

ANTHROPOMETRIC INDICES, CORD LENGTH AND PLACENTAL WEIGHT IN NEWBORNS

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ABSTRACT

A study on the anthropometric indices of 3835 singleton newborn babies was conducted over a four months period at Sree Avittom Thirunal Hospital, Trivandrum. Of these, 1921 (50.1%) were male babies and 1914 (49.9%) were female babies. The majority of infants (43%) were born to the middle socio-economic groups and the mean birth weight of babies was high among the high-income groups. Five hundred and ninety six (15.5%) babies weighed less than 2500 g; of these 121 (20.2%) were preterm and 477 (79.8%) were full term. The prevalence of low birth weight (LBW) was high (22.0%) among the mothers aged between 15 and 19 years. There was a significant difference ($p < 0.001$) in the mean birth weight (BW) of term male and female babies but there was no significant differences in their body length, head circumference and cord length. The mean ponderal index of term newborn babies was 2.3 g/cm^3 . The mean placental weight of LBW term and preterm babies was less than that of the corresponding normal weight babies. The birth weight of babies was directly proportional to their placental weight.

Key words: Birth weight, Cord length, Head circumference, Low birth weight, Ponderal index.

Kerala stands foremost in literacy among the states in India with a literacy rate of 89.8% as against the all India average of 52.2%(1). According to 1991 census, the population of this state is 29.1 million with a growth rate of 1.3% and a population density of 749 persons per square km. The infant mortality rate which serves as a measure of the development and progress of a community, is lowest in Kerala(2).

The birth weight of a newborn is a significant determinant of neonatal and postnatal infant mortality(3). It is potentially a useful parameter for measurement of health during the vulnerable periods of life and serves as a useful indicator of health of the community because it is sensitive to environmental and socio-economic influences(4).

This study reports the distribution of birth weight; the prevalence of low birth weight (LBW); the relation of physical parameters to sex, socio-economic status and age of mothers; the placental weight and the ponderal index in a hospital population from Kerala.

Subjects and Methods

This study was conducted at the Department of Obstetrics and Gynecology, Sree Avittom Thirunal Hospital, Trivandrum. The records of 4078 delivery cases over a period from May 1993

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to August 1993 were analyzed retrospectively. The socio-economic classes were classified as: low income group (LIG)—monthly income below Rs. 200; middle income group (MIG)—monthly income between Rs. 200 and Rs. 500; and high income group (HIG)—monthly income above Rs. 500.

Of the 4078 deliveries, 3835 were singleton live births, 61 were twins, 93 were intrauterine deaths and 89 were high risk groups. The birth weight (BW), body length (BL), head circumference (HC), cord length (CL) and placental weight (PW) of all 3835 singleton liveborn babies were analyzed. The weight of the baby and the placental weight were taken using a portable single pan weighing balance (Libra, made in India, weighing to the nearest 50 g). The body length, head circumference and cord length were measured using a non-elastic cloth tape (1'cm/2). All the measurements were taken within 24 hours after birth.

The babies were classified into different groups according to their birth weight as laid down by the WHO(5). Babies weighing less than 2500 g at the time of birth were considered as LBW babies. The babies were also, classified as full term (gestation period from 37 completed weeks to less than 42 completed weeks) and as preterm (gestation less than 37 completed weeks). The data obtained were subjected to a computer based analysis to find, out the distribution of birth measurements to sex, the ponderal index(6) and the relative weight of placenta. The relative weight of placenta (RWP) was calculated as:

$$\frac{\text{Placental weight} \times 100}{\text{Weight of infant}}$$

The statistical analysis was carried out using student's 't' test(7)

Results

It was observed that of the 4078 delivery cases, 94% were live born single births, 1.5% were twin births, 2.2% were high risk groups and 2.3% were intra-uterine deaths.

Of the 3835 live born singleton babies, 1921 (50.1%) were males and 1914 (49.9%) were females. The mean birth weight of the babies was 2821 g \pm 479.8 (males = 2857 g \pm 497.1 and females = 2786 g \pm 455.7).

Among the 3835 live born single births, 125 babies (3.3%) were preterm and 3710 babies (96.7%) were full term. Five hundred and ninety six babies (15.5%) were low birth weight; of these 11.9% were between 2000-2499 g. Of the LBW babies, 121 (20.2%) were preterm and 477 (79.8%) were fullterm.

Relationship between birth weight and socio-economic' status of mothers: The classification of mothers based on their monthly income showed that greater number of mothers belonged to the middle income group (Table I). The prevalence of babies with birth weight \geq 2500 g. was high among the high income group (89.9%) and the prevalence of LBW babies was high among the low-income group (17.9%). Also the mean birth weight of babies showed an increase with the rise of socio-economic status of mothers. The mean birth weight of babies of the high income group was significantly greater ($p < 0.01$) when compared to that of the low and middle income groups (Table I).

TABLE I-Socio-Economic Status and Birth Weight

Socio-economic status (Rs/month)	Birth weight <2500 g (No.)	%	Birth weight ≥2500 g (No.)	%	Total	%	Mean birth weight (g)	SD	SE
LIG (<200)	236 (17.9)	6.38	1082 (82.1)	29.3	1318	35.6	2806.0	492.96	12.39
MIG (200-500)	259 (16.3)	7.00	1332 (83.7)	36.0	1591	43.0	2811.3	472.87	12.02
HIG (500)	80 (10.1)	2.16	709 (89.9)	19.2	789	21.3	2895.6*	441.34	19.09
Total (All classes)	575	15.54	3123	84.5	3698	100.0	2821.32	479.84	7.75

(Number of missing observations= 139); Figures in parenthesis indicate row percentages.

* p<0.01, compared to LIG and MIG

Relationship between birth weight and age of mothers: The prevalence of LBW babies was higher (22%) among the mothers aged between 15 and 19 years. As the age of mothers increased, there was a decrease (11.5%) in the prevalence of LBW babies, and an increase (88.5%) in the incidence of babies with birth weight ≥2500 g. The prevalence of babies with birth weight ≥2500 g was high among 35-39 year old mothers.

Relationship of sex of newborn to birth measurements: The mean birth weight, mean body length, mean head circumference and mean cord length of preterm and fullterm male and female babies are given in *Table II*. The mean birth weight of term male babies was 2905.2 g (SD 431.4) while that of female babies was 2819.7 g (SD 410.9) (p<0.001)

The mean body length of term male babies was 47.7 cm (SD 2.15) and that of term females was 47.6 cm (SD 2.31). The

mean head circumference was 32.37 cm (SD 1.63) in term males and 32.35 cm (SD 1.82) in term female babies (*Table II*). There was no significant difference (p>0.05) in these parameters between male and female babies.

The mean cord length of babies are given in *Table II*. The results showed that the full term male babies had a slightly longer cord length (50.8 cm ± 2.8) than term female babies (50.5 cm ± 3.2) but there was no significant difference (p>0.05) between their cord lengths.

Ponderal index of newborn babies: The mean ponderal index *Table III* of full term normal weight babies was 2.3 g/cm³ (SD 1.1) and that of fullterm LBW babies was 1.9 g/cm³ (SD 1.0). The mean ponderal index of preterm normal weight babies was 1.8 g/cm³ (SD 1.2) and that of preterm LBW babies was 1.4 g/cm³ (SD 1.1) respectively.

Relationship between placental weight and birth weight: The average weight of placenta of fullterm normal babies was 502.4 g (SD 43.3) and that of fullterm LBW babies was, 469.1 g (SD 55.8) (Table III). For preterm normal weight babies, the mean placental weight was 483.3 g (SD 28.9) and that of LBW preterm babies was 410.2 g (SD 101.3). In both low birth weight fullterm and pre-term babies, the mean placental weight was less than that of the normal weight term and preterm babies. The relative weight of placenta was greater in the case of fullterm and preterm LBW babies compared to that of the normal weight term and preterm babies (Table III).

Discussion

The present study showed that the prevalence of LBW babies was 15.5%.

Other studies indicate this value to range from 20% to 40% in India(8,9). Low birth weight is fairly common in India perhaps because of the widespread malnutrition in women, particularly during pregnancy. The National Health Policy has set a goal of bringing down the prevalence of LBW in India by 10%. The level of 15.5% in this report may be indicative of the improvement of maternal nutritional status and the health status of newborn babies in Kerala.

We also observed that the birth weight of babies was related to the socio-economic status, the age of mothers and sex. Our findings are in concordance with earlier reports (10-13).

However there was no significant difference in the mean body length and

TABLE II-Mean Birth Measurements in Relation to Sex

Sex	No.	Body weight (g)	SE	Body length (cm)	SE	Head circumference (cm)	SE	Cord length (cm)	SE
Fullterm									
male	1847	2905.2*	10.0	47.7	0.1	32.4	0.04	50.8	0.1
Pre term									
male	70	1685.0	53.2	44.4	0.6	30.3	0.5	48.0	0.7
Fullterm									
female	1856	2819.7	9.5	47.6	0.1	32.4	0.04	50.5	0.1
Preterm									
female	53	1718.9	45.7	44.8	0.5	31.1	0.7	48.9	0.9

(No. of missing observations = 9); * p<0.001, compared to fullterm female babies.

Mean head circumference of term male and female babies. These results are in agreement with earlier studies(14,15).

The mean ponderal index of LBW term (1.86 g/cm³) and LBW preterm babies (1.37 g/cm³) was less than that of

TABLE III—Placental Weight and Ponderal Index in Relation to Birth Weight

Group	No.	Mean birth weight (g)	SD	Mean placental weight (g)	SD	Relative weight of placenta (RWP)	Mean Ponderal Index (g/cm ³)	SD
Fullterm ≥2500 g	3230	2961.0	348.8	502.4	43.4	17.2	2.3	1.1
Fullterm <2500 g	473	2187.9	226.1	469.1	55.8	21.4	1.9	1.0
Preterm ≥2500 g	4	2625.0	250.0	483.3	28.9	19.3	1.8	1.2
Preterm <2500 g	121	1657.4	371.9	410.2	101.3	25.9	1.4	1.1

normal weight term (2.32 g/cm³) and preterm babies (1.78 g/cm³). Miller *et al.*(16) defined the limits of ponderal index as 2.00 and 3.00 for diagnosing under and overnutrition. Therefore our results show that the babies with ponderal index 2.32 g/cm³ are well nourished babies.

In both LBW fullterm and preterm babies, the placental weight was less than that of corresponding normal weight babies. Placenta has a very important role in the intrauterine development of the fetus. The low placental weight could be one reason for the observed low birth weight of babies. The relative weight of placenta (RWP) which has been used as the standard of placenta function, was greater in the case of fullterm and preterm LBW compared to that of normal weight term and preterm babies. The RWP was inversely proportional to the birth weight of newborn babies (*Table III*). Our results are in

agreement with the findings by Desai *et al.*(17).

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