# SOME FACTORS AFFECTING SIZE AT BIRTH OF SRI LANKANS

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Birth weights have been recorded in hospitals and maternity homes in Sri Lanka for more than half a century and several studies of these weights have been published since 1936.

Nicholls (1936) analysed the results obtained from a study at the De Soyza Maternity Hospital, Colombo ( DMH). Birth weights were recorded by the sister-in-charge of the delivery room, using a balance that was accurate to within less than half ounce. Birth weights were recorded to the nearest quarter pound. His results have been summarized in Table I. Mothers admitted to the "paying" wards were at a higher socio-economic level than those in the "non-paying" wards. Clearly, the socio-economic level of the mother has a significant influence on birth weight (Table 1) and on the "vitality" of the newborn ( Table 2).

A comparison of weights of British infants with those born in paying wards at the DMH showed Nicholls that "weights of newborn of both races are in much the same range".

A study of 837 consecutive births during a 7-month period at the same hospital 14 years later led Collumbine (1950) to stress that the factors leading to low birth weights are;

i. body weight of the mother, small women giving birth to small babies. Mothers weighing less than 36 kg. had infants with significantly smaller birth weights. Birth weight increases with maternal weight until the maternal weight is 59 kg; above 59 kg; there is no further increase in birth weight.

ii. age of mother, children born to teenagers were smaller than others. The influence of age is due to increase in parity with age. Among the primiparae there was no influence of age on birth weight.

iii. Nutritional status of the mother.

iv. Haemoglobin concentration of mother influenced birth weight only when the concentration was below 40%.

Eleven years later Abhayaratne and de Fonseka (1961) analysed the records of 595 births at the same hospital, which represented 50% of a sample of babies born after the 28th week of a norml pregnancy.

| | Males | Females |
|---|---|---|
| Mean period of gestation (days) | 282.13 | 284.71 |
| Mean birth weight in (kgs) | 2.94 | 2.9 |
| % less than 2.5 kg | 17.92 | 13.91 |

Soysa and Jayasuriya (1975) made a detailed study of 457 babies born in the University unit of the DMH during a 7 month period in 1971. Of the total of 1988 live births during the period 21% were less than 2.5 kg. The following are listed as being factors exerting a significant influence in birth weight:

i. Parity; no association of birth weight with maternal age independent of parity.

ii. Maternal height and weight

iii. Family income levels

iv. Nutritional status of the mother, if height and weight are considered indices of nutrition.

The above conclusions from studies at the DMH Colombo are supported by studies carried out at the General Hospital, Kandy. The results of a retrospective study are summarised in Table 3. Comparison of 746 infants born to mothers of high socio-economic status with 1522 infants of mothers of low socio-economic status shows that birth weight is greater in the former at all ages and parities ( Wikramanayake et al, 1977) Birth weight increased with parity in both groups. Birth weight increased with the age of mother in the upper socio-economic group.

Three prospective studies have been reported from non-paying wards of the General Hospital, Kandy. In the first (Wikramanayake et al, 1977) the size of 53 babies and placentae have been compared with results by Laga et al, (1974) reported from Boston and Gautamala (Table 4). Birth weight is lowest in the Kandy series as is to be expected from the smaller size of the mothers. The placentae are also smaller but the ratio, placental weight to birth weight is the same in Sri Lanka and in Boston. Comparison of 23 feto-placental units from women whose family income was less than Rs.230/- per month with the other 30 showed no significant different in birth weights, placental size of the placental/ fetal weight ratios. Thus, the variations in birth weights in widely different population groups is not present in the lower percentiles, and agreement among the tenth percentile is good partly because there is a lower absolute limit to birth weight ( Battaglia, et al 1966, 1967)

The relationship between immunoglobins of cord blood and placental birth weights have been investigated ( Dissanayake, et al 1976) in 61 women admitted to the non-paying delivery room at the general Hospital, Kandy. Although a direct correlation of cord blood Ig G content with either placental weight or birth weight was not observed, lower and higher placental weights were found to be associated with lower and higher values for cord Ig G, respectively In cases where Ig M was detected, birth weight was lower than in those without detectable IgM in cord blood.

De Silva et al (1978) studied 294 neonates born in the "non-paying" delivery room of the General Hospital, Kandy. The mean birth weight was 2.703 ± 0.415 kg. Estimating gestational age from the LRMP, the births were classified into 4 groups:-

Group 1. those born 15 or more days before the expected date ( pre-term 1)

Group 2. those born 0-15 days before the expected date ( pre-term 2)

Group 3. those born on the expected date ( term)

Group 4 those born after the expected date (post term)

Only in the groups 1 and 4 were the mean birth weight for each group significantly different from the mean for the whole series. However, when the infants were classified according to the Ig M, content of their cord blood, birth weight was higher in those with less than 10 IU/ml Ig M than in those with higher Ig M values. Elevated levels of cord Ig M are indicative of intrauterine infection. Intrauterine infection affects neonatal thyroid function adversely (de Silva 1980, de Silva et al 1980)

De Silva (1980) studied the effect of intra-uterine infection on neonatal thyroid function. Intra-uterine infection was diagnosed by estimating the Ig M level of cord blood.

Maternal data ( n=294)

| | | | | | |
|---|---|---|---|---|---|
| Age | 27.9 | ± | 5.6 | range | (16-43) |
| Parity | 3.4 | ± | 2.4 | range | (1 - 8 ) |

Neonatal data (n=294)

| | | | | | |
|---|---|---|---|---|---|
| Estimated age weeks | 39.60 | ± | 1.53 | range | (36.4-42.5) |
| Birth weight kgs. | 2.70 | ± | 0.42 | range | (1.80-3.65) |

Elevated Ig M (> 20 IU/ml) levels were seen in 11.5% of the subjects. In previous study at the same hospital (GHK) the value was 15% ( Dissanayake et al 1976) which could be compared with figures ranging from 6 to 48%in Latin America and about 5% from developed countries.

Raised levels of IgM were accompanied by raised levels of $T_3$ and TSH, with no significant charge in T4 levels. De Silva concludes that intra -uterine infection probably affects fetal Thyroid function, although no obvious clinical signs of altered thyroid function were noticed in the neonates, or in 6 babies seen 6 months after birth.

Antibodies to thyroid microsomal antigen were found in 9 out of the 24 neonates with elevated Ig M levels. In 2 of these, thyroid microsomal antibodies were not seen in the corresponding mother's serum, suggesting a fetal auto-immune response to thyroid microsomal antigen.

All the studies referred to above have been on patients attending two teaching hospitals in two of the major cities in the country. Tables 5 and 6 shows the weights of babies delivered in two deprived districts, Hambantota and Vavuniya, during a 2½ year period. There are no qualified obstetricians or paediatricians in these districts. Qualified doctors are attached to district and Base hospitals. Midwives who attend to deliveries at other institutions manage only pregnancies they consider to be "normal" Mothers with any complications are referred to the District or Base Hospital. The percentage of low birth weight babies is small in Maternity Homes and Rural Hospitals. Even in the District and Base Hospitals less low birth weight babies are born than in the two Teaching Hospitals mentioned earlier.

In summary, the following factors have been reported as having an influence on the size at birth of Sri Lankans:

1. Socio-economic status ( Nicholls, 1936 Cullumbine 1950 Soysa and Jayasuriya 1975, Wikramanayake et al 1977; Wimalawansa and Wikramanayake, 1987).

2. Parity ( Cullumbine 1950; Soysa and Jayasuriya 1975; Wickramanayake et al 1977)

3. Maternal height and weight ( Cullumbine 1950; Soysa and Jayasuriya 1975; Wimalawansa and Wikramanayake, 1987)

4. educational level of mother ( Wimalawansa and Wikramanayake 1987)

5. weight gain during pregnancy and nutritional status of mother ( Wimalawansa and Wikramanayake 1987)

6. intra-uterine infection ( Dissanayake et al 1976) de Silva et al 1977; de Silva 1980, de Silva et al 1980)

Table I. Relationship between birth weight and socio-economic Status of mother ( from Nicholls - 1936)

| Delivery room | Birth weight | | | | % below 2.5 kg | |
|---|---|---|---|---|---|---|
| | Males | | Females | | Males | Females |
| | n | kg | n | kg | | |
| Non-paying | 564 | 2.79 (0.91-4.55) | 467 | 2.75 (0.91-4.09) | 21.79 | 21.81 |
| Paying | 110 | 3.20 (2.05-4.32) | 106 | 3.08 (1.82-4.55) | 5.44 | 12.25 |

Table 2. Relation of "vitality" of children at birth & socio-economic status (Nicholls, 1936 ).

| Weight of infant kg. | Vitality | Non-paying wards % | | Paying wards % | |
|---|---|---|---|---|---|
| 1.82 | very low | 11.8 ) 24.4 ) | 36.4 | 2.8 ) 11.1 ) | 13.8 |
| 2.95 | fair | 35.3 | | 24.3 | |
| 3.41 | normal | 21.1 ) | 27.2 | 37.5 ) | 62.0 |
| 3.63 | high | 6.1 ) | | 24.5 ) | |

Table 3. **Birth weight in kg of boys and girls born to mothers of high and low socio-economic status**
( from Wickramanayake et at 1977)

| Delivery room | Males | | Females | |
|---|---|---|---|---|
| | n | Birth weight | n | Birth weight |
| Non-paying | 766 | 2.720 ± 0,718 | 756 | 2.651 ± 0.661 |
| Paying | 411 | 3.030 ± 0.446 | 335 | 2.992 ± 0.531 |

Table 4. Maternal, fetal and placental data (summarised from Wikramanayake et al, 1977).

| Parameter | | Kandy | Boston | Guatemala |
|---|---|---|---|---|
| Maternal | | | | |
| | n | 53 | 18 | 20 |
| | Age, years | 27.9 (5.17) | 23.9 (1.28) | 25.0 (1.18) |
| | Weight, lbs | 108.1 (11.04) | 151.5 (6.46) | 127.9 (1.68) |
| | Parity | 3.37 (1.89) | 1.82 (0.33) | 1.78 (0.46) |
| Fetal | Gestational age, weeks | 39.2 (4.5) | 39.7 (0.30) | 38.6 (0.4) |
| | Birth weight, g | 2739 (418) | 3412 (150) | 3005 (337) |
| | Birth length, cm | 50.6 (5.72) | 49.8 (0.3) | 47.4 (1.0) |
| Placental | | | | |
| | Weight, g | 377.4 (81.2) | 469.0 (18.5) | |
| | Volume, ml | 369.8 (81.3) | 448.0 (18.0) | |
| | Placental weight/ birth weight | 0.137 (0.19) | 0.137 | |

S. D within brackets.

Table 5. A survey of deliveries in maternity homes and maternity wards of hospitals in the Hambantota District during 1977, 1978 and 1979 (6 months), from Wikramanayake (1980 a)

| Institution | Total deliveries 1977 | 1978 | 1979 | Still births 1977 | 1978 | 1979 | % less than 2.5 kg 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|---|---|---|
| DH, Tangalla | 1285 | 1377 | 750 | 37 | 44 | 21 | 21.5 | 20.3 | 15.9 |
| RH, Ranna | 338 | 428 | 223 | 2 | 3 | 1 | 19.8 | 19.4 | 13.0 |
| PU, Angunukolapelessa | 179 | 297 | 180 | 5 | 4 | 9 | 2.8 | 13.5 | 9.4 |
| RH, Beliatta | 372 | 504 | 372 | 1 | 4 | 1 | 5.1 | 6.0 | 0 |
| MH, Kakuruwela | 18 | 12 | 22 | na | na | na | 11.1 | 16.7 | 13.6 |
| MH, Palatuduwa | 7 | 12 | 13 | 1 | 0 | na | na | na | na |
| MH, Getamanna | 144 | 121 | 49 | na | na | na | 7.6 | 4.1 | 10. |
| MH, Nakulugamuwa | 9 | 12 | 16 | na | na | na | 0 | 25.0 | 18. |
| DH, Walasmulla | 1336 | 1535 | 647 | 20 | 44 | 9 | 14.1 | 13.2 | 6. |
| MH, Weeraketiya | 321 | 714 | 400 | 0 | 2 | 1 | 0.3 | 0 | 0. |
| RH, Kirama | 145 | 239 | 113 | na | na | na | 14.5 | 15.9 | 11. |
| MH, Middeniya | 134 | 162 | 98 | 1 | 0 | 0 | 0 | 0.6 | 4. |
| PU, Katuwana | 355 | 459 | 298 | 4 | 8 | 3 | 6.5 | 7.2 | 6. |
| MH, Beligalle | 31 | 7 | 6 | 0 | 0 | 0 | 3.2 | 14.3 | 0 |
| DH, Hambantota | 817 | 922 | 451 | 47 | 56 | 19 | 16.3 | 16.1 | 10. |
| DH, Tissa | 1300 | 1283 | 616 | 30 | 22 | 10 | 12.8 | 7.8 | 8. |
| PU, Ambalantota | 578 | 757 | 377 | 12 | 7 | 1 | 8.3 | 6.3 | 6. |
| RH, Mseegahajandura | 63 | 88 | 37 | na | na | 0 | na | na | 8. |
| MH, Uduwila | 55 | 31 | 11 | na | na | na | na | na | na |
| PU, Beragama | na | 41 | 10 | na | na | 0 | na | na | 20. |

DH = District Hospital, RH = Rural Hospital, PU = Peripheral Unit
MH = Maternity Home Na = Not available

Table 6. Deliveries in maternity wards in the Vavuniya District during 1978, 1979 and first quarter of 1980 ( Wikramanayake 1980 b )

| Institution | Total deliveries | | | Still births | | | % less than 2.5 k | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1978 | 1979 | 1980 | 1978 | 1979 | 1980 | 1978 | 1979 | 1980 |
| BH, Vavuniya | 1543 | 1705 | 400 | 36 | 37 | 11 | 11.9 | 12.8 | 17.4 |
| MH, Poovarasankulam | 209 | 212 | 50 | na | na | na | na | na | na |
| MH, Pavakkulam | na | 163 | 21 | na | 0 | 0 | na | 11.0 | 19.0 |
| RH, Cheddikulam | 264 | 409 | 54 | 2 | 10 | 0 | 14.1 | 7.0 | 24.0 |
| MH, Nedunkerney | 170 | 197 | 68 | na | 2 | 1 | na | na | na |

BH = Base Hospital, MH = Maternity Home

RH = Rural Hospital na = Not available

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