Skinfold Thickness of New Born Infants and its Correlation to Gestational Age and Birth Weight

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Introduction

For nutritional assessement of the newborn the commonly used measurements are birth weight, length and head circumference. The other less commonly used measurements are head length and breadth, chest circumference, sitting height (crown rump), bi-acromial and bi-cristal diameter, foot length, mid-arm circumference and skinfold thickness[1].

Standard reference data for anthropometric measurements are not available for Bangladeshi children. On the other hand, the available information on anthropometric studies of new born is mostly confined to birth weight only[2].

The skin of premature babies is thin and gelatinous while that of a fullterm baby is comparatively thicker. This difference is due to the amount of subcutaneous tissue is which mainly laid down during the last two months of intrauterine life[3].

Measurement of skinfold thickness with a standard caliper is the simplest and easiest method for estimation of body fat and the only method suitable for a field study. Skinfold thickness are measured at: a) the mid arm over the biceps and the triceps so that skinfold is parallel with the long axis of the arm; b) subscapular skinfold immediately below the inferior angle of the scapula; c) abdominal skinfold parallel to the long axis of the body; and d) from supra-iliac skinfolds[4].

Studies on skinfold thickness of adults or new borns are exceptionally few in Bangladesh. The main objective of this study was to determine the skinfold thickness of new born babies and try to establish its relationship with their birth weight and gestational age. This could be helpful in developing a parameter for determining the nutritional status at birth and assessing post-natal growth of full term and pre-term babies.

Materials and Methods

This prospective cross-sectional study was conducted at the obstetrics ward of Dhaka Medical College Hospital, Dhaka from 4th February 1987 to 31st March 1987. The study population was 162 new born babies who were examined within 24 hours

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of their birth during the study period. A carefully designed interview schedule, length tape, weighing machine, skin pencil and Harpenden skinfold caliper were used to collect the data.

On every visiting day, first of all, the list of the babies born within the last 24 hours was taken from the baby room. Skinfold thickness was measured within 24 hours of birth with the help of a Harpenden skin fold caliper with the infant lying prone. The distance between the jaws of the caliper were read directly from the dial within a few seconds. Measurements did not cause any undue discomfort to the babies.

The gestational age of the new born was assessed in completed weeks from the interval between the first day of the last menstrual period (LMP) and delivery of the baby. Those having a doubtful history about the LMP and those with twin pregnancies were excluded from the study. Birth weight of the new born babies was recorded by the nurse just after delivery and was verified by one of the authors.

Results

A total of 162 new borns who fulfilled the selection criteria were included in this study. All the selected mothers were from a low socio-economic background, with practically no formal schooling and having poor nutritional status. No difference was observed for such variables as mothers' gravida, nutritional status, and level of education.

Out of 162 cases, 81 (50%) were males and 81 (50%) were females. As many as 79 babies (48.77%) had birth weights below 2500 gm, and only 8 (4.94%) were in between 3501 and 4000 gm (Table 1). The mean birth weight for males and females were 2647.19±588.7 gm and 2673.86±445 gm respectively. The mean birth weight for both sexes combined was 2660.53±518 gm. It was noticed that female new born babies were slightly heavier than the male new borns (Table 1).

Table 1. Birth weight of new borns by sex

SEX (N)	BIRTH WEIGHT (IN GRAMS)						Mean
	1500	1501-2000	2001-2500	2501-3000	3001-3500	3501-4000	(gm)
Male (81)	1 (0.62)	11 (6.79)	25 (15.43)	25 (15.43)	14 (8.64)	5 (3.09)	2647.19 (50.0)
Female (81)	1 (0.62)	4 (2.47)	37 (22.84)	26 (16.04)	10 (6.17)	3 (1.85)	2673.86 (50.0)
Combined (162)	2 (1.24)	15 (9.26)	62 (38.27)	51 (31.48)	24 (14.81)	8 (4.94)	2660.53 (100.0)
Cumulative Percentage	1.24	10.50	48.77	80.25	95.06	100	

Fig. in parenthesis indicate percentages

Table 2. Duration of pregnancy by birth weight and skinfold thickness

Duration of pregnancy (wks)	BIRTH WEIGHT (gm))						Total	Mean weight (gms)	Mean skin fold thickness (mm)
	1500	1501-2000	2001-2500	2501-3000	3001-3500	3501-4000			
29-32	0	2	0	0	0	0	2	1782.0	2.90
	(0)	(100)	(0)	(0)	(0)	(0)	(100)		
33-36	1	1	5	2	1	0	10	2394.8	3.08
	(10)	(10)	(50)	(20)	(10)	(0)	(100)		
37-40	1	9	46	31	11	6	104	2572.8	3.77
	(0.96)	(8.65)	(44.23)	(29.81)	(10.58)	(5.77)	(100)		
40+	0	3	11	18	12	2	46	2830.2	3.85
	(0)	(6.52)	(23.91)	(39.13)	(26.09)	(4.35)	(100)		

Fig. in parenthesis indicate percentages

Majority of the babies (64.2%) were bron within 37-40 weeks of gestation. Next frequent duration of gestation was 41 weeks or above (Table 2). It was noticed that birth weight increased with an increase in the duration of pregnancy (Figure 1). It was also observed that with the increase of gestational age there was an increase in skinfold thickness in the new borns, i.e., there was a direct relationship of gestational age with the skin-fold thickness of new borns (Table 2).

Out of 162 cases, the lowest mean skinfold thickness for both sexes combined was 1.78 mm and the maximum was 6.63 mm. The mean skinfold thickness for all male, female and both sexes combined were 3.71±1.1 mm, 3.76±0.9 mm and 3.73 ± .02 mm respectively (table 3).

Table 3. Mean skinfold thickness of newborn infants by sex

SEX (in mm)	MEAN SKINFOLD THICKNESS (OF TRICEPS) OF NEW BORN INFANTS						
(n)	1-2	2-3	3-4	4-5	5-6	6-7	Mean
Male	1.83	2.66	3.68	4.52	5.51	6.70	3.71
(81)	(7)	(18)	(29)	(17)	(9)	(1)	(81)
Female	1.60	2.78	3.43	4.56	5.4	6.60	3.76
(81)	(2)	(16)	(36)	(18)	(7)	(2)	(81)
Combined	1.78	2.71	3.54	4.54	5.46	6.63	3.73
(162)	(9)	(34)	(65)	(35)	(16)	(3)	(162)

Fig. in parenthesis indicates number of infants

Table 4. Mean skinfold thickness (in mm) by birth weight and sex

Birth weight (gms)	Mean skinfold thickness of triceps (mm)	
	Male (n)	Female (n)
≤1500	2.2 (1)	1.2 (1)
1501-2000	2.9 (11)	2.8 (4)
2001-2500	2.9 (25)	3.4 (36)
2501-3000	3.9 (25)	4.0 (27)
3001-3500	4.7 (15)	4.6 (10)
3501-4000	4.7 (4)	4.9 (3)

Table 5. Mean skinfold thickness of newborns by sex and period of gestation

Period of gestation (wks)	Mean triceps thickness (mm)		
	Male (n)	Female (n)	Combined (n)
Preterm (upto 36 wks)	3.14 (7)	2.92 (5)	3.05 (12)
Term (37-41 wks)	3.76 (60)	3.84 (66)	3.80 (126)
41± wks	3.79 (14)	3.76 (10)	3.78 (24)

When skinfold thickness was compared to birth weight (Table-4) the skinfold thickness at a very low birth weight i.e. < 1500 gm) was observed to be higher in the males (2.2 mm) than in the females (1.2 mm). But later, with every 500 gm increase in birth weight, increment of skinfold thickness was remarkable in the female infants. This is shown in figure 2 and table 4.

The skinfold thickness of preterm infants was quite low especially in the females. However, there was very little difference in the skinfold thickness for both the sexes once they reached the full term (table 5).

Discussion

The mean birth weight of the new born babies in this study was 2660.53±518 gm. The birth weights of males and females were 2647.19±588 gm and 2673.86±445 gm respectively (Table-1). In Bangladesh, Khan et al. (1978) found the mean birth weight of 1002 full term male & female babies to be 2574±476 gm and 2281±411 gm respectively which is slightly lower than that of this study. Rowshan et al. (1978)[5] showed the mean birth weight for 100 live new born babies to be 2560 gm which is also slightly lower than that of the present study. Rahman et al. (1983)[6] observed the mean birth weight of babies born in Holy Family Hospital, Dhaka to be 2800 gms and that in Azimpur Maternity Centre, Dhaka to be 2630 gm. The present study coincides with the results from Azimpur Maternity

Centre. Some workers in India found the birth weight of new born babies ranging between 2494 to 2850 gm[7]. The observation in the present study is also close to the Indian study.

Mean birth weight for the babies having gestational periods of 29-32 weeks, 33-36 weeks, 37-40 weeks and those above 40 weeks were 1782.0 gm, 2394.8 gm, 2572.8 gm and 2830.2 gm, respectively (Table-2). It indicates that birth weight increases with increase in the duration of pregnancy. The findings of Das et al.[8] and Dey[9] are also similar.

All the low birth weights in the study were found to occur in the babies having gestational period of 29-32 weeks. The rate of low birth weights decreased with the increase in the duration of pregnancy (Table 2). It means that birth weight of new born babies has a direct relationship with the gestational age which coincides with the studies of Puri et al.[10] and Vaucher et al.[11] In this study the incidence of low birth weight was found to be 48.77 percent. In a previous study[12] done in 1977, the incidence of low birth weight was only 14.47%. This was observed as 34.6% in 1983[6] and 36.06% in the study of Dey (1984)[9]. Higher percentage of low birth weight in this study only indicates a chronic deprivation over time of maternal nutrition, low Socio-economic condition and poor ante-natal care during early age.

The present study shows that the skin fold thickness increased with an increase in birth weight (Table 4). A relationship however weak, could be established in the study between the gestational age and the skinfold thickness of new born babies (Table 5). In their studies, Oakley et al.[13] Farr[14], Gamples[15], and Brans et al.[16] also found skinfold thickness to be weakly correlated with gestational age. The mean skinfold thickness of American[11] and Indian[10] new born babies were 3.7±0.8 mm (male), 3.7±0.9 mm (female) nd 3.53 mm (male) and 3.86 mm (female), respectively. Both the studies are almost indentical to the present study. There was a significant difference in the skinfold thickness of preterm & full term babies (Table-5). This is in accordance with the observations of Puri et al.[10]

In most reports full term female neonates were noted to have greater absolute values for skinfold thickness although only Oakley et al.[13] was able to show a statistically significant difference between the sexes. The present study also showed similar results. Full term female new borns were noted to have a slightly greater skinfold thickness.

Conclusion

The norms of average birth weight and anthropometry are different for different regions due to varied socio-economic and geographic conditions. Studies on skinfold thickness and its correlation with birth weight and gestational age are exceptionally few in Bangladesh. The present study, on

both preterm, full term as well as post term new born babies in the hospital, may not reflect the characteristics of the whole population. If only a large number of full term babies could be studied from different areas of Bangladesh, a standard skinfold thickness of new borns could be prepared. Further studies and research in this field is thus necessary to establish the findings of this study and suggest a correlate or regression value for gestational age against skinfold thickness of new born baby and birth weight.

Summary

This study was conducted in the obstetrics ward of Dhaka Medical College Hospital, Dhaka form 4th February 1987 to 31st March 1987 to study the skinfold thickness of new born infants and determine its correlation, if any, to gestational age and birth weight.

Among the 162 babies born during the study period, 81 were males and 81 were femles. Their mean birth weight was 2647.19±588.7 gm and 2673.86±445 gm, respectively. The mean birth weight for both sexes combined was 2660.53±518 gm. Female babies were found to be slightly heavier. The skinfold thickness of male, female and both sexes combined were 3.71±1.1 mm, 3.76±0.9 mm and 3.73±1.02 mm respectively.

The percentage of new born infants having low birth weight (i.e., below 2500 gm) was 48.77.

A direct relationship between skinfold thickness at birth and birth weight was found. A direct relationship between skinfold thickness at birth and gestational age could also be established in this study.

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