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Assessment of Gestational Age among Bangladeshi New Born Infant by New Ballard Score

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Abstract **Original Research Article**

Background: Assessment of gestational age is important in clinical practice to identify infants at risk for morbidity and mortality related to their gestational age. Globally, LMP date is uncertain or unknown in 20% of pregnant women. In most developing countries, the majority of women are uncertain about LMP and are more likely to be late attendees for prenatal care. In Bangladesh, assessment of gestational age by using NBS, has not been evaluated. ***Aim:*** The aim of the study was to validate New Ballard Score (NBS) for assessment of gestational age among Bangladeshi newborns. ***Methodology:*** This descriptive cross-sectional study was conducted in the Department of Paediatrics and in the Department of Gynaecology & Obstetrics, Dhaka Medical College Hospital, from January 2014 to June 2014. A total of 100 newborns of both sexes (whose mothers provided exact history of last menstrual period (LMP) and confirmed by prenatal ultrasonography) were included in the study. Prenatal ultrasonography was performed in 17 ± 10 weeks (mean ± SD) of gestation. Informed consent was taken from all the mothers. Gestational age of the babies was determined on the basis of New Ballard Score. Confirmed gestational age by Last Menstrual Period (C-GLMP) was defined as gestational age by Last Menstrual Period confirmed by agreement within two weeks with gestational age by prenatal ultrasonography. The study included assessment of gestational age of newborns by New Ballard Score (NBS), by menstrual history & assessment of confirmed gestational age by menstrual history and by prenatal ultrasonography. Comparison was made between assessed gestational age by NBS and confirmed gestational age by (both LMP and USG) in cases of both preterm and term newborns. Assessed gestational age by NBS and assessed gestational age by menstrual history were also compared with gestational age assessed by USG. ***Results:*** The mean (±SD) age of babies examined were 29.6 (±15.2) hr and range 0.5-94 hr. Out of 100 newborns, 57 were male and 43 were female. Twenty-nine were born preterm, 70 were term and one was post term. Of the assessed babies 69 were born by lower uterine caesarean section (LUCS), 26 were born normally and 5 were born by forcep delivery. Eighty-seven newborn came from urban area and 13 from rural area. Seventy-seven of assessed babies were born in tertiary level hospital, 19 were born at home and 4 were born in community maternity clinic. Twenty two babies were found to be low birth weight; of them 3 were <1.5 kg and 19 were between 1.5-2.5 kg. The birth weights of 78 were 2.5 kg. The mean (±SD) gestational age by last menstrual period (LMP) was 37.5 (± 3.2) weeks and range 29 to 43 weeks. The mean (±SD) gestational age by ultrasonography was 37.2 (± 2.8) weeks and range 30 to 43 weeks. ***Conclusions:*** The conclusions of the study are a) The clinical assessment of gestational age by New Ballard Score (NBS) is a valid method for estimating gestational age of both preterm and term babies: b) Accurate menstrual history when available, gives more accurate estimation of gestational age than that by NBS. c) Estimation of gestational age by NBS has higher clinical utility in preterm babies.

Keywords: Gestational age, new ballard score, morbidity.

INTRODUCTION

Assessment of gestational age (GA) in newborn infants is a common practice in neonatal department and several scales based on physical and neurological criteria have been developed for this purpose [1]. Estimation of length of gestation is of critical importance in clinical practice to ensure appropriate management of newborns and to distinguish pre-term from term infants. Knowledge of gestational age assists in the identification of infants at risk for morbidity and mortality related to their gestational age and nutritional status. Low birth weight, a common problem in developing countries is due to either short gestation or to being small or light-for-date [2]. Clinical problems encountered with short gestation (pre-term) are different from those experienced in small-for-date infants [3]. Pre-term infants whose birth weights match

their gestational age are at risk of hyaline membrane disease and infection, while small-for-date babies whether pre-term or term, are more often liable to suffer form asphyxia and hypoglycemia during the course of labour and immediately post-delivery [4].

Although LMP is commonly used to estimate gestational age, this approach is dependent on the mother knowing the first day of her last menstrual period.

Globally, LMP date is uncertain or unknown in 20% of pregnant women [5]. In developed countries women enroll early for pre- natal care and advanced technological techniques such as ultrasound can be used to assist ascertainment of gestational. Breastfeeding women might not have menstruated before the current pregnancy. Even ultrasound were readily available, measurement taken late in pregnancy are less reliable in assessing gestational age [6].

Alternative, less technologically oriented methods have been developed to assess gestational age based on the development status at birth. One method commonly used to estimate gestational age was designed pregnancy by Dubowitz et al in 1970 and found to be reliable in several countries [7].

By searching literature, it is evident that the use of New Ballard Score has not been evaluated in Bangladeshi population. This study aimed to evaluate the usefulness of NBS to assess gestational age among Bangladeshi newborn babies.

OBJECTIVE

General Objective

The aim of the study was to validate New Ballard Score (NBS) for assessment of gestational age among Bangladeshi newborns.

Specific Objectives

a. To assess gestational age of newborn infants by New Ballard Score (NBS).
b. To assess gestational age of newborn infants by menstrual history.
c. To assess confirmed gestational age by menstrual history and by prenatal ultrasonography.

METHODOLOGY

Study Procedure: The procedure of the study was follows.

Study type: Descriptive cross sectional

Place and period of study

The Department of Paediatrics and the Department of Gynaecology & Obstetrics, Dhaka Medical College Hospital. This study was carried out 6 months, from January 2014 to June 2014.

Study Population

A total of 100 cases were included on the basis of inclusion criteria. After enrollment, gestational age of the babies was determined on the basis of New Ballard Score.

SELECTION CRITERIA

Inclusion Criteria

a) Newborn infants of all gestational ages whose mothers provided exact history of last menstrual history (LMP).
b) Gestational age by LMP was confirmed by prenatal ultrasonography (at 17 ± 10 weeks of gestation).
c) Age: From birth to 96 hours of age (according to New Ballard Scoring system.
d) Sex: Both sexes.

Exclusion Criteria

Newborn infants whose mothers:

a) were not sure of LMP had not undergone prenatal USG examinations for assessing gestational age.
b) Were sure of LMP but had not undergone prenatal USG examination.
c) Were sure of LMP and had undergone prenatal USG examination but gestational age exceeded by two weeks from each other.

Data Collection procedure

Newborn infants of both sexes from birth to 96 hours of age were selected on the basis of inclusion criteria. A preset questionnaire regarding particulars of the baby, problems, perinatal history, clinical findings etc. was filled up. Thereafter each baby's gestational age was evaluated according to New Ballard Scoring system which includes neuromuscular maturity and physical maturity (Appendix-II). All procedures were performed in day light for a baby who was awake and calm.

Statistical Analysis

Data are expressed as mean + Standard Deviation. Pearson's correlation coefficients were calculated to see the relationship between quantitative variables: a) gestational age by New Ballard Score (NBS) with confirmed gestational age by Last Menstrual Period (C-GLMP); b) individual criteria scores of NBS with C-GLMP; c) gestational age by menstrual history with gestational age by ultrasonography; d) gestational age by NBS with gestational age by ultrasonography; e) gestational age by NBS in preterm babies with C-GLMP; f) gestational age by NBS in term babies 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.

RESULTS

Seventy-seven of assessed babies were born in tertiary level hospital, 19 were born at home and 4 were born in community maternity clinic (Table-I). Twenty-two babies were found to be low birth weight; of them 3 were <1.5 kg and 19 were between 1.5-2.5 kg. The birth weights of 78 were 2.5 kg.

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

Parameters	Value	Range
Gender		
Male	57	
Female	43	
Maturity		
Preterm	29	
Term	29	
Post term	1	
Mode of delivery		
LUCS	69	
Normal	26	
Forcep delivery	5	
Area of residence		
Urban area	77	
Rural area	19	
Community Maternity Clinic	4	
Birth weight (kg)	2.6+0.54*	1.2-3.6
<1.5 kg	3	
1.5 -2.5 kg	19	
>2.5 kg	78	

*value expressed as mean± SD; LUGS= lower uterine caesarean section

The mean (+SD) gestational age by last menstrual period (LMP) was 37.5 (+ 3.2) weeks and range 29 to 43 weeks. The mean (+SD) gestational age by ultrasonography was 37.2 (+ 2.8) weeks and range 30 to 43 weeks. The mean (±SD) gestational age by New Ballard Score (NBS) was 37.4 (+ 2.9) weeks and range 29 to 43 weeks (Table II).

Table II: Gestational age of the subjects (N = 100)

Parameters	Value	(weeks)
	Mean± SD	Range
Gestational age by LMP	37.5+3.2	29-43
Gestational age by ultrasonography	37.2+2.8	30-43
Gestational age by NBS	37.4+2.9	29-43

LMP= last menstrual period, NBS= New Ballard Score,

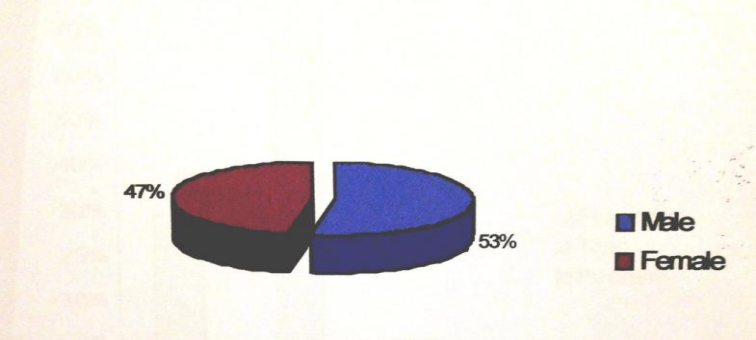

Fig 1: Sex distribution of assessed new born

The mean (±SD) age of babies explained were 29.6(±15.2) hr and range 0.5-94 hr. Out of 100 newborns 57 were male and 43 were female (Fig 1).

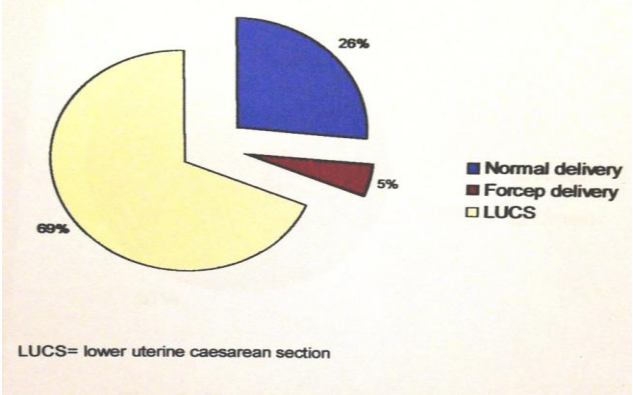

Fig 2: Mode of delivery of assessed babies

Of the assessed babies 69 were born by lower uterine caesarean section (LUCS), 26 were born normally and 5 were born by forcep delivery (Fig 2).

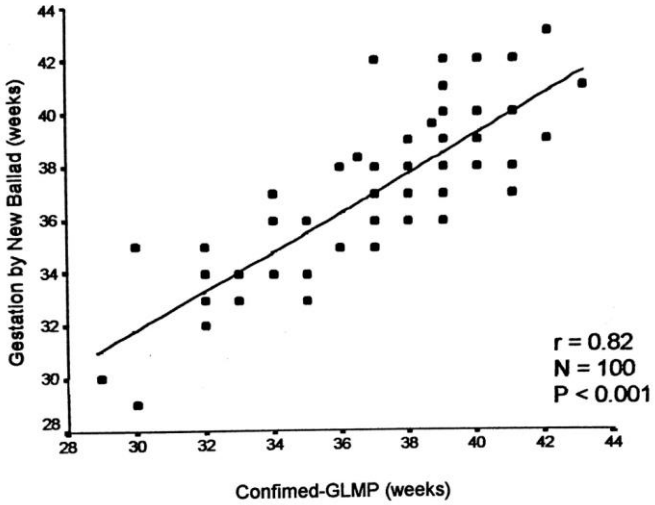

Fig 3: Correlation between gestational age by New Ballard Score and confirmed – GLMP
GLMP = Gestational age by Last Menstrual Period

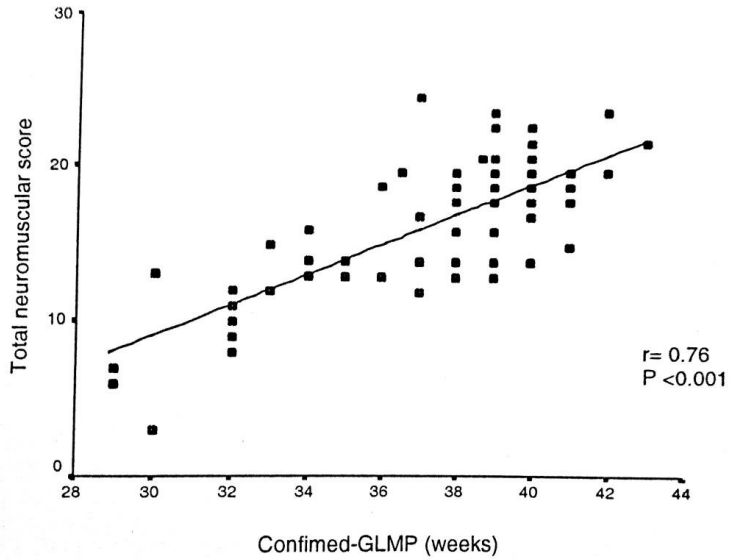

Fig 3: Correlation of New Ballard Score with confirmed GLMP
GLMP = Gestational age by Last Menstrual Period

Table-III: Correlation of New Ballard Score and its individual criteria scores with confirmed-gestational age by last menstrual period (C-GLMP)

Variables	r	p
New Ballard Score (NBS) with C-GLMP	0.82	<0.001
Neuromuscular maturity by NBS with C-GLMP		
Total neuromuscular score	0.76	<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
Physical maturity by NBS with C-GLMP		
Total Physical score	0.73	<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

Table-IV: Correlation of gestational age By NBS and by menstrual history with gestational age by ultrasonography

Variables	r	p
Gestational age by NBS in preterm babies with C-GLMP	0.74	< 0.001
Gestational age by NBS in term babies with C-GLMP	0.34	< 0.001
Gestational age by NBS in all newborn babies with C-GLMP	0.82	< 0.001

r = correlation coefficient,
NBS =New Ballard Score =, C-GLMP= confirmed gestational age by Last Menstrual Period

DISCUSSION

(i) The clinical assessment of gestational age in newborn babies is very important as it helps in their management [8]. 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 optimise management, and giving parents an idea about the probable outcome of their babies. The clinical assessment of gestational age by scoring system was started more than three decades [9].

(ii) The present study was designed to assess the gestational age of new born infant by using NBS, which will help the clinician about its usefulness and applicability regarding assessment of gestational age among our children and thus ensure more scientific management of this group of infants.

Estimation of gestational age based on either physical (r=0.73) or neurological (r=0.76) criteria of NBS alone was found to correlate with confirmed gestational age to a similar extent. However, the combination of both types of criteria showed better (r=0.82) correlation with confirmed gestational age, although Constantine *et al*., [10] have shown that physical part of the Ballard scale is more accurate than the neurological part. The cause of this discrepancy may be that he worked with low-birth-weight babies *only* and with a large sample size of 1246. But in this study sample size is 100 where low birth weight is 22 only.

The correlation of individual criteria of NBS with confirmed gestational age was found statistically significant like that of Ballard *et al*., [11]. But the correlation of individual criteria in this study ranged from 0.31 to 0.72, which varied widely in comparison to original NBS study where it was between 0.71 to 0.82. This may be due to large sample size (n=578) including extremely preterm infants of <26 weeks by Ballard *et al*., [11] of gestation but in this study none of the newborn enrolled was found to be <26 weeks of gestation.

In comparing gestational age by menstrual history and that by NBS respect of gestational age by ultrasonography, it was found that both gestational age by menstrual history and that by NBS have significant correlation with gestational age by ultrasonography (which) is considered to be most accurate [12].

This study shows that NBS is a valid and acceptable method for estimating gestational age in both preterm and term newborn babies. In preterm babies gestational age by NBS shows stronger correlation with confirmed gestational age than term babies. Thus NBS may assess preterm babies more accurately. This indicates its high clinical utility in preterm infants.

CONCLUSIONS

The clinical assessment by New Ballard Scoring (NBS) is a valid method of assessing gestational age of newborn while compared with confirmed gestational age by last menstrual period and with gestational age by ultrasonography alone. Exact menstrual history, when available, gives more accurate estimation of gestational age than that by NBS while compared with gestational age by ultrasonography alone. Gestational age estimation by NBS is valid for both preterm and term babies between 29 to 43 weeks.

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