

GROWTH OF TERM INFANTS DURING NEONATAL PERIOD

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ABSTRACT

One hundred and seventy two healthy term (T) appropriate-for-dates (AFD) singleton neonates were prospectively studied from birth until 28 days of age for changes in weight, occipito-frontal circumference (OFC), chest circumference (CC), midarm circumference (MAC), thigh circumference (TC) and crownheel length (CHL). Male babies had statistically significant ($p < 0.05$) higher values than females for weight, OFC, CC and CHL at birth and for all the six parameters at 28 days. The mean loss of weight during the first 72 hours was 120 g and 140 g and the mean gain in weight at 28 days was 640g and 520 g for males and females, respectively. After an initial decrease, OFC, CC and TC showed a mean growth of 1.9 cm and 1.9 cm, 1.4 cm and 1.1 cm and 0.9 cm and 0.7 cm in males and females, respectively by 28 days. By that age CHL showed a mean growth of 3.2 cm in males and 3.0 cm in females. Although both groups after an initial decrease in MAC, had started showing growth by 2nd week, female babies fell short by 0.1 cm of mean birth values by 28 days while males had a mean growth of 0.1 cm.

Keywords: Neonatal growth, Anthropometric variables.

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The growth of an infant depends to a large extent on its birth weight and gestation. A few studies have been carried out to measure growth of term (T) appropriate-for-dates (AFD) babies during early neonatal period (birth to 7-10 days of age)(1), but there is hardly any information available on growth throughout the neonatal period. This prospective study was undertaken to study changes in birth weight and other anthropometric parameters during first 28 days of life in T AFD neonates.

Material and Methods

Two hundred and fifteen T AFD neonates born at Rajindra Hospital, Patiala, Punjab during January to April 1991 were selected for the study after obtaining informed parental consent. For the final analysis, 172 neonates were retained, omitting dropouts and those who developed significant morbidity during the study period. Gestational age was estimated from last day of menstrual period and confirmed by physical* and neurological criteria(2). All the infants were AFD (between 10th to 90th percentiles) on intrauterine growth curves for north Indian infants(3). All the measurements were carried out by the same person and with the same set of instruments to eliminate interpersonal and inter-instrumental errors. All the measurements were taken in the anteroom of the nursery, six times during neonatal period, *i.e.*, within the first 24 hours of birth and at the completion of 72 hours, first, second, third and fourth weeks of life.

Neonates were weighed nude on a lever-actuated scale to the nearest 20 g. Supine crownheel length (CHL) was recorded to the nearest of 0.1 cm on an infantometer with baby supine, knees fully extended and soles of feet held firmly

against the footboard and head touching fixed board. Occipitofrontal circumference (OFC) was measured by passing fibreglass tape around the glabella anteriorly, opisthocranium on the occiput posteriorly and just over the ears laterally. Care was taken to ensure that the tape passed around the head at the same level on each side. Chest circumference (CC) was measured at the level of xiphisternum by the fibreglass tape to the nearest of 0.1 cm. The measurement was taken during quiet respiration with tape applied in such a manner as to permit skin contact without compression of underlying tissues. Midarm circumference (MAC) was measured at a point halfway down left arm between tip of acromion and olecranon to the nearest of 0.1 cm. Thigh circumference (TC) was measured using left thigh with the neonate supine. The tape was placed perpendicular to the long axis of the lower limb with its top edge just under the gluteal fold(4).

The infants were offered first feed within 6 hours of birth. The mothers were encouraged to breast feed their babies. In the event of additional formula feeding, Lactogen (R), and/or buffalo's/cow's milk were used. The babies were offered feeds *ad-libitum* except in the babies who were kept in the nursery and given feeds at the rate of 60-180 ml/kg/day at 2 hourly intervals of Lactogen (R)₁(5).

Most of the mothers who delivered vaginally stayed in the hospital for 2-4 days, while those who had a lower segment cesarean section stayed for about 2-3 weeks. On discharge from the hospital, mothers were given next date of hospital visit on the discharge cards of their babies. Those who could/did not report within one day of the due date were dropped from the study.

The mean and the standard deviation

of the parameters were calculated for all the variables studied. The postnatal mean values and the per cent increase over the birth values was obtained. Statistical methods included computation of means, standard deviations and 't' test. All the tests were done with the help of computer PC/XT at Chandigarh Computer Centre Leela Bhawan, Patiala.

Results

Eighty six males and an equal number of females comprised our study of 172 babies.

The mean (SD) for weight, CHL, OFC, CC, MAC and TC at birth and 28 days of life are presented in *Table I*. Weight, CHL, OFC, and CC at birth had statistically significant ($p < 0.05$) higher values in males as compared to female babies while all the six parameters had statistically higher values in males compared to females at 28 days; the data is, therefore, presented for males and females separately.

Discussion

Male babies had statistically significant ($p < 0.05$) higher values at birth for weight, OFC, CHL and CC than their female counterparts. At 28 days all the six parameters showed significantly higher ($p < 0.05$) values in males compared to those in females. This finding is different from the study of Singhi, *et al.*(1) who found no significant sex related difference in weight and CHL at birth. However, they found that the mean OFC was about 4-5 mm higher in boys compared to in girls ($p < 0.05$), in comparison to the difference (9 mm) in the present study. The mean difference between OFC and CC in our study was 2.2 cm at birth. Ghai(6) and Malina *et al.*(7) found this difference to be about 3 cm and 2.5 cm, respectively.

TABLE I—Mean (SD) for Anthropometric Parameters at Birth and 28 Days

Parameter	At birth		At 28 days	
	Males	Females	Males	Females
Weight (g)	2940(300)	2800(340)**	3580(380)	3320(400)***
CHL (cm)	48.6(1.6)	47.4(1.7)***	51.7(1.9)	50.4(1.8)***
OFC (cm)	34.3(1.5)	33.4(1.2)***	36.1(1.1)	35.3(1.1)***
CC (cm)	31.9(1.4)	31.4(1.6)*	33.3(1.6)	32.5(1.5)**
MAC (cm)	9.8(0.7)	9.6(0.7)	9.9(0.6)	9.5(1.1)**
TC (cm)	16.2(1.0)	15.9(1.3)	17.0(1.3)	16.6(1.3)*

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

During the first week of life, weight loss upto 15% occurs normally as a result of loss of extracellular water and tissue catabolism. Small infants lose a larger fraction of their weight, presumably because of their relatively larger extracellular water and more negative protein and energy balance. Thus, a 0.75 kg infant may lose upto 20% of its birthweight while a 3 kg infant will lose about 5%(8). The mean weight loss during the first 72 hours in our babies was 4.2% of birth weight(8). This is similar to observations of Singhi *et al.*(1). Rudolph, *et al.*(9) and Ghai(6) however, have mentioned a 5% to 10% and about 10% loss, respectively during the first few days of life.

After 72 hours, the mean weight started increasing in our study and did not reach the mean birth weight by one week of age but had crossed it by two weeks. Our observations are in consonance with those of Rudolph, *et al.*(9) and Ghai(6).

Kumari *et al.* (10) reported a weight gain of 25.1% by one month of age. This is higher than our observation of 18.2% by 28 days of life. Rudolph, *et al.*(11), Avery(12) and Ghai(6) have mentioned 600 g, 450 to 900 g and 750 to 900 g, respectively as the

expected weight gain during the first month of life. These different values may be due to different gestational ages, birth weights, feeding practices, socio-economic, geographical and racial factors in the various studies.

Male babies had an initial decrease in OFC during first 72 hours. This is similar to findings of DeSouza, *et al.* (13) and Singhi, *et al.*(1). Both male and female babies had an initial decrease in mean CC (1.0% and 0.7%) and TC (4.1% and 4.1%). After extensive review of literature, we could not find a study to compare our observations of postnatal decrease in CC and TC.

The MAC regained the birth value by about 28th day of life. It was significantly correlated with birth weight in both males ($r=0.8078$) and females ($r=0.7677$). This is similar to observations of Man Mohan, *et al.* ($r=0.808$)(14). After an initial decrease, MAC showed positive growth by second week in both males and females. In males MAC at 28 days (9.9 ± 0.6) had crossed mean birth value (9.8 ± 0.7) while at that age it just fell short (9.5 ± 1.1) of

mean birth value (9.6 ± 0.7) in females. An extensive review of literature did not yield a study to compare our MAC values at 28 days.

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