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Role of Neonatal Foot Length as Alternative Predictor of Low Birth Weight

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Research Article

Abstract: **Introduction**: LBW is the major public health problem in India. The perinatal mortality in LBW babies is 8 times higher than that in infants weighing more than 2500gms. 74% of India's population lives in rural areas. Most of the deliveries in rural areas conducted at home by untrained relatives and dais where weight recording is a problem. **Aim and objective:** To overcome the logistic problems associated with weighing the newborns in the field, a study was undertaken to assess the usefulness of neonatal foot length (FL) as an alternative to birth weight in identifying low birth weight babies specially below 2000 gms. **Methods:** nine hundred and thirty four live born neonates having weight below 2500 gms were studied at Sassoon general hospital, block no 20, the postnatal wing where the neonates are kept with their mothers. Birth weight and FL were recorded within 24 – 48 hrs of birth by standard procedures. **Results:** results showed significant correlation between birth weight and FL (r=0.70). The correlation was significant in preterm neonates (r=0.54). Mean weight of LBW babies was 2183.88 ± 255.04 gms. the mean birth weight of preterm newborn was 1856.8 ±249.4 gms. The mean FL was 6.67 ± 0.47 cm. the mean FL of preterm newborns was 6.21 ± 0.28 cm. sensitivity and specificity of FL at cut off point of < 6.75 cm for identifying low birth weight babies specially below 2000 gms was 92.8% and 65% respectively. **Conclusion**: Measurement of FL being simple alternate,low cost, reliable, and practicable method for identification of LBW babies specially below 2000 gms can be used by a person with little training in community.

Key words: Foot length, Low birth weight, correlation.

Introduction:

LBW is the major public health problem in India. Vast majority of these births occur in community where weighing of every newborn at birth is not feasible due to logistic problems. Birth weight is not only critical determinant of survival, growth and development of baby but also a valuable indicator of maternal health, nutrition and quality of antenatal services. Worldwide out of 139 million live births, about 23 million infants had LBW i.e. below 2500 gms [1] In India prevalence of LBW is 33%. [2] The perinatal mortality in LBW babies is 8 times higher than that in infants weighing more than 2500gms. [3] Birth is correlated with gestational age and ease of recording in hospital in hospital setting.However,74% of India's population live in rural areas. Most of the deliveries in rural areas conducted at home by untrained relatives and dais where weight recording is a problem.[4] Thus the present study was conducted with an aim to find out practicable method for identification of LBW babies that to find out an alternate,low cost,reliable and pr can be used by person with little training.

Aim and Objectives:

1.To find out an alternate,low cost, reliable, and practicable method for identification of LBW babies than can be used by a person with little training.

2.To study some socio-demographic factors that influence birth weight.

Materials and methods:

Place of study:

This cross sectional study was undertaken in Sassoon General Hospitals, Pune that provide services to population, in and around Pune District. Block number 20 was the mainstay of this study where all postnatal mothers with their neonates are kept together.

Study population:

Study considered 934 live born babies with weight less than 2500 gm during study period that is from January 2004 to Dec. 2004. Their mothers were interviewed to obtain information related to socio-demographic factors related to low birth weight (LBW).Purpose explained to mothers & informed consent taken.

Exclusion criteria:

All babies born with congenital anomalies / birth defects, twins or any evidence of intrauterine infection and the babies in NICU or seriously ill were excluded from study.

Inclusion criteria:

All low birth weight newborns delivered by normal delivery within 24-48 hours of life to apparently healthy mother were included in the study.

Weight & foot length (FL) recorded by standard procedures within 24-48 hours of life of newborn.

1) Weight

For this study, weight was taken on electronic weight machine scale with an accuracy of 10 gm.

2) Foot Length: (FL)

Foot length was measured by specially designed FL caliper. It has readings for foot length on one side. The babies left foot was held in examiners (myself) hand, FL caliper in right hand. The sole was placed inside the caliper against platform. It has sliding portion, which was moved towards first metatarsal or great toe. The reading was taken with an accuracy of 0.1cm. Measurements were 3 times and mean was taken so as to avoid observer's error. Babies left foot was used to maintain standard during study period.

Analysis was done by using SPSS software.

Results:

It is the LBW babies, which are less than 2000gms, which are considered as 'at risk' babies who need special neonatal care for which hospitalization in special neonatal units is recommended for further survival. Therefore in this study, the analysis is done to see the effect of some variables in the LBW babies below and above 2000gms. The measurements are also compared in these two groups to detect LBW babies below 2000gms for further referral to improve their survival.

Table No. 1: Distribution of LBW neonates

LBW (gms)	N	%
<1500	8	0.85
1500-	174	18.63
2000+	752	80.52
Total	934	100

Out of total LBW babies studied maximum number of neonates belonged to >2000gms i.e. 752(80.5%). 174 (18.6%) neonates belong to 1500- and only 0.85 % neonates had birth weight <1500gms.

Table No.2: Distribution of LBW according to parity and gestation

Gestation	Parity		Total
	Primi	Multi	
Preterm	49(66.2)	25(33.8)	74
Term	418(48.6)	442(51.4)	860
TOTAL	467(100)	467(100)	934

χ^2=7.76, P<0.01 sig.

When LBW newborns were studied as per parity and period of gestation it was observed that there was significant difference between mothers parity and gestational age. More number of primis gave birth to preterm babies as compared to multiparous mothers.

Table No. 3: LBW and FS/FA tablets consumed

LBW (gms)	Number of FS/FA tablets		
	<50	51-75	76-100
<1500	1(0.6)	7(1.0)	-
1500-	56(36.4)	108(15.4)	10(12.8)
2000+	97(63.0)	587(83.6)	68(87.2)
Total	154(100)	702(100)	78(100)

χ^2 =47.12, Df = 2, P< 0.001 HS.

Mothers who had consumed 76-100 tablets gave birth to 12.8% LBW babies weighing <2000gms while the proportion for above 2000 gms was 87.2%. Those who had taken <50 tablets the proportion for <2000gns was 37% and for above 2000gms was 63%. Those who had taken 51-75 tablets the proportion for above and below 2000gms was 83.6% & 16.4 % respectively.

Table No.4: Day rest and LBW

LBW (gms)	Yes	No	Total
< 1500	5(0.7)	3(1.7)	8(0.8)
1500-	123(16.2)	51(28.8)	174(18.6)
2000+	629(83.1)	123(69.5)	752(80.6)
Total	757(100)	177(100)	934(100)

χ^2 = 16.05 Df = 1 P< 0.001 HS

Those who had not taken day rest during pregnancy, the proportion was 19%(177). Those who took rest, the proportion was 81%(757). In the group <2000 gms the proportion was 16.9% and for above 2000 gms the proportion was 83.1% , those who took rest. In the other group the proportion >2000 gms &<2000gms was 69.5% & 30.5%. this difference was highly significant i.e.mothers who took rest in the afternoon ,birth weights of their babies were more than those who did not take day rest.

Table No.5: Mishri use and LBW

LBW (gms)	Mishri Use		Total
	Yes	No	
<1500	1(0.2)	7(1.9)	8(0.8)
1500-	120(21.5)	54(14.4)	174(18.6)
2000+	437(78.3)	315(83.7)	752(80.6)
Total	558(100)	376(100)	934(100)

χ^2 = 14.41, df = 2, P< 0.01 sig.

Out of total 558(59.7%), the proportion of LBW below 2000 gms was 21.7% for mishri users, while the proportion was 78.3% for above 2000 gms group. In case of non users the proportion for below and above was 16.3 % and 83.7 % respectively. P value was <0.01,the difference was statistically significant

Table No.6: foot length and LBW

LBW (gms)	Mean Foot Length (cm)	S .D.
<1500	6.28	0.39
1500-	6.19	0.25
2000+	6.78	0.44

F=148.22, p<0.001 HS.

It was found that in these three groups of low birth weight, foot lengths were different. This difference was statistically significant ($p<0.001$)

Table No.7: sensitivity and specificity for foot length

Foot Length (cm)	LBW (gms)	
	<2000	2000+
<6.75	169	264
≥6.75	13	488
Total	182	752

Sensitivity = 92.8%
Specificity = 65.0%

Sensitivity and specificity values for foot length at the cut off point of <6.75 cm were 92.8 % and 65.0 % respectively for birth weight below 2000gms. At this cut off point (<6.75cm) LBW, below 2000gms can be predicted.

Discussion:

In the present study mean foot length is 6.67 ± 0.47 cm. FL is significantly correlated to birth weight. Mean FL was more for birth weight (6.78 + 0.44cm) more than 2000gm than for below 2000(6.20 cm). There was positive correlation between FL and birth weight. These findings are similar with the findings of study by James D.K. et al[5]. Observations showed that there was a positive linear correlation between FL and other indices of body. However, in premature babies (< 37 weeks) the correlation between FL and LBW (r = 0.95) and FL and CHL (0.96) was pronounced. Birth weight and CHL of premature babies can therefore been estimated from measurement of FL. Another study by Hirve S.S. et al [6] used a tricolor tape for measuring FL as proxy of LBW. The sensitivity and specificity of tape was highest for birth weight < 1500 gm from regression analysis. FL of 6.35 and 7.63 were identified as cut off points corresponding to a birth weight of 1500 and 2500 gm respectively. Another study by Daga R[7]showed S that FL could be used as surrogate to birth weight in newborns. Present study also showed highest sensitivity for FL (92.8%) and can be used efficiently as screening tool in identifying low birth weight.

Conclusion:

Mean weight of LBW babies was 2183.88 + 255.04(SD) gm.Mean value of foot length is 6.7+ or – 0.5cm. Foot length showed positive correlation with birth weight. The correlation between FL and birth weight was statistically significant. Sensitivity and specificity of foot length at cut off point of 6.75 cm was 92.8% and 65% in predicting birth weight below 2000gms.

Recommendations:

A cut off point of 6.75 cm for FL can be used for prediction of low birth weight below 2000 gms. Especially in preterm a formula to predict birth weight by FL was derived: **BW = 470.33 X FL – 1066.88**
Foot Length Caliper can be used by Auxillary Nurse Midwife (ANM), TBAs after appropriate training in its use. By using this appropriate technology LBW and VLBW babies can be detected and referred to higher centers for neonatal intensive care. This cost effective tool can be used to reduce perinatal mortality in our country.

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