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Original Research Article

Comparison of gestational age assessment by new ballard score and parkin score in neonates

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ABSTRACT

Background: In newborn, both normal and sick, gestational age (GA) is important to evaluate the risks of morbidity and mortality and may modify the line of management. The objective of the present study was to compare the New Ballard Score (NBS) and Parkin's score in estimating GA among normal neonates, sick neonates.
Methods: Observational analytical study of 500 neonates, who qualified the selection criteria. GA estimated by Naegele's rule (G-LMP), NBS and Parkin score. Data collected and analysed by SPSS 21.
Results: The mean gestational age as estimated by last menstrual period was 37.7 weeks; NBS- 37.66 weeks, Parkin score-37.7 weeks. Mean difference between the two scores estimating GA in all neonates was 3.75 days, in normal neonates- 3.61 days, sick neonates-3.7 days. NBS and Parkin score were calculated in both groups, had strong positive correlation (p value <0.05) with G-LMP. GA calculated using NBS and Parkin score had a strong positive correlation (p value <0.05). in all sick neonates except HIE-3 and RDS, NBS had significant correlation with G-LMP, but Parkin score had significant correlation with all. The mean difference between the two scores with RDS and HIE-3 was 11.64 days. Total crying episodes in NBS were 334 and Parkin score were 124. Mean time taken to complete NBS was 5 min 33 sec and Parkin score was 1 min 36 sec.
Conclusions: GA of sick neonates with HIE-3 and RDS were better assessed by Parkin score. Parkin score caused less discomfort to neonates.

Keywords: Gestational age, New Ballard Score, Naegele's Rule, Parkin's Score

INTRODUCTION

In a newborn infant, it is essential to know the correct gestational age (GA), so as to evaluate the risks of morbidity and mortality. Knowledge of gestational age may modify the line of management and prognosticatio1. It becomes more important to know the exact gestational age of sick neonates as they are sensitive to even minor change in lines of management such as doses of intravenous fluid and medications.[1] The methods to assess the gestational age in a newborn infant is by calculation from mothers last menstrual period, antenatal sonography, clinical examination, electroencephalogram, ophthalmic examination.[2] The date of last menstrual period is not known to a significant minority of mothers who do not recall exactly.[1] In others, it gives misleading information for example when menses are very irregular or have continued after conception or when the mother was taking oral contraceptives shortly before conception. There is clearly a need in clinical practice for method of estimating gestational age.[1] Antenatal ultrasonography has not penetrated in to the roots of rural population to be

widely used. So is the case with electroencephalogram and ophthalmic examination.

In like resource limited settings, like in India clinical examination remains a important method to estimate the gestational age.[3] Historically there are many researchers who proposed number of scores to clinically each with their own advantages and disadvantages. The two methods that are commonly used clinically, for assessment of gestational age arethe New Ballard Score and Parkin score, proposed in 1991 and 1976 respectively. The New Ballard score (NBS) is primarily used to assess the gestational age in most of the neonatal units. Many of the neurologic criteria are difficult to assess in sick infants or those in incubators.[3] The Parkin's score (PS) uses only four external characteristics i.e. skin texture, skin colour, ear firmness and breast size.[1] This study compared the accuracy of Parkin's score and NBS in assessing the gestational age of the sick neonates so that the errors caused by NBS due to impaired neurological states were identified. Each parameter were examined and scores were assigned as per the charts available.

The objectives of the present study were to compare the New Ballard Score and Parkin's Score in estimating the gestational age in neonates, to compare the New Ballard Score and Parkin's Score in healthy and sick neonates, to compare the New Ballard Score and Parkin's Score in different morbid conditions.

METHODS

Setting: postnatal wards, mother wards and Special Newborn Care Unit of Department of Pediatrics, Kamlaraja Hospital, Gajra Raja Medical College, Gwalior. The study was a hospital based prospective analytical study with 500 newborns with the duration of one year.

Inclusion criteria

- Neonates whose mothers were knowing date of last menstrual period

Exclusion criteria

- Neonates whose mothers had irregular menstrual cycles, conceived when taking oral contraceptive medications.
- Neonates with major congenital malformations
- Neonates born to mothers who had received any drug causing neonatal CNS depression
- Neonates whose parents did not give consent

Methodology

The cases were enrolled as per the inclusion criteria. Informed consent of parents were taken. The date of last menstrual period (LMP) is enquired from the mother and recorded in the proforma. The GA was calculated by using LMP by Naegele's rule (G-LMP). The presence or absence of morbidities is assessed and recorded. Then NBS and Parkin score were done on the enrolled subjects as per the procedure, with angles such as square window, popliteal angle was measured by goniometer. Scores were calculated, and corresponding GA given in the chart were assigned. The time taken during each examination was noted and also the number of crying episodes during the examination were recorded. After collecting all the above said data, comparison was made among different sets of data like correlation between G-LMP and NBS; G-LMP and Parkin score, NBS and Parkin score; time taken for NBS and Parkin score, crying episodes during NBS and Parkin score.

Statistics

Pearson correlation was calculated to know the degree of correlation between Parkin score and NBS. The descriptive data of both the scores were plotted in Bland-Altman plot.[4] Chi-square tests applied such as Pearson Chi-square, likelihood ratio and Linear- by- linear association for crying episodes of the two scores. For difference in mean student's t test was applied.

A p value of less than 0.05 was considered statistically significant. Descriptive analysis was carried out to describe categorical variables in terms of percentages and continuous variables in terms of mean and standard deviation. All analysis was carried out in SPSS version 21.

RESULTS

The total neonates in the study were 500, in which normal neonates were 223 (44.6%) and those with morbidities were 277 (55.4%). The basic characteristics of subjects are mentioned in Table 1. All the neonates were examined from birth to 109 hours of life. The mean age of examination 35.56 hours. Birth weight of neonates examined were from 750 gm to 4200 gm and the mean birth weight was 2435.80 gm.

Table 1: Basic characteristics of subjects.

Characteristics	No.	Percentage
Male	273	54.6
Female	227	45.4
IBN	271	54.2
OBN	229	45.8
>2500 g	263	52.6
1500-2499 g	184	36.8
1000-1499 g	47	9.4
<1000 g	6	1.2
Normal vaginal delivery	407	81.4
LSCS	93	18.6
Normal newborn	273	54.6
Sick newborn	227	45.4

The mean gestational age as estimated by LMP was 37.7 weeks; by NBS was 37.66 weeks; by Parkin score was 37.7 weeks. Mean difference between the two scores estimating gestational age was 3.75 days. In normal neonates the mean difference was 3.61 days. But in sick neonates it was 3.7 days.

Among the co morbidities, majority were birth asphyxia which constituted 129 (25.8%) and prematurity which constituted 71 (14.2%), neonatal sepsis 67 (13.4%). Correlation between New Ballard Score and Parkin score was calculated in both normal neonates and it was observed that it had strong positive correlation.

For normal neonates, Pearson correlation for Ballard score with gestational age estimated by Last menstrual Period is 1 and with Parkin score 0.733. So, the correlation was significant (p value <0.05). Gestational age calculated using NBS and Parkin score were also compared, and strong positive correlation was observed was observed among it. Pearson correlation for NBS was 1 and Parkin score was 0.897 and it was significant (p<0.05).

The two scores are compared in each morbidity separately and correlation was calculated.

It was observed that in morbidities such as septicemia, HIE-1 (mild), HIE-2 (moderate), Preterm (excluding RDS) there was strong correlation (p value <0.05), whereas HIE-3 (severe) and RDS in which the correlation was positive but not significant (p value >0.05). the mean difference in estimating gestational age between between the two scores in neonates with RDS and HIE-3 was 11.64 days. Table 2 depicts correlation of G-LMP with NBS and Parkin score.

Table 2: Pearson's correlation of NBS and Parkin score.

Characteristics of neonates	Pearson's correlation nbs	Pearson's correlation parkin score	P value
Normal neonates	1	0.142	<0.05
Sick neonates			
EOS	1	0.607	<0.05
NNHB	1	0.900	<0.05
HIE-1	1	0.500	<0.05
HIE-2	1	0.558	<0.05
HIE-3	1	0.478	>0.05
RDS	1	0.420	>0.05

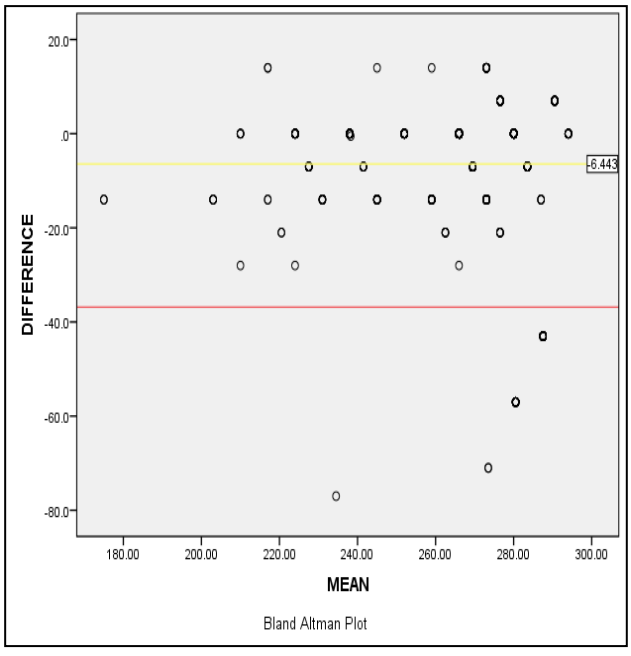

Figure 1: Bland Altman plot of the average and difference between the NBS and PS along with the limits.

Crying episodes in both groups were compared. Number of neonates that cried during NBS examination were 221 (44.2%) but during Parkin score examination were only 116 (23.2%).

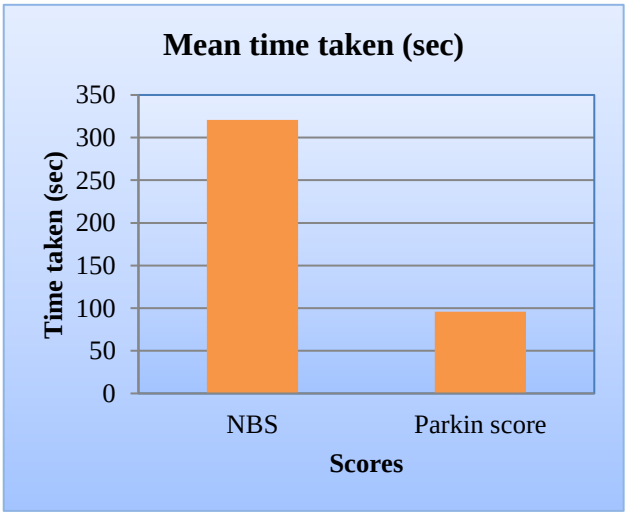

Figure 2: Time taken for NBS and Parkin score.

Total crying episodes in NBS were 334 and Parkin score were 124. Pearson chi square test was applied, and the value was 10.798.

Bland-Altman plot was plotted based on the categorical values obtained and the mean was found to be -0.6443 and standard deviation was 15.5120.[4] The p value was <0.05 and it was highly significant. It means the two scores were statistically significant from each other in interpretation.

It rejects the null hypothesis of no difference between the two methods. The scatter plot is scatter plot is shown below.

Time taken for performing both the tests were recorded and compared. mean time taken to complete NBS examination was 320.62 seconds (5 min 33 sec) and Parkin score was 95.92 seconds (1min 36 sec.).

Range of time taken were varied from 240 seconds to 470 seconds depending on crying episodes.

DISCUSSION

Parkin et al. assessed the accuracy of various physical characteristics in comparison to neurological criteria used in the Dubowitz score.[1] They recommended a score consisting of four physical characteristics to assess the gestational age of neonates. In 1979, Ballards, et al. modified dubowitz score to develop a simplified score for assessment of fetal maturation of newly born infants.[5] In 1991, Ballard score was extended to include extremely premature neonates and it was named New Ballard Score.[6] Present study compared the gestational age estimation by both New Ballard score and Parkin score and found that it had a strong positive correlation. Similar observations were observed by Kavita et al.[3]

Gestational age were assessed by examination at a mean age of 35.56 hours to minimize errors due to advancing gestational age causing changes in the physical characteristics such as skin texture, skin colour, planter surface, lanugo though New Ballard score was validated to use upto seven days of life (Sasidarshan K et al).[7]

The minimum score for Parkin score was two which corresponds to gestational age of 30 weeks. There is uncertainty in the confidence of gestational age that can be assessed when scores are two or less. 97% confidence limit for prediction of GA from sum of the scores for the 4 most reliable characteristics in the study done by Parkin et al. Was +15 days.[3] This finding was similar in the present study.

Bland-Altman plot was plotted to know the agreement between two scores and it was found that there is similarity and most of the values were found within the limits of agreement.

It is proposed the the sick neonates especially neonates with perinatal asphyxia and prematurity should be handled to minimal as it may cause agitation and may increase intracranial pressure in neonates with asphyxia and subsequently leading to seizures and may contribute to poor neurological outcome; preterm low birth weight neonates have risk of intraventricular haemorrhage on vigorous handling.[8] All neonates both normal and sick have risk of acquiring sepsis in handled unnecessarily for prolonged period of time. New Ballard score is causing more discomfort to neonates than Parkin score as evidenced by significantly increased number of crying episodes and prolonged period of examination. In normal neonates, Parkin score gestational age correlated well with LMP-GA but was less accurate when compared with NBS. In sick neonates having morbidities of HIE-3, and RDS, NBS did not correlate significantly (p value >0.05) with Parkin score and with the gestational age by LMP-GA, but Parkin score correlated significantly (p value <0.05). this finding is similar to that observed by Indra et al.[9]

CONCLUSION

NBS and Parkin score both are used for gestational age assessment in neonates. GA of sick neonates with HIE-3 and RDS were better assessed by Parkin score. Parkin score caused less discomfort to neonates and takes less time to perform. In resource limited setting where Doctor-Patient ratio is very less Parkin score can be used to assess GA with reasonable accuracy.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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