MEASUREMENT OF NEONATAL SKINFOLD THICKNESS–IS IT OF ANY CLINICAL RELEVANCE ?

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ABSTRACT

The skinfold thickness (SFT) was measured in 750 Punjabi newborns at triceps and subscapular sites using a Harpenden's Caliper. It was correlated with various maternal and neonatal factors. SFT increased with increasing gestation but showed a decline after 40 weeks. There was a positive correlation of SFT with birth weight and length of the baby in both sexes. The correlation co-efficient for all these parameters was 0.9. The female babies had a higher SFT at all weight and length groups. Increasing maternal age, parity, weight and height all influenced the neonatal SFT positively. Mothers with higher SFT produced babies with more skinfold thickness. Similar relationship was observed between birth weight and these maternal factors. While severe pre-eclampsia and eclampsia led to a significant fall in SFT, hypertension alone did not affect it. A higher than normal SFT was seen among infants of diabetic mothers. It was concluded that the SFT does not give any additional information than that provided by the commonly measured parameters like birth weight and length.

Key words: *New born, Skinfold thickness.*

Skinfold thickness (SFT) taken at various sites on the body is used widely as a measure of subcutaneous tissues. It is reported to be of clinical significance in neonatology as it sheds light on the intrauterine nutrition of the fetus(1). As intrauterine growth is closely dependent upon the mother's health, neonatal SFT is likely to be influenced by various maternal factors. There have also been reports suggesting that measurement of SFT may be useful in picking up growth retarded babies at risk for hypothermia and hypoglycemia(2-4). There have been few studies on neonatal SFT in India. The present study was undertaken to assess the SFT of Punjabi newborns, to correlate it with various maternal and neonatal factors, and to evaluate the predictive value, if any, of SFT in high risk babies.

Material and Methods

A prospective study was conducted on 750 newborns delivered consecutively at Christian Medical College and Hospital, Ludhiana. Maternal history including any complications in the antenatal period, *viz.*, pre-eclampsia, eclampsia, hypertension, diabetes and anemia were recorded. The weight and height along with SFT at triceps of the mother were measured.

The newborns were weighed soon after birth and classified as small, appropriate or large for gestational age using the weight chart of Singh *et al.*(5). Length was meas-

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ured on an infantometer. The gestational age was assessed from the last menstrual period of the mother. In case of a doubt, the Dubowitz Scoring System was used(6). SFT measurements were made at Triceps and Subscapular sites within 48 hours of birth, using a Harpenden's Caliper. The results were statistically evaluated for correlation co-efficient, linear regression curves and p value.

Results

Of 750 babies, 55% were males. Preterms constituted 14.5% of the total cases. The SFT increased progressively with increase in gestational age, reaching a maximum at 40 weeks after which there was a decline (Correlation co-efficient r = 0.9) (*Fig. 1*).

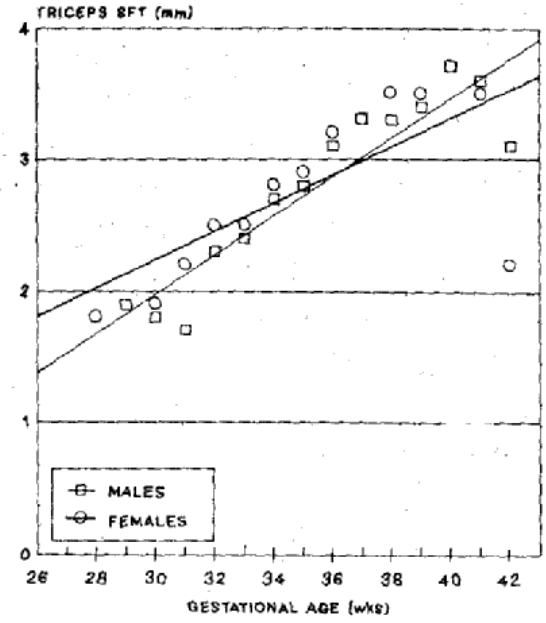

Fig. 1. Correlation of Triceps SFT with Gestation.

As shown in *Fig. 2*, there was an increase in SFT with increasing birth weight in both sexes. In all the weight groups, female babies showed a higher SFT than males, the difference being more marked among higher weight groups. The correlation co-efficient for SFT and birth weight

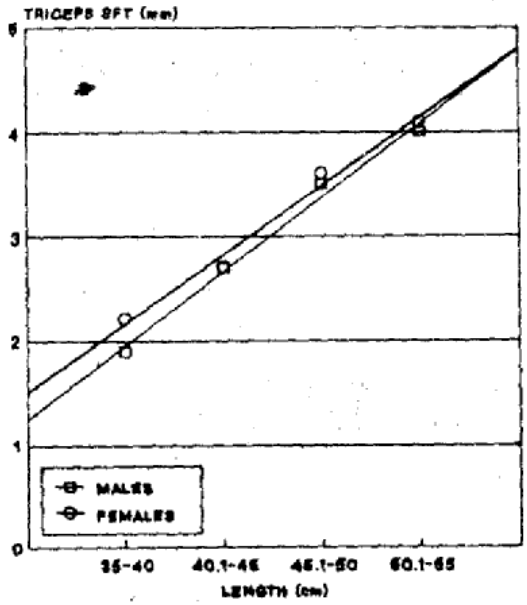

Fig. 2 (a). Correction of Triceps SFT with length.

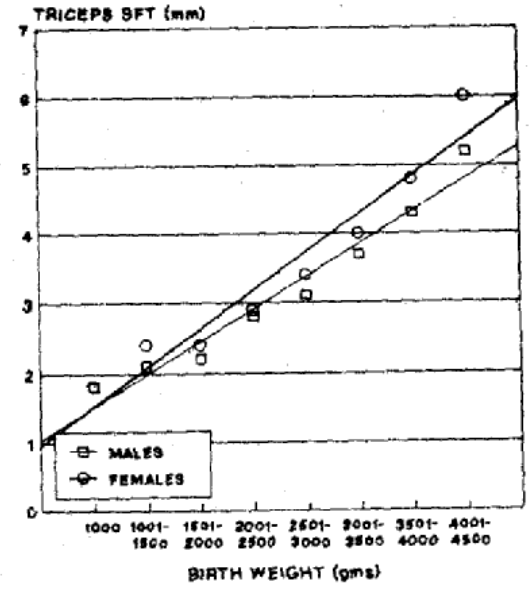

Fig. 2 (b). Correlation of triceps SFT with birth weight.

was 0.9. Similar relationship was observed with the length of the baby.

SFT was less for SGA babies at all gestations though even amongst them it increased progressively with gestation (*Table I*). It was also observed that at the same gestation, as the birth weight increased SFT also increased indicating that though the SFT depends on birth weight and gestational age, it correlates better with birth weight (*Table II*).

TABLE I—*Skinfold Thickness of SGA, AGA, IGA Babies in Different Gestational Groups*

Gestation (weeks)	Mean and SD triceps skinfold thickness (mm)					
	No. of babies	SGA	No. of babies	AGA	No. of babies	LGA
28-32	4	1.85 ±0.09	13	2.3 ±0.29	–	–
33-36	13	2.30 ±0.29	79	2.8 ±0.48	–	–
37-40	30	2.05 ±0.30	499	3.02 ±1.1	99	4.50 ±0.74
41-42	3	2.3 ±0.18	8	3.5 ±0.58	2	4.8 ±0.44
Total	50		599		101	

TABLE II—*Skinfold Thickness of Newborns of Different Gestations and their Corresponding Birth Weights*

Birth weight (g)	Mean triceps skinfold thickness (mm)			
	28-32 wks gestation	32-36 wks gestation	37-40 wks gestation	41-42 wks gestation
<1000	1.8			
1001-1500	2.0 ±0.55	2.22 ±0.24	2.0	
1501-2000	2.42 ±0.44	2.51 ±0.29	2.30 ±0.24	
2001-2500		2.85 ±0.35	3.10 ±0.37	2.4 ±0.28
2501-3000		3.4 ±0.32	3.48 ±0.39	3.25 ±0.45
3001-3500			3.72 ±0.49	4.13 ±0.42
3501-4000			4.5 ±0.50	4.65 ±0.69
>4000			5.60 ±0.12	

There were 50 SGA babies, out of which 32% were malnourished, 24% hypoplastic and the rest of mixed variety. The lowest SFT was observed in malnourished babies. The SFT of hypoplastic group was more than the other two groups. These findings were not statistically significant ($p>0.05$).

Table III shows that the neonatal SFT and birth weight increased with increasing maternal age, the lowest being for mothers of less than 20 years of age. Similarly, SFT and birth weight were higher among multifarious mothers. These results were statistically significant. With an increase in the weight and height of the mother a statistically significant increase of neonatal SFT and birth weight were observed (*Table IV*). The maternal skinfold and neonatal SFT also showed a statistically linear correlation.

No correlation was observed between maternal hemoglobin levels and neonatal SFT. Babies born to mothers with severe pre-eclampsia and eclampsia had a statistically significant decrease in SFT. Hypertension alone was not found to affect the SFT. Infants of diabetic mothers had a higher SFT though the difference was not statistically significant when compared to normal (*Table V*).

An attempt was made to correlate the

TABLE III—*Correlation of Skinfold Thickness with Maternal Age and Parity*

Maternal parameters	Mean birth weight (kg)	Mean skinfold tickness (mm)	
		Triceps	Subscapular
Age (yrs)			
<20	2.45	3.214	3.359
20-30	2.72	3.583	3.733
30-40	3.8	4.013	4.113
>40	4.1	5.4	5.4
Parity			
Primi	2.66	3.371	3.571
1-3	2.82	3.843	3.917
≥4	2.99	4.101	4.210
	p<0.01	p<0.05	p<0.05

TABLE IV—*Correlation of Neonatal Skinfold Thickness with Maternal Height and Weight*

Maternal parameters	Mean birth weight (kg)	Mean skinfold tickness (mm)	
		Triceps	Subscapular
Height (cm)			
<150	2.683	3.633	3.735
150-162.5	2.752	3.783	3.872
>162.5	2.929	4.113	4.257
	p<0.01	p<0.05	p<0.05
Weight (kg)			
<45	2.44	3.011	3.103
45-55	2.55	3.353	3.307
55-65	2.72	3.670	3.777
>65	2.91	4.373	4.554
	p<0.01	p<0.01	p<0.01

occurrence of morbidities and mortality with SFT in term SGA babies, but no statistically significant relationship could be established.

Discussion

The abundant subcutaneous fat in a mature newborn infant is laid down mainly in the last two months of intrauterine life. The increasing SFT with advancing gestation has been observed by various authors(7-9). We also noted an increase in SFT from 28 weeks to term which was almost two-fold. The aging of placenta after 40 weeks was evident as a fall in SFT beyond this gestation. As SFT reflects the

TABLE V—*Correlation of Neonatal Skinfold Thickness with Maternal Morbidity*

	Mean skinfold tickness (mm)	
	Triceps	Subscapular
Normal	3.73 ±0.88	3.75 ±0.83
Maternal Morbidity		
Anemia (g/dl)		
<8	3.73 ±1.10	3.84 ±0.93
8-10	3.83 ±0.63	3.978 ±0.75
PET		
Mild	3.67 ±0.69	3.7 ±0.7
Moderate	3.537 ±0.82	3.687 ±0.97
Severe	2.983 ±0.59	2.866 ±0.47
Eclampsia	3.066 ±0.39	2.866 ±0.47
Hypertension	3.68 ±1.79	3.68 ±1.88
Diabetes	3.92 ±0.83	3.99 ±0.85

subcutaneous fat, an increase in birth weight would lead to a higher SFT. This linear relationship between weight and SFT has been well observed in the present study with a correlation co-efficient of 0.9. Similar findings have been reported previously by others also(3,8-11).

A deviant fetal growth can result in SGA babies. A lower SFT among these newborns has been reported by others(7,12,13). Our observations were also similar. The lack of subcutaneous fat in malnourished type of SGA babies was reflected in the lower SFT as compared to mixed and hypoplastic types. We also observed that though the SFT depended both on weight and gestation, it correlated better with weight. Sumners *et al.* have commented that though SFT is a more precise measure of fetal growth, as it is cumbersome to measure, a better parameter correlated to SFT and easier to measure, would be birth weight crown heel length ratio(4).

The length of the baby and SFT showed a direct correlation. However, for the same length, female babies had a higher SFT and were fatter as compared to male babies. Farr has also commented that the females had higher SFT which was related to the fact that they were shorter than males of the same weight(11). Even among different weight groups, female babies had thicker skinfold as compared to males. In contrast, there have been reports of either no difference between the two sexes or of higher SFT among male babies(10-14).

Maternal factors like age, parity, maternal height and weight all showed a positive correlation with both birth weight and SFT. Mothers with higher SFT produced babies with more SFT. Some worker have also reported higher SFT of babies born to obese mothers while Gampel stated that there is no relationship between the two(14-16). Among maternal morbidities, severe PET and eclampsia led to significantly lower SFT while hypertension alone

did not affect the SFT. Infants of diabetic mothers had more skinfold thickness. Whitelaw has also observed a similar relationship(17,18).

No statistically significant association could be found between SFT and occurrence of neonatal morbidities and mortality in term SGA babies.

It is concluded that SFT correlates positively with birth weight, gestation and length. The maternal factors influence the SFT and birth weight in a similar manner. Thus SFT did not provide any additional information than the easily measured parameter like birth weight and it did not have any significant relationship with occurrence of neonatal morbidity or mortality.

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NOTES AND NEWS

EXHIBITION ON PROTECTION OF CHILD CONSUMER

The Fourth Exhibition on Protection of Child Consumer will be held from 9-12 January,1992 on the occasion of XXIX National Conference of Indian Academy of Pediatrics at Nagpur. The theme will be "Rational Drug Therapy". You are requested to contribute exhibits, posters, books and articles and send your valuable suggestions on rational drug therapy, infant formulae and other relevant items.

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GENETICS CHAPTER OF INDIAN ACADEMY OF PEDIATRICS

The Genetics Chapter of IAP will have a 75 minutes session at the forthcoming XXIV National Conference of IAP at Nagpur in January, 1992. The topics to be discussed include:

1. Prenatal detection of chromosomal and biochemical genetics disorders (2 lectures).
2. Algorithms in practice of clinical genetics.