How to Cite:
Imran, A., Tanvi, T., Rathaur, V. K., & Maheshwari, S. (2022). Foot length- A Screening tool and it's correlation with gestational age and other anthropometric parameters among neonates at a tertiary care centre in Uttarakhand. *International Journal of Health Sciences*, *6*(S5), 12120–12130. https://doi.org/10.53730/ijhs.v6nS5.11226

Foot length- A Screening tool and it's correlation with gestational age and other anthropometric parameters among neonates at a tertiary care centre in Uttarakhand

Dr. Ayesha Imran
MBBS, MD Pediatrics, Fellowship Pediatric Gastroenterology (ISPGHAN), Assistant Professor, Department of Pediatrics, Government Doon Medical College, Dehradun, Uttarakhand India
Email: dr.ayesha1286@yahoo.co.in

Dr. Tanvi
MBBS, MD Pediatrics, Assistant Professor, Department of Pediatrics, Government Doon Medical College, Dehradun, Uttarakhand India
Email: enfriar73@gmail.com

Dr. Vyas Kumar Rathaur
MBBS, MD Pediatrics, Professor and Head of Department, Department of Pediatrics, VCSGGIMS&R Srinagar, Uttarakhand India
Email: vyasrathaur@gmail.com

Dr. Sonam Maheshwari*
MBBS, MD Community Medicine, Assistant Professor (Biostatistics) Department of Community Medicine, Government Doon Medical College Dehradun Uttarakhand India
*Corresponding author email: maheshwarisonam2@gmail.com

***Abstract*---**Background & objectives-The neonatal mortality continues to remain high. Early identification of high risk babies can decrease it. In areas where health care services are poorly retrieved, it becomes difficult to identify these babies. Study was done to assess the feasibility of foot length in identifying these neonates and also to find out it's correlation with other anthropometric parameters. Methods-This cross-sectional study was conducted over 753 newborns over duration of 1 year. All singleton babies between 32-38 weeks of gestation within 72 hours of birth were included. Foot length was measured by non-stretchable measuring tape from posterior most prominence of foot to the tip of longest toe of right foot. Results-Amongst all, 37.6% were preterm and 58.8% were low birth weight.

Manuscript submitted: 9 May 2022, Manuscript revised: 18 July 2022, Accepted for publication: 27 August 2022

The mean ±SD of foot length for pre-term and term was 6.90±0.28 and 7.42±0.26 respectively. All parameters were significant (P<.001) according to gestational age. The mean of anthropometric parameters were higher in term neonates (P<0.0001). Males had higher values of foot length and body weight. There was a significant positive correlation of foot length with body weight and gestational age (0.773, 0.694 respectively). Foot length contributed significantly to weight. The coefficient of determination for preterm and term (R^2) was 46% and 40%, respectively. Using Receiver operating characteristic curve, foot length had highest sensitivity and specificity. Interpretation & Conclusion- Foot length is a simple, quick, reliable and easily accessible anthropometric surrogate in identifying high risk newborns. It is particularly useful in resource constraint countries where facility-based services for newborn are poorly accessed.

***Keywords*---**foot length, preterm, low birth weight, neonatal mortality.

Introduction

Neonatal mortality, which refers to the death of any newborn between birth and 28 days after birth, is among the major public health challenges in low and middle income countries.[1] Children face the highest risk of death in first month of life. The world has made substantial progress in child survival since 1990. Globally, the newborn deaths has declined from 5 million in 1990 to 2.4 million in 2019, yet large numbers die shortly after birth and many of them die within first 28 days of life.[2] This decline in neonatal mortality is likely to be attributed to several interventions such as neonatal resuscitation program, immunization, integrated treatment for childhood illnesses in the first week of life and strengthening of the healthcare facilities. In 2019, globally approximately 6,700 newborn die every day, with about a third of all neonatal deaths occurring in the first 24 hours after birth and almost three quarters in the first week after birth.[3] India has the highest number of newborn deaths in 2019 accounting for an approximate of 522000.[2]

The determinants of neonatal mortality may be related to factors in the newborn, maternal or health care system. The newborn factors include age, birth weight, gender and neonatal infections.[4] Maternal factors include age, parity, birth interval, complications at the time of delivery, history of abortion, low Apgar score and home deliveries.[5] Healthcare system factors include lack of quality care at birth, treatment immediately after birth and in the first days of life, health staff attitudes and supervision of delivery.[4] The main causes of neonatal death are preterm birth, intrapartum-related complications (birth asphyxia), infections and birth defects.[2] Low birth weight (LBW) is also an important indirect cause of neonatal death.[6] Every year, an estimated 15 million babies are born before 37 weeks of gestation, that is more than 1 in 10 babies.[2] Approximately 1 million children die each year due to complications of preterm birth, making it the leading cause of death among children under 5 years of age.[7] About 60% of the LBW babies are born at term after restriction of fetal growth as small for gestational age (SGA) babies, while the remaining 40% are born preterm.[8]

Approximately 6,700 neonates die daily because of these preventable causes.[3] So, there is a dire need to identify these LBW and preterm babies to turn down the neonatal mortality and morbidity.

In India, particularly in remote hilly areas, where health care services are poorly retrieved, majority of newborns are born at home or else in some low resource setting where there is no access to scales and other means which can help them in identifying preterm, LBW who are in need of special care. In these scenarios, foot length (FL) estimation by a simple and easily available measuring tape will help us to identify newborns who are in need of referral to higher centre and special management. So, in view of lack of proper knowledge about the scales and cumbersome scoring systems, we conducted a study on feasibility of FL as a screening tool in identifying preterm and LBW babies who are in need of special care. And also we tried to find out the correlation between newborn FL and other anthropometric parameters namely body weight (BW), gestational age (GA), head circumference (HC), chest circumference (CC) and length.

Materials and Methods

This hospital based cross-sectional study was conducted over study sample of 753 live newborns, selected by simple random sampling technique over a time period of 1 year from June 2020 to May 2021. The approval was taken from the Institutional Ethics Committee and a written informed consent was taken from their parents or guardians. The study was conducted for examining and assessing newborn FL as a screening tool and for determining its utility in identifying LBW and preterm babies. All live inborn singleton babies of GA between 32-38 weeks within 72 hours of birth were included in the study. The following were excluded from the study-

- Babies with GA <32 weeks
- Multiple births (twin/triplet)
- Extremely LBW babies (<1000 grams)
- Babies who were having skeletal deformities of the foot, congenital anomalies (major or lethal abnormalities, e.g. neural tube or cardiac defect)
- Babies having severe respiratory distress (oxygenation support required)
- Babies having severe birth asphyxia (Apgar score <3 at 5 minutes),
- Neonates for whom reliable information about gestational age was not available (mother not aware of beginning of her Last Menstrual Period (LMP), irregular period prior to pregnancy, use of oral contraceptive before pregnancy, lactational amenorrhoea)
- Babies whose parental consent for FL measurement was not provided.

Methods of collecting data

Data was collected using the standard proforma meeting the objectives of the study. Mother's age, LMP, expected date of delivery, mode of delivery were noted. After taking informed consent from the mother, examination of the each newborn was done within 48 hours of birth, 1-2 hours after feeding, after stripping them off completely at the temperature of 29-33°C, with good diffuse light in the special care nursery units of the hospital. Examination of each new born included assessment of GA and anthropometric measurements was carried out by one of the investigators to avoid the inter-observer bias. All anthropometric parameters were recorded in a pre-designed proforma.

Gestational age assessment

Ultrasound documentation was given first preference to estimate GA as it is considered gold standard.[9] In case where ultrasound documentation was not available, GA of newborn was calculated from case sheet of mother using Naegeli's formula[10] and new Ballard score.[11] The GA was first calculated from Naegeli's formula. New Ballard score gives a range for the GA, it was used to check if the age predicted by Naegeli's formula falls within this range. New Ballard score is highly inaccurate because it's a subjective test and inter-observer variation is very high.[12] To reduce the inter-observer variation in Ballard, two investigator calculated the score. We included the sample in our study only if the results of both the investigators were similar.

Anthropoemetric parameters

- **Foot length-** It was measured by flexible, non-stretchable measuring tape with an accuracy of a millimeter from posterior most prominence of foot to the tip of the longest toe of the right foot, parallel to the long axis of the measuring tape. At the time of measurement, ventral surface of foot was straightened out using gentle pressure. It was documented in cm.
- **Head circumference-** It was measured by flexible, non-stretchable measuring tape. The tape was placed encircling the occipital prominence posteriorly, just above the ear lobes laterally and just above the supra-orbital ridge anteriorly by cross over technique. Measurement was done to the accuracy of a millimeter. It was documented in cm.
- **Crown Heel Length-** It was measured using infantometer with baby in the supine position measuring with accuracy 1millimeter. An assistant's help was sought to do the length measurement. Baby's lower limb was fully extended and soles of the feet held firmly against the foot board and head touching the fixed board. It was documented in cm.
- **Birth weight-** Digital electronic weighing scale for measuring weight nearest to 5 gm**.** Babies were weighed naked on electronic weighing scale. The scale offered an accuracy of ±5gms.
- **Chest circumference-** It was measured at the level of nipples by measuring tape to the nearest of 0.1 cm.
- **Classification of babies-** Babies less than 37 weeks of gestation were counted in the preterm group. All the babies were categorized into SGA, appropriate for gestational age (AGA) and large for gestational age (LGA). The classification was done by using Lubchenco intrauterine curve.[13]
- **Sample size calculation-** In the study time period there were 788 population size. After using this formula, we got a sample size of 753 by considering 1% margin of error.

$$\text{sample size} = \frac{z^2 p(1-p)}{e^2} \Bigg/ 1 + \frac{\frac{z^2 p(1-p)}{e^2}}{N}$$

Where:
N = population size
e = Margin of error (percentage in decimal form)
z = z-score= 2.58

Statistical Analysis

The data was entered in MS excel and then transferred to SPSS V. 24.0 (Statistical Packages for social Science). Mean and Standard Deviation (SD) were computed and compared using independent student "t" test for the anthropometric measures of newborn babies. Categorical variables were given as the number or the percentage of newborns with the characteristic of interest. To measure the association between anthropometric measurements Pearson's product-moment correlation coefficient was used. Linear Regression analysis was used to predict the body length using foot length as independent variable according to term. Sensitivity, specificity with 95% confidence level was calculated to evaluate the accuracy of different anthropometric measurements. $P>0.05$ was considered statistically significant. All statistical tests were two-tailed.

Results

Out of 753 newborns, 51.4% were female and 48.6% were male. 37.6% were preterm and 62.4% were term. 52.7% were SGA, 46.6% were AGA and 0.7% were LGA. 58.8% were LBW, 37.5% were normal weight and only 3.7% were VLBW. 54.7% were delivered by normal vaginal delivery and 45.3% with caserean section. (Table I) The mean ±SD of FL for male was 7.24±0.38 and for female was 7.21±0.36. The mean ± SD of BW for male and female was 2.34±0.49 and 2.28±0.46 respectively. When we compared various anthropometric parameters as per the gender it was not significant.(Table II) Although males had a slightly higher values of FL and BW compared to females.(Table II) When we compared various parameters according to GA we found that all were significant. ($P<.001$) The mean± SD of FL for pre-term and term was 6.90±0.28 and 7.42±0.26 respectively. The mean values for anthropometric parameters were significantly higher in term babies compared to preterm babies with a $P<0.0001$ (Table II).

We observed a significant positive correlation of FL with BW & GA (0.773, 0.694 respectively). In preterm, FL has positive correlation with HC, GA and BW whereas in term FL has positive correlation with BW.(Table III). FL contributed significantly to BW. It was noted that the coefficient of determination for preterm and term (R^2) was 46% and 40%, respectively.(Table IV). Using Receiver operating characteristic (ROC) curve, among all anthropometric parameters, FL had highest sensitivity and specificity. Overall, FL with cut off value ≤ 6.9cm had sensitivity 97.17% and specificity 74.05%. In case of detecting preterm, FL with cut off value ≤ 6.4 cm had sensitivity 97.18% and specificity 75.27% and for detecting LBW babies, FL with cut off ≤ 6.7 had sensitivity 94.50% and specificity 74.52 %.(Table V)

- For identifying LBW babies
  - FL ≤ 6.7 cm had 94.50% sensitivity and 74.52% specificity.
  - HC ≤ 30.2 cm had 86.54% sensitivity and 71.20% specificity.
  - CC ≤ 27.8 cm had 80.21% sensitivity and 69.22% specificity.
  - Length ≤ 44.3 cm had 83.21% sensitivity and 70.20% specificity.

- For identifying preterm babies
  - FL ≤ 6.4 cm had 97.18% sensitivity and 75.27% specificity.
  - HC ≤ 30.1 cm had 84.15% sensitivity and 66.15% specificity.
  - CC ≤ 29.2 cm had 85.21% sensitivity and 74.12% specificity.
  - Length ≤ 44.8 cm had 86.23% sensitivity and 67.14% specificity.

Discussion

Early identification of high risk conditions of newborns is an important prerequisite of any initiative to reduce neonatal mortality and morbidity in developing countries like India. There are various measurements which are done at the time of birth like BW, FL, length, HC and CC which helps in identifying whether the child is sick or stable. In many developing countries, either equipment's required for these measurements are not available or the babies are sick or handling is needed to get the maximum information about the maturity of the baby. In such cases FL is easy accessible tool which can be measured even in sick neonate, requires less handling and less disturbance of the neonate. This study was undertaken to study the feasibility of FL as a screening tool in identifying preterm and LBW newborn who are in need of special care so that the para-medical workers at remote places could easily identify these sick neonates and refer them to higher centre for further management and also to find out the correlation of FL with other anthropometric parameters in newborns and the use of FL as a proxy measurement for identifying LBW and preterm babies.

In this study, there was female preponderance (51.4%) in contrast to Srinivasa et al[8] (55.4% male, 44.6% female) and Rakkappan et al[14] (53.7% male, 46.3% female) who had male preponderance. Majority were term (62.4%) which was almost similar to the studies of Srinivasa et al[8] (83.2% term and 16.8% preterm) and Rakkappan et al[14] (81.4% term and 18.6% preterm). On the contrary, Saroj AK et al[15] found that 89.2% were preterm and 10.8% were full term. We found that SGA babies were more than AGA (52.7% and 46.6%) respectively. Whereas Srinivasa et al[8] found that AGA babies outnumbered SGA (83.6% vs 15.2%). In our study, 58.8% were LBW, 37.5% were normal weight and only 3.7% were very low birth weight (VLBW). BW in our study ranged from 1.2 to 4 kg which was similar to Srinivasa et al[8] who found the range of BW between 1.02 to 3.82 kg. 54.7% were delivered by normal vaginal delivery and 45.3% were with caserean section.

In our study, all the anthropometric parameters were significant as per the GA (P<0.001). The mean values of all anthropometric parameters and GA were significantly higher in term as compared to preterm with a P<0.0001 (Table II). In our study, for preterm, the minimum FL was 6.3cm and maximum was 7.6cm and the mean value was 6.90±0.28. For term, the minimum FL was 6.9cm and maximum was 8.2cm and the mean value was 7.42±0.26. This was comparable with several studies.[8,15] Srinivasa et al[8] also observed that FL of term babies (7.71 ±0.28 cm) was higher than that of preterm (6.91 ± 0.49 cm). Saroj AK et al[15] observed a minimum FL of 7.3 cm and maximum 8.5 cm for full term (SGA) (n=27) with mean of 7.75±0.66. For preterm (AGA) (n=223) minimum FL was 6.2 cm and maximum 8.5 cm with mean 7.41±0.78.

On assessing the descriptive statistics of anthropometric parameters based on gender, it was not significant. We found that for males the mean±SD of FL was 7.24±0.38 and for BW was 2.34±0.49 whereas for female it was 7.21±0.36 and 2.28±0.46 respectively (Table II). Similar to the study of Srinivasa et al[8] we also found that males had a slightly higher anthropometric values as compared to females. In 1920 Streeter proposed that the fetal FL has a characteristic pattern of normal growth. He proposed that the FL could be used to estimate GA.[16] In 1987, Mercer concluded that ultrasonographic measurement of fetal foot was a reliable parameter to estimate GA.[17] In this study FL showed positive correlation with BW, GA, length, HC, CC of the baby and was statistically significant. It was observed that FL showed the higher values in correlation when compared to other parameters in identifying LBW and preterm babies (0.773, 0.694 respectively). Srinivasa et al[8] also noticed that FL showed the higher values in correlation, sensitivity and specificity in identifying LBW and preterm babies.

Saroj AK et al[15] noted a positive correlation between FL and GA (r =0.396, 0.328 and 0.128). Similarly we observed that in preterm, FL has positive correlation with HC, GA and BW whereas in term FL has positive correlation with BW. This shows that FL increases as GA and BW increases. So, it is possible to predict the GA of babies with the help of FL assessment. Srivastava A et al[18] noted that correlation coefficient of BW with FL was 0.94 and that of GA with FL was 0.99. The correlation coefficient of GA and FL was 0.99 in AGA and 0.99 in SGA babies. So, FL had a strong correlation with GA in both AGA and SGA babies. Using ROC curve, among all anthropometric parameters, FL had highest sensitivity and specificity. We found that FL with 6.7cm and 6.4cm cut off showed higher sensitivity and specificity compared to HC, CC and length in identifying LBW newborns (94.50% sensitivity and 74.52% specificity) and identifying preterm babies (97.18% sensitivity and 75.27% specificity) respectively. Srinivasa et al[8] noted that FL with 7.4 cm cut off showed higher sensitivity and specificity compared to HC, CC and length in identifying preterm (98.81% sensitivity and 79.09% specificity) and LBW newborns (97.03% sensitivity and 87.05% specificity). Saroj AK et al[15] noted that FL less than 7.27 cm has 100% sensitivity and 68.6% specificity for identifying LBW babies (<2500). In the study by Srivastava et al[18], FL of 7.37 cm was identified from linear regression analysis as the cut-off point corresponding to a GA of 37 weeks. On the contrary, Mullany et al[19] in their study of 1890 newborns found that circumference was superior to FL in classification of infants into birth weight categories.

In India, particularly in remote hilly areas, where health care services are poorly accessed, a low-cost, simple, easily available, home based device like measuring tape will help us to identify high risk newborn who are in need of special management at higher centre. This could support community efforts to save these newborn. This hospital based study was conducted towards this effort of using foot length as an anthropometric surrogate to identify high risk newborns in need of extra care and special management. Our study had certain limitations. It was a hospital based study without any community follow-up and hence it may not represent the population as a whole. The anthropometric parameters were measured within 48 hours of life. Whether any change occurred on subsequent measurements were not documented. This method of FL measurement may be useful in areas where most of the deliveries occur at home. For neonates born at the hospital with a good set up, direct measurement of weight and close observation are better ways for detecting high risk babies.

To conclude, FL is a simple, quick, reliable and easily accessible anthropometric surrogate which can be used as a proxy measurement in identifying high risk newborns, who need of extra care. It is particularly useful in resource constraint countries with a high burden of neonatal mortality and where facility-based services for new born are poorly accessed. We observed that all the anthropometric parameters were significant as per the gestational age. There was a positive correlation of FL with GA and BW. Amongst all the parameters, FL is an efficient tool and had highest sensitivity and specificity in identifying preterm and LBW making it a reliable anthropometric parameter for the rural set-up and remote areas to identify these high risk newborns for life saving, home care or referral to higher centre for better management. This will also help to strengthen our referral system.

References

1. Abdullah A, Hort K, Butu Y, et al. Risk factors associated with neonatal deaths: a matched case–control study in Indonesia. Glob Health Act 2016;9:30445.
2. Annan GN, Asiedu Y. Predictors of neonatal deaths in the Ashanti region of Ghana: a cross-sectional study. Adv Public Heal 2018; 2018:1–11.
3. Ballard JL, Khoury JC, Wedig K, Wang L, Eilers-Walsman BL, Lipp R. New Ballard Score, expanded to include extremely premature infants. J Pediatr 1991;119(3):417-23.
4. Hug L, Alexander M, You D, et al. National, regional, and global levels and trends in neonatal mortality between 1990 and 2017, with scenario-based projections to 2030: a systematic analysis. Lancet Glob Health 2019;7:e710–20.
5. Intriago, C. Z., & Posligua, T. I. Q. (2020). Telecommunications and virtualization in times of pandemic: impact on the electrical engineering career. International Journal of Physical Sciences and Engineering, 4(3), 38–44. https://doi.org/10.29332/ijpse.v4n3.630
6. Krithika S, Rajainish KV, Adarsh E. Cprrelation of gestational age assessed by last menstrual period and New Ballard's score in pre-term babies. Int J Contemp Pediatr 2020:7:1718-22.
7. Liu L, Oza S, Hogan D, Chu Y, Perin J, Zhu J, et al. Global, regional, and national causes of under-5 mortality in 2000-15: an updated systematic analysis with implications for the Sustainable Development Goals. Lancet 2016;388(10063):3027-35.
8. Loytved CA, Fleming V. Naegele's rule revisited. Sex Reprod Healthc 2016 Jun;8:100-1.

9. Lubchenco LO, Hansman C, Boyd E. Intrauterine growth in length and head circumference as estimated from live births at gestational ages from 26-42 weeks. Pediatrics 1996; 37(3):403-8.
10. Mercer BM, Sklar S, Shariatmadar A, Gillieson MS and D"Alton ME: Fetal foot length as a predictor of gestational age. AM J Obstet Gynecol 1987;156:183-5.
11. Mukherjee S, Roy P, Mitra S, Samanta M, Chatterjee S. Iranian Journal of Pediatrics 2013;23(5):508-12.
12. Mullany LC, Darmstadt GL, Khatry SK, et al. Relationship between the surrogate anthropometric measures, foot length and chest circumference and birth weight among newborns of Sarlahi, Nepal. Eur J Clin Nutr 2007; 61: 40-46.
13. Rakkappan I, Kuppusamy N. Newborn foot length measurement to identify high-risk neonate. Int J Sci Stud 2016;4:13-19.
14. Saroj AK, Sharma JN, Singh M. Measurement of Neonatal Foot Length to Identify Low BirthWeight Babies: a cross-sectional hospital based study. IOSR Journal of Dental and Medical Sciences 2016;15(6):49-53.
15. Sequera, D. M., Quijije, N. K. A., Mendoza, A. D. R. V., & Rivas, Y. C. (2022). Kichwa orality, past and present from the educational, anthropological and cultural perspective. International Journal of Health Sciences, 6(2), 577–587. https://doi.org/10.53730/ijhs.v6n2.7280
16. Smith GCS, Nakimuli A. Ultrasound estimation of gestational age in late pregnancy in low-income countries: made to measure or off-the-peg? The Lancet Global Health 2020.8(4):462-63.
17. Srinivasa S, Manasa G, Madhu GN. Foot length of newborn: Its correlation with gestational age and various anthropometric parameters. Curr Pediatr Res 2017; 21(2):248-53.
18. Srivastava A, Sharma U, Kumar S. To study correlation of foot length and gestational age of new born by new Ballard score. Int J Res Med Sci 2015;3:3119-22.
19. Streeter GL. Weight, sitting height, head size, foot length, and menstrual age for the human embryo. Contrib. Embryol 11:143, 1920.
20. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). Health and treatment of diabetes mellitus. International Journal of Health Sciences, 5(1), i-v. https://doi.org/10.53730/ijhs.v5n1.2864
21. UNICEF data:Monitoring the situation of children and women. Neonatal mortality. September 2020 https://data.unicef.org/topic/child-survival/neonatal-mortality.
22. World Health Organization. Preterm Birth, Fact Sheet. World Health Organization, 2020. http://www.who.int/mediacentre/factsheets/fs363/en/ (accessed 21 January 2021).https://www.who.int/news-room/fact-sheets/detail/newborns-reducing-mortality 19 September 2020.

Table

Table I
Descriptive characteristics of respondents

Variables	Frequency(%)
Male	366(48.6%)

Female	387(51.4%)
Preterm	283(37.6%)
Term	470(62.4%)
Small for Gestational Age	397(52.7%)
Appropriate for Gestational Age	351(46.6%)
Large for Gestational Age	5(0.7%)
Normal	282(37.5%)
Low birth weight	443(58.8%)
Very low birth weight	28(3.7%)
Normal vaginal delivery	412(54.7%)
Cesarean	341(45.3%)

Table 2
Gender wise and term wise comparison of mean values of parameters

	Male	Female	*P* value
Foot length(cm)	7.24±0.38	7.21±0.36	0.407
Gestational Age(week)	36.62±1.50	36.66±1.51	0.736
Body weight (kg)	2.34±0.49	2.28±0.46	0.107
Length (cm)	45.68±3.34	45.72±3.37	0.871
Head Circumference (cm)	33.05±1.33	33.12±1.61	0.527
Chest Circumference (cm)	31.03±1.37	31.24±1.88	0.088
	Pre-term	Term	
Foot length(cm)	6.90±0.28	7.42±0.26	0.000
Gestational Age(week)	34.89 ±0.84	37.70± 0.46	0.000
Body weight (kg)	1.98 ±0.42	2.51± 0.39	0.000
Length (cm)	42.18±2.83	47.82±1.09	0.000
Head Circumference (cm)	32.51±2.04	33.42±0.81	0.000
Chest Circumference (cm)	30.64±2.41	31.44±0.82	0.000

Table III
Correlation between foot length with various parameters according to Term and Preterm

	Gestational Age	Body Weight	Head Circumference	Chest Circumference
Total	0.694(0.000)	0.773(0.000)	0.424(0.000)	0.346(0.000)
Preterm	0.664(0.000)	0.629(0.000)	0.926(0.000)	0.325(0.000)
Term	0.222(0.000)	0.678(0.000)	0.371(0.000)	0.297(0.000)

Table IV
Results of Linear Regression Analysis where the Foot Length predicts the Body weight

Variables	Regression Coefficient	SE*	R-square (%)	t-value	*P* value

Term	0.429	0.032	0.40	13.55	0.000
Preterm	0.459	0.023	0.46	19.97	0.000

*SE-Standard error

Table V
Cut-off value of anthropometric parameters for detecting LBW and preterm babies using ROC curve

	Variables	Cut- off Value (cm)	Sensitivity	95%CI*	Specificity	95%CI
Total	Foot Length	≤ 6.9	97.17	93.5-99.8	74.05	69.5-87.7
	Head Circumference	≤ 30.8	87.51	80.1-98.2	69.22	64.1-73.2
	Chest Circumference	≤ 29.4	89.20	77.9-95.2	72.12	62.3-78.2
	Length	≤ 45.6	86.52	82.1-89.2	68.41	62.4-75.8
For detecting LBW Babies	Foot Length	≤ 6.7	94.50	90.2-99.1	74.52	70.4-79.2
	Head Circumference	≤ 30.2	86.54	79.9-93.2	71.20	63.5-79.2
	Chest Circumference	≤ 27.8	80.21	75.2-86.5	69.22	63.2-76.5
	Length	≤ 44.3	83.21	79.8-89.5	70.20	64.1-75.4
For detecting Preterm babies	Foot Length	≤ 6.4	97.18	94.1-100.0	75.27	71.2-83.2
	Head Circumference	≤ 30.1	84.15	80.2-88.3	66.15	60.1-78.1
	Chest Circumference	≤ 29.2	85.21	80.1-89.3	74.12	69.2-78.2
	Length	≤44.8	86.23	80.2-90.9	67.14	63.2-74.2

*CI- Confidence interval