



CROSS SECTIONAL STUDY ON ASSESSMENT OF GESTATIONAL AGE OF NEONATES, BASED ON FOOT LENGTH.

Neonatology

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ABSTRACT

Background: Birth weight is single most important criterion for determining neonatal and infant survival. LBW is a sensitive indicator of socio-economic conditions and indirectly measures the health of the mother and child.

Objective : To compare the accuracy of assessing gestational age using foot length by comparing with ultrasound findings.

Methods and Analysis: A cross sectional observational study was carried out in all live, newborn babies under 48 hours of life, admitted in RLJH, was taken for the study at , Kolar from July 2021 to September 2021. Gestational age of all the babies are determined by 1st trimester ultrasound report. Right foot gestational age measured from the heel to the tip of the great toe, using a plastic stiff ruler. Gestational range varied from 27 weeks to 42 weeks.

Results: Gestational age and foot length also showed a positive correlation with a correlation coefficient , pearson coefficient of 0.677 and p value of <0.001.

Conclusion : There was positive strong correlation between foot length and gestational age which was statistically significant. Foot length can be taken as an ancillary to determine the gestational age of a neonate, when other parameters like first trimester ultrasound or Ballard's scoring cannot be done. It is a quick method to estimate the gestational age to plan further management of the new born.

KEYWORDS

Gestational age , foot length

INTRODUCTION

Birth weight is single most important criterion for determining neonatal and infant survival. Low Birth Weight is a sensitive indicator of socio-economic conditions and indirectly measures the health of the mother and child. Gestational age is a critical determinant in the management of newborns. Misclassification of babies as per term or preterm can lead to many findings being overlooked and can alter management¹. It can also jeopardize the statistical analysis.

About 60% of the low birth weight babies are born at term as Small for gestational age(SGA), whereas the remaining 40% are born preterm². It is important to identify SGA and preterm babies and treat them accordingly.

Determination of GA using Naegele formula from LMP, although easy and cost effective, requires the mother to be having regular cycles of 28 days^{3,4}. It cannot be used if there is delay in ovulation or in low literate mothers. Ultrasonography is the gold standard for calculating the gestational age, but it is reliable only when it is done in the first trimester of pregnancy⁵. It is again a limitation in peripheral centres, where ultrasonography is not always available.

Different scoring systems use a number of neurological and physical criteria which are suitable for doctors but are cumbersome to use at remote places by paramedical staff. Foot length is simple to measure and do not require much expertise.

Hence, this study aims to determine the accuracy of gestational age by measuring foot length, using ultrasound as the gold standard.

OBJECTIVES

To compare the accuracy of assessing gestational age using foot length by comparing with ultrasound findings.

MATERIALS AND METHODS

Study design:

Cross – Sectional Observational Study

Source of data:

All live, newborn babies under 48 hours of life, admitted in RLJH, either in postnatal ward or ICU was taken for the study.

Study period- 3 months, July 2021 – September 2021

Method of collection of data:

Inclusion Criteria: All live, neonates within 48 hours of life, admitted in RL Jalappa hospital.

Exclusion Criteria:

Neonates with lower limb congenital anomalies
Neonates for whom 1st trimester ultrasound was not done or was not available.

METHODOLOGY

Study was started after obtaining institutional ethical committee permission. All live, newborn babies under 48 hours of life, admitted in RLJH, either in postnatal ward or ICU taken for the study. Those meeting the exclusion criteria were excluded. Gestational age of all the babies are determined by 1st trimester ultrasound report. Right foot gestational age measured from the heel to the tip of the great toe, using a plastic stiff ruler. Accuracy is taken to the nearest of 0.1 cm.

Foot length (FL): The foot length of right foot was measured by a steel ruler to the nearest of 0.1 cm thrice by the author and the average was recorded. The measurement was taken by fixing the tip of heel to the zero mark of the ruler and after straightening the foot and toes, the foot length measurement was recorded, the other end being the tip of the great or second toe (whichever was the longer length).

All the measurements were taken within 48 hours of birth. Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software.

Statistical Analysis

Data was analyzed using MS Excel, SPSS 22 version software ((IBM SPSS Statistics, Somers NY, USA) was used to analyze data. Categorical data was represented in the form of Frequencies and proportions. Continuous data was represented as mean and standard deviation. Correlations were performed with Pearson Correlation coefficient .P value <0.05 was considered as statistically significant.

RESULTS

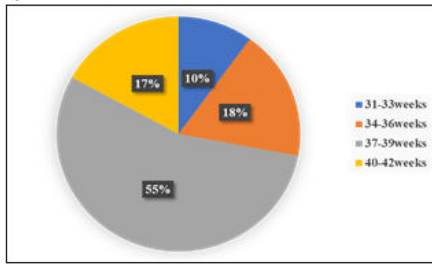


Figure 1:-Graph showing Distribution of the subjects according to gestational age.

Table 1:- Comparison of Length, Head circumference, Foot length according to gestational age.

GA	Length	Head circumference	Foot length
31-33weeks	Mean	43.00	32.100
	SD	1.764	.9944
34-36weeks	Mean	45.06	32.667
	SD	1.798	.9075
37-39weeks	Mean	47.36	33.782
	SD	1.957	.9896
40-42weeks	Mean	48.47	34.235
	SD	2.065	1.2005

Table 3:- Correlation of Length, Head circumference, Foot length with gestational age.

		GESTATION AGE
LENGTH	Pearson Correlation	.644**
	P value	<0.001
HEAD CIRCUMFERENCE	Pearson Correlation	.593**
	P value	<0.001
FOOT LENGTH	Pearson Correlation	.677**
	P value	<.001

There was positive strong correlation between length and gestational age which was statistically significant.

There was positive moderate correlation between head circumference and gestational age which was statistically significant

There was positive strong correlation between foot length and gestational age which was statistically significant.

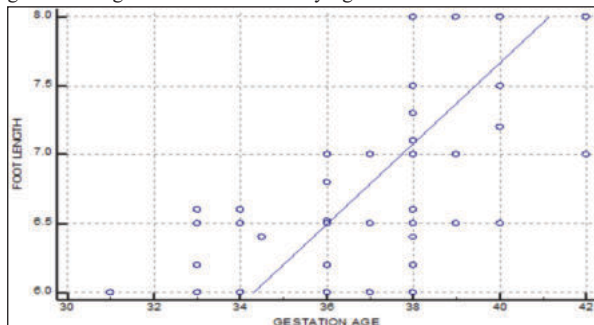


Figure 2:- Graph showing Correlation of Foot length with gestational age

A significant regression equation was found P value (<0.001) with R² = 0.460 Gestational age = -2.932 + .828(foot length).

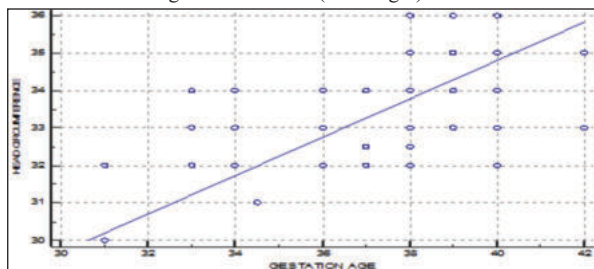


Figure 3:- Graph showing Correlation of head circumference with gestational age

Model		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-2.932	.630		-4.656	.000
	FOOT LENGTH	.828	.091	.678	9.132	.000

a. Dependent Variable: GA

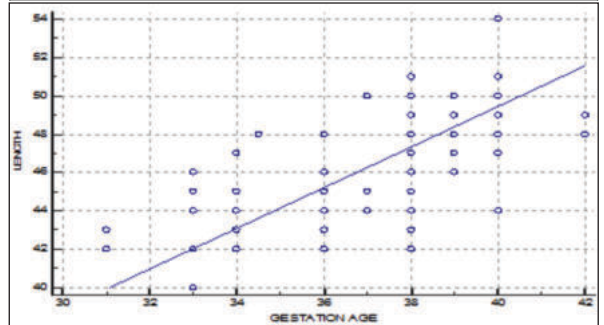


Figure 4:- Graph showing Correlation of length with gestational age.

DISCUSSION

In this study, foot length-derived GA was found to be more accurate than LMP or Ballard-determined GA. In a comparison of GA determination methods in a low-resource setting, it was found that the Ballard score underestimated the GA, while the Dubowitz score overestimated the GA in a preterm infant population in Bangladesh¹. The clinical use of these neonatal scores is compromised by the need for sufficient training and clinical skills needed by the health care workers to accurately apply these scores. In our study and also study done by Tenali et al and Tikmani et al, Foot length measurement with the measuring scale requires minimal training, is faster and can therefore be used by all levels of medical personnel^{5,6}. In contrast to the neonatal scores, foot length measurements also cause minimal disturbance to the infant.

In this study, only one-third of mothers had accurate pregnancy dating with antenatal ultrasound before 23 of weeks gestation. In an Indian study, it was found that antenatal ultrasound was available for 10–70% of women.

Foot length was shown to correlate well with GA, birth weight, length and head circumference in the present study. It was shown not to be influenced by sex or race.

Limitation of the study

Only neonates who were admitted before 48 hours of life were taken into study.

This study cannot be used in case of lower limb congenital anomalies, which is quite common.

CONCLUSION :

There was positive strong correlation between foot length and gestational age which was statistically significant. Foot length can be taken as an ancillary to determine the gestational age of a neonate, when other parameters like first trimester ultrasound or Ballard's scoring cannot be done. It is a quick method to estimate the gestational age to plan further management of the new born.

Recommendations

Acknowledgment-

Conflict of interest: Nil

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