

VALIDATION OF GESTATIONAL AGE ASSESSMENT IN PRETERM BABIES BY NEW BALLARD SCORE**Md. Ashraful Islam^{*1}, Nazneen Naher², Mamun Miah³ and Mohammad Monir Hossain⁴**¹Associate Professor, Department of Paediatrics, Sheikh Hasina Medical College, Tangail, Bangladesh.²Assistant Professor, Department of Gyanae and Obs, Magura Medical College, Magura, Bangladesh.³Associate Professor, Department of Paediatrics, Bangladesh Shishu (Children) Hospital and Institute, Dhaka, Bangladesh.⁴Assistant Professor, Department of Paediatrics, Sylhet MAG Osmani Medical College, Sylhet, Bangladesh.***Corresponding Author: Md. Ashraful Islam**

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ABSTRACT

Background: Estimation of length of gestation is of critical importance in clinical practice to ensure appropriate management of newborns, specially to pre-term infants. Although history of last menstrual period (LMP) is commonly used to estimate gestational age, this approach is dependent on the mother knowing the first day of her last menstrual period. **Objective:** The aim of the study was to validate the clinical assessment of gestational age by New Ballard Score (NBS) among preterm newborn infants. **Method:** This descriptive cross sectional study was done in the Department of Paediatrics, Dhaka Shishu Hospital, from March 2015 to October 2016. A total of 101 preterm newborn infants of both sexes whose mothers provided exact history of last menstrual history (LMP) and was confirmed by prenatal ultrasonography were included in the study. **Results:** Correlation of gestational age by New Ballard Score (NBS) with confirmed gestational age by last menstrual period (C-GLMP) was found to be statistically significant. Correlation of NBS total score with C-GLMP, total neuromuscular score with C-GLMP, total physical score with C-GLMP and (d) individual criteria scores of NBS with C-GLMP were also done and was found to be statistically significant ($P < 0.05$). **Conclusion:** In conclusion we can say that the clinical assessment by New Ballard Scoring (NBS) is a valid method of assessing gestational age of preterm babies while compared with confirmed gestational age by last menstrual period. Estimation of gestational age by NBS has high clinical utility in preterm babies.

KEYWORDS: Gestational age, ballard score, neuromuscular score.**INTRODUCTION**

In recent years, there has been an increasing interest in the assessment of gestational age in differentiating the preterm from the small for gestational age babies.^[1] The gestational age affects decisions regarding interventions at the limits of viability, influences caregiver's expectations of problems related to organ system immaturity and dysfunction, influences pharmacokinetics of certain drugs and thus influences the time of discharge from the unit. In Bangladesh, reported incidence of Preterm births vary from 31% to 50% in various reports from the community & hospital studies.^[2,3,4,5,6]

Gestational age is usually calculated from the date of mother's last menstrual period. But this date is not known with certainty in a large majority of pregnancies and sometimes it gives misleading information; for example, when menstruations are very irregular or have continued after conception, or when the mother was taking oral contraceptives shortly before conception.

Physical examination is one of the methods used to assess Gestational Age (GA). A detailed description of the physical characteristics of neonates was made in 1966 by both Usher et al^[7] and Farr et al.^[7] At about the same time, it was suggested that neurologic development was the best criterion for determining maturity.^[8]

In 1970 Dubowitz et al^[9] devised a new scoring system of neonatal maturity that combined 10 physical criteria as used by Farr et al^[10] and 11 neurologic criteria from Amiel-Tison.^[11] Again this method was long, cumbersome and time consuming. Several attempts were then made to simplify it. Nearly a decade later, Ballard et al^[12] (1979) devised a scoring system based on 6 of these physical items and 6 neurologic items, this scoring system has widely used. In 1987 Constantine et al^[13] suggested that estimates of postnatal GA, based just on the physical items on the Ballard examination, were more accurate than estimates based on the full Ballard examination or on the neurologic items only. Other investigators have

also tried to improve the method of scoring of GA. A modified version of the Ballard score (New Ballard Score, (NBS) was published in 1991 to improve accuracy of dating of very preterm neonates. By addition of negative score in both neuromuscular and physical maturity of original Ballard score.^[14] New Ballard score (NBS)^[15] has been developed.

Although some methods used postnatally can be helpful when assessing the GA of older babies, significant limitations exist in estimating the GA of infants < 34 weeks gestation. The real problem then is not in the discrepancy that may occur in estimating the GA of infants of 34 to 40 weeks gestations, but in the discrepancy of estimating that of an infant at 22 to 28 weeks gestation. The "New Ballard Score" which included extremely premature infants < 26 weeks gestation^[16] was developed to correct this discrepancy. Despite many modern attempts to address the issue of postnatal GA assessment, there is still no absolute "gold standard", especially for preterm infants.

OBJECTIVE

General objective

The General Objective of the study was to validate the clinical assessment of gestational age by New Ballard Score (NBS) in preterm newborn babies.

Specific objectives

1. To assess confirmed gestational age by menstrual history supported by prenatal ultrasonography;
2. To assess gestational age of preterm newborn infants by New Ballard Score (NBS);
3. To determine the correlation between the assessed gestational age by NBS with confirmed gestational age,

METHODOLOGY

Study Procedure

The procedure of the study was follows:

Study type: Descriptive cross sectional study.

Place and period of study

This study was carried out from March 2015 to October 2016 in Dhaka Shishu Hospital.

Study population: A total of 101 Preterm neonates age ranging from 1-4 days of both sexes were included in the study.

RESULT

Table 1: Demographic data of the subjects (N=101)

Parameters	Frequency	(Percentage)
Gender		
Male	62	(61%)
Female	39	(39%)
Mode of delivery		
LUCS	70	(69%)
Normal	26	(26%)
Forcep delivery	5	(5%)

Selection criteria: m

Inclusion Criteria

- a) Preterm infants whose mothers provided exact history of last menstrual history (LMP).
- b) Gestational age by LMP were confirmed by prenatal ultrasonography (i.e. difference within plus or minus two weeks)
- c) Age: From birth to 96 hours of age.
- d) Sex: Both sexes.

Exclusion Criteria

- a) Preterm infants whose mothers were not sure of LMP.
- b) Preterm infants whose mothers were sure of LMP and had undergone prenatal USG examination but gestational age exceeded by two weeks from each other.
- c) Preterm infants whose mothers gave history of bleeding in the early pregnancy.
- d) Critically ill and preterm with gross congenital anomaly.

Sampling technique: Purposive sample technique was followed.

Data Collection Procedure

Preterm newborn infants of both sexes from birth to 96 hours of age were selected on the basis of inclusion criteria. The data were collected using a pre designed questionnaire by 2 (two). different physician observers: one for history and one for clinical assessment including assessment of gestational age by New Ballard Score.

Statistical Analysis

Data are expressed as mean ± Standard Deviation. Pearson's correlation coefficients were calculated to see the relationship between quantitative variables: gestational age by New Ballard Score (NBS) with confirmed gestational age by Last Menstrual Period (C-GLMP); individual criteria scores of NBS with C-GLMP. Data were managed and analyzed using computer program Statistical Package for Social Science (SPSS) for Windows, version 10.0. A 'p' value less than or equal to 0.05 was considered significant.

Area of residence		
Urban area	45	(45%)
Rural area	56	(55%)
Place of delivery		
Tertiary level Hospital	76	(75%)
Home	21	(21%)
Community Maternity Clinic	4	(4%)
Birth weight (kg)		
<1.5kg	50	(50%)
1.5 -2.5 kg	51	(50%)

LUCS= lower uterine caesarean section

Of the assessed babies 70 were born by lower uterine caesarean section (LUCS), 26 were born normally and 5 were born by forcep delivery (Fig-6.2). Fifty-six newborn came from rural area and 45 from urban area.

All babies were found to be *low birth weight*, of them 50 were <1.5 kg and 51 were between 1.5 - 2.5 kg (Fig-6.3); 76 babies were delivered at tertiary level hospital, 21 at home and 4 at community maternity clinic (Table 6.1).

Table 2: Gestational age of the subjects (N=101)

Parameters Range	Value(weeks) Mean ± SD	
	Gestational age by LMP	32.3 + 1.9
Gestational age by ultrasonography	32.2 + 2.0	28-36
Gestational age by NBS	31.2 + 2.6	26-36

LMP= last menstrual period, NBS= New Ballard Score

Correlation of gestational age by New Ballard Score with gestational age by Last Menstrual Period confirmed by USG(C-GLMP)

Table 3: Correlation of New Ballard Score with confirmed-gestational age by last menstrual period (C-GLMP)

Variables	r	p
New Ballard Score (NBS) with C-GLMP	0.75	<0.001
<i>Neuromuscular maturity by NBS with C-GLMP</i>		
Total neuromuscular score	0.55	<0.001
Posture score	0.46	<0.001
Square window (wrist) score	0.64	<0.001
Arm recoil score	0.50	<0.001
Popliteal angle score	0.42	<0.001
Scarf sign score	0.49	<0.001
Heel to ear score	0.51	<0.001
<i>Physical maturity by NBS with C-GLMP</i>		
Total Physical score	0.58	<0.001
Skin score	0.31	0.002
Lanugo score	0.57	<0.001
Planter surface score	0.48	<0.001
Breast score	0.72	<0.001
Eye/Ear score	0.57	<0.001
Genetalia score	0.48	<0.001

r=correlation coefficient

C-GLMP =Confirmed Gestational age by Last Menstrual Period

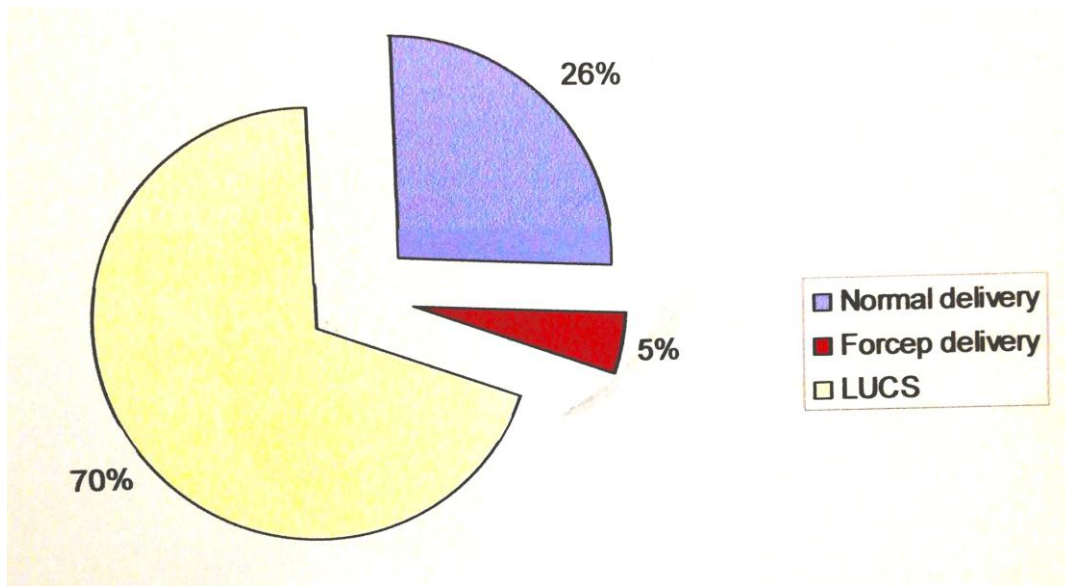


Fig. 1: Mode of delivery of assessed babies.

Of the assessed babies 70 were born by lower uterine caesarian section (LUCS), 26 were born normally and 5 were born by forcep delivery (Fig-1).

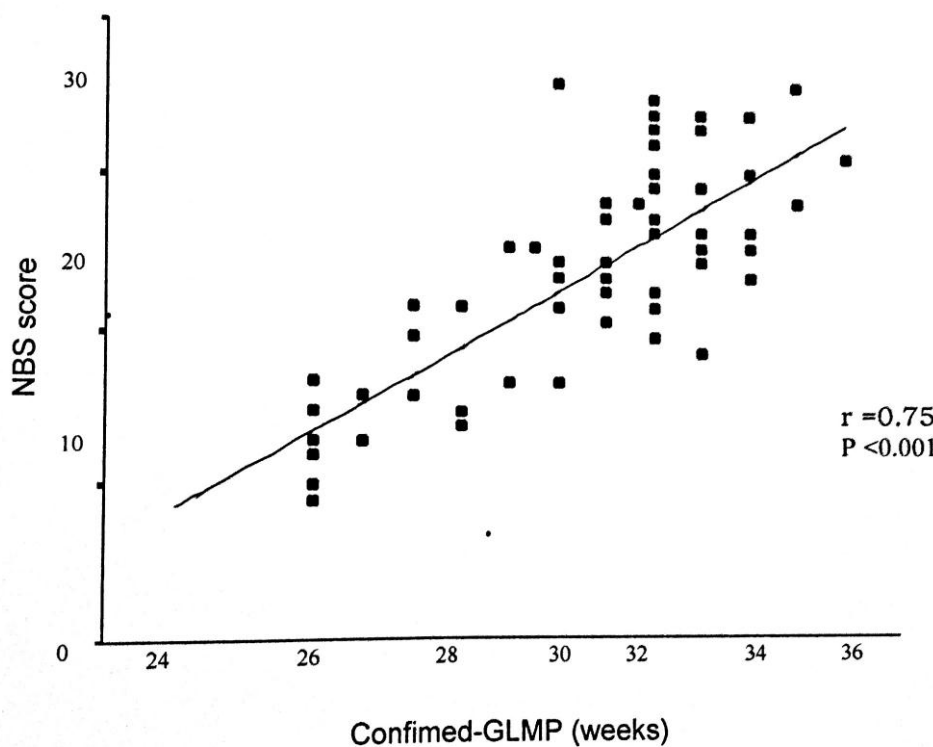


Fig.2 Correlation of New Ballard Scorewithconfirmed- GLMP.

GLMP = Gestational age by Last Menstrual Period

DISCUSSION

The clinical assessment of gestational age in preterm newborn babies is very important as it helps in their management. When mothers are not sure of their last menstrual period and a prenatal ultrasonographic report is not available, clinical assessment is the only way to

know the gestational age of a newborn. Apart from distinguishing between the preterm, term and light for date mature infant, the value to assess gestational age lies in helping the health care staff working in the neonatal unit to optimize management, and giving parents an idea about the probable outcome of their babies. The clinical

assessment of gestational age by scoring system was started about four decades ago.^[17,18]

New Ballard Score (NBS) is a modification of original Ballard Method^[16] and it has been widely used. Literature search reveals that, in Bangladesh, none of the methods of assessing gestational age, particularly using NBS, has been evaluated to assess its applicability among preterm babies in this country.

Babies of both sexes were included, but males (61%) were more than the females (39%). As the gestational age assessment by New Ballard method is independent of gender difference all the consecutive cases fulfilling the inclusion criteria were enrolled irrespective of sex.

The commonest mode of delivery was LUGS (70) followed by normal vaginal delivery (26) and Forcep delivery (5). As place of study was a tertiary level hospital, most of the patients came here as referred patients.

The babies were more from rural (59%) than urban (41%) background. Babies from rural background are referred for better facilities in the tertiary/ super specialized hospital. Babies from urban background are initially treated in urban modern clinics (some with paediatric/neonatal facilities) and thus only very complicated cases are referred to such tertiary/ super specialized hospital.

As common with preterm babies all the babies assessed were of low birth weight. About half (49%) of the babies were very low birth weight (>1.5 kg). So the validity of NBS was tested in babies of wide range of birth weight.

This study shows that there is significant correlation between confirmed gestational age and gestational age assessed by NBS. However, the extent of correlation found in this study ($r=0.75$) is less than that described by Ballard *et al.*¹⁸ ($r=0.96$). The cause of this difference in our study is not known but it may be due to smaller sample size. The presence of correlation supports that NBS can be used effectively to assess gestational age among preterm newborn babies.

CONCLUSION

In conclusion we can say that the clinical assessment by New Ballard Scoring (NBS) is a valid method of assessing gestational age of preterm babies while compared with confirmed gestational age by last menstrual period.

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