al (1972) South India[10]	1652	6.3	30.0
Katua SP et al (1978) East India[11]	2792	–	47.0
Panna Choudhury et al (1978)[12]	2495	–	20.0
Santosh K Bhargava et al (1979)[13]	643	2.7	22.9
Karun Makhija (1987)[14]	2421	3.4	18.7
Singhal PK et al (1989)[15]	920	24.0	40.7
Present study (1991) Udupi	4498	2.4	13.3

DISCUSSION

In accordance with the criteria laid down by the World Health Organization, (LBW) accounted for 13.3% of the infants. Since the average birth weight of the Indian newborn is 500 gms less than their American counterparts, many paediatricians consider that the cut off point for LBW should be considered as 2000 gms for developing countries[1,6]. Applying the above criteria, only 2.4% of the babies in the present study were found to be of LBW. The incidence of LBW among male and female babies was 12.8% and 14% respectively. However, the observed difference was statistically not significant (P>0.05).

A number of studies have been conducted in India to highlight the problem of LBW, using different criteria to define it, the findings are shown in Table 5. The incidence of LBW in the present study was found to be much less when compared to the studies mentioned.

Very Low Birth Weight (VLBW) babies accounted for less than 0.5% and this incidence is very low when compared to other studies[13,16].

The lower incidence of LBW in the present study could be attributed to many reasons. Firstly, the study has been conducted in a socio-economically developed town of one of the most developed districts of Karnataka state. Health facilities are in good supply and the utilisation of maternal and child health services are high. Over 90% of the pregnant mothers had a minimum of three antenatal check-ups and the majority of them had their first examination between 16-20 weeks of gestation. Immunisation coverage for tetanus toxoid was over 90%. Institutional deliveries accounted for nearly 95% of total deliveries in this region[17]. Thus the majority of pregnant women had access to quality antenatal care. Under such prevailing conditions it is not unusual to find such a low incidence as observed in this study.

Secondly, it could be due to the fact that the study was conducted in a field rural practice area of a Medical College with a well established referral system between peripheral RMCW homes and the apex hospital. It is quite likely that high risk pregnancies might have been referred to the apex hospital and this could have exerted an influence on the low incidence of LBW observed in the present study. The estimated increase in overall incidence of LBW would be in the range of 1-2%, when referrals are taken into account.

The results of this study show that teenage mothers (19 years or under) were at increased risk of giving birth to LBW babies. The proportion of LBW babies has shown a declining trend with increase in maternal age. The results were found to be statistically significant (P<0.001). The incidence of LBW in teenage mothers was reported to be 28.2%[13]. The low incidence of LBW amongst teenage mothers in this study could be due to a low proportion of teenage mothers (9.1%), which in turn could be due to the higher mean age at marriage for females (21.4 years) in this region[17].

In this study the incidence of LBW was highest among the primipara ie. 16.8% while in para 5 and above it was 8.8%. This decline in incidence with parity was found to be statistically significant (P<0.0001). The incidence of LBW among primipara in this study was found to be less, compared to studies conducted in other parts of India[13,18]. This may be due to the fact that the majority of primipara were above 20 years old and therefore the risk associated with teenage pregnancy was minimal.

The results of this study also show 82% of pre-term babies were LBW and only 7.8% of term babies were found to be of LBW. Among LBW infants, 321 (53.5%) were born at term ie. pre-term. Santosh Bhargava et al[13] reported 82.5% and 17.5% of SFD and pre-term babies respectively. The lower proportion of SFD (53.5%) in this study indicates improved nutritional status of pregnant mothers in this region, a finding that needs further investigation. In developed nations of the world, the problem of LBW is mainly related to prematurity rather than to SFD or intrauterine growth retardation. Thus the pattern of LBW in this region has a tendency to follow the Western norms. There was no difference in incidence of LBW among different religions (P>0.05).

CONCLUSION

The lower incidence of LBW in the present study can be attributed not only to the availability of quality antenatal care in RMCW homes but also to the high levels of utilisation of these services. This in turn could be related to high female literacy and easy access to health facilities in this region.

REFERENCES

1. Kramer MS. Determinants of low birth weight: Methodological assessment and Meta analysis. WHO Bull 1987;65:663-737.
2. World Health Organization. New trends and approaches in the delivery of maternal and child health care in health services. WHO publication TRS No. 600, 1976:94-5.
3. World Health Organization. International Classification of Diseases. WHO publication (9th ed, revised) 1977;1:763-4.
4. Behrman, Vaughan. High Risk Infant: Prematurity and Intrauterine growth retardation. Nelson's Text Book of Paediatrics, 13th ed. Philadelphia: WB Sauder's International publication, 375-85.
5. Campbell AGM, McIntosh N. Low Birth Weight. Forfar and Arneil's Text Book of Paediatrics, 3rd ed. London: Churchill Livingstone Publication, 1990:286-327.
6. Bhargava SK, Kishan J. Low Birth Weight and its sequalae - The Indian expereince. Indian J Pediatr 1980;7:117-21.
7. Ministry of Health and Family Welfare. National Health Policy. Govt of India Publication, 1984.
8. Prasad KN, Phaneendra Rao RS, Krishna Rao TS. Risk profile of pregnant mothers in the coastal area of Udupi taluk, India. Bahrain Med Bull 1991;13:85-90.
9. Mukherjee S, Biswas S. Birth Weight in relationship to gestational age, sex and other maternal factors. J Indian Med Assoc 1959;32:389-97.
10. Kapur S, Mammen KC, Jesudian G, et al. Criteria to define prematurity in South India. Indian J Med Res 1972;60:1533-41.
11. Katua SP, Manocha BK, Chaterjee S, et al. The incidence and etiology of small for date infants born at term. Indian Pediatr 1979;16:395-402.
12. Chowdhury P, Tirupuram S, Gupta S. A longitudinal study of maternal and neonatal factors in relation to perinatal mortality. Indian Pediatr 1978;15:311-18.
13. Bhargava SK, Banerjee SK, Chowdhury P, et al. A longitudinal study of morbidity and mortality patterns from birth to 6 years of age in infants of varying birth weight. Indian Pediatr 1979;16: 967-73.
14. Makhija K. Incidence of Low Birth Weight at Airforce Hospital, Jorhat 1975-84. Indian J Com Med 1987;12:69-75.
15. Singhal PK, Mathur GP, Mathur S, et al. Mortality pattern in Low Birth Weight babies in ICDS urban slum area. J Indian Med Assoc 1989;87:111-3.
16. Chen SJ, Gua NW, Wang PF, et al. Outcome for very low birth weight infants. Acta Paediatr Scand 1989;30:30-9.
17. Directorate of Health and Family Welfare. Status Report, 1989-90. Govt of Karnataka:India, 1991:33-43.
18. Ramaiah TJ, Narasimhan VL. Birth weight as a measure of prematurity and its relationship with certain maternal factors. Indian J Med Res 1967;55:513-24.