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# Neuro-Behavioural Pattern of Newborn Babies in Relation to Gestational Age and Birth Parameters in a Tertiary Care Centre

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**Abstract**
Routine clinical examination in neonatal care facilities is the first method through which newborns (in first 28 days of life), were identified as having CNS and neurobehavioral development problems1. The Brazelton Neonatal Behavioural Assessment Scale (NBAS) was used in evaluating behaviour of newborn babies2. This study was planned to establish the differences in neuro behavioural pattern in newborn babies in relation to gestational age, birth weight, mode of delivery and gender. To determine the association of Neuro behavioural Pattern of newborn babies in relation to Gestational age, Birth weight, mode of delivery and gender In this Cross-Sectional Study, 40 New-born babies are assessed within 72hrs of birth. Gestational age noted based on LMP and USG. Weight is noted using digital weighing scale. Neuro behavioural pattern was assessed using NBAS. Descriptive analysis was carried out by mean, median, standard deviation, minimum and maximum for quantitative variables, frequency and proportion for categorical variables. Among the study population, statistically significant parameters were gestational ages =37 weeks ($p<0.05$), Birth weight ($p<0.05$), mode of delivery ($p<0.05$), There was no significant association with gender ($p>0.05$). There was a statistically significant association with gestational age and birth weight in most of the neurobehavioral items studied. This is especially useful in 'At Risk babies', who may need early stimulation and early intervention. Those with lower scores can be identified and followed up with extra care and stimulation.

## INTRODUCTION

Routine clinical examination in neonatal care facilities is the first method through which newborns (in first 28 days of life), were identified as having CNS and neurobehavioral development problems[1]. At least one of three primary aims is usually present in newborn assessments: To identify high-risk infants with CNS and neurobehavioral disorders who require therapy and/or intervention, to assess developmental progress in response to NICU interventions and family-centred therapies and/or To predict long-term neurodevelopmental outcomes[1]. The Brazelton Neonatal Behavioural Assessment Scale (NBAS) is used in evaluating behaviour of newborn babies[2]. This study was planned to compare the NBAS between term and preterm babies and also the relation with gestational age, birth weight, mode of delivery and gender. Significant differences were observed in the NBAS in relation to gestational age, birth weight, a few differences with respect to mode of delivery and none with gender. This study gave insight into the various neurobehavioral profile, that can predict future neuro developmental outcome. This study also helped to establish the differences in neuro behavioural pattern in newborn babies in relation to gestational age, birth weight, mode of delivery and gender.

**Objective:** To determine the association of Neuro behavioural Pattern of newborn babies in relation to Gestational age, Birth weight, mode of delivery and gender

## MATERIALS AND METHODS

In this Cross Sectional Study, 40 New-born babies were assessed within 72hrs of birth, were recruited irrespective of gestational age. Sick babies admitted in NICU and newborns with congenital malformation and chromosomal defects were excluded. Informed consent taken from the mother and IEC approval obtained. Gestational age noted based on LMP and USG. Weight was noted using digital weighing scale. NBAS was assessed using NBAS kit, that contains a red ball, a rattle, a bell, a foot probe and a torch and scoring chart. The data analysed using SPSS version 20.1.Descriptive analysis was carried out by mean, median, standard deviation, minimum and maximum for quantitative variables, frequency and proportion for categorical variables

## RESULTS AND DISCUSSIONS

In this study a total of 40 newborns, in which 50% babies were term and 50% babies were preterm

Among the study population, 62.50% of the babies were Appropriate for gestational age and 37.50% of the babies were small for gestational age.

Among the study population, the mean gestational age was 36.5±3.53 weeks, the mean age of new born baby was 1.23±1.12 days, the mean birth weight was 2487.63±627.43 grams, the mean length was 48.05±1.94 cm and the mean head circumference was 32.49±1.45 cm

Among the study population, the following were statistically significant between gestational ages = 37 weeks and<37 weeks. The median difference of habituation parameters (Response decibel to Light, Response decibel to Rattle)-P<0.05. The median difference of social interactive parameters (Animate Visual)-P<0.05. The median difference of motor system parameters (Defensive)-P<0.05. The median difference of state organization parameters (Peak of Excitement)-P<0.05. The median difference of State regulation parameters (Cuddliness, Hand to Mouth)-P<0.05. The median difference of Autonomic system parameter (Tremulousness, Startles, Lability of Skin Colour)-P<0.05. The median difference of ssupplementary items parameter (Quality of Alertness, Examiner Facilitation)-P<0.05.

Among the study population, the following were statistically significant between Birth weight, = 2.5 kg and <2.5 kg. The median difference of habituation parameter (Response decibel to Light, Response decibel to Rattle)-P<0.05. The median difference of social interactive parameter (Animate Visual and Auditory, Inanimate Visual and Auditory) P<0.05. The median difference of motor system parameter (Pull to Sit, Defensive, Activity Level)-P<0.05. The median difference of state organization parameter (Peak of Excitement, Irritability)-P<0.05. The median difference of State regulation parameter (Cuddliness, Self-Quieting)-P<0.05. The median difference of Autonomic system parameter (Tremulousness, Startles, Lability of Skin Colour)-P<0.05. The median difference of ssupplementary items parameter (Quality of Alertness, Examiner Facilitation, General Irritability)-P<0.05).

Among the study population, the median difference of State organization parameter (Lability of States) was statistically significant in relation to the mode of delivery-P<0.05

Among the study population, the outcome variables namely the median difference of habituation parameter, social interactive parameter, Motor system parameter, State organization parameter, State regulation parameter, Autonomic system parameter, Supplementary items parameter and reflexes between males and females were not statistically significant. (P>0.05)

This was a unique study comparing NBAS in relation to birth weight, gestational age, mode of delivery and gender. This study has many similarities as well as certain differences when compared with previous studies, implying the effect of gestational age and birth weight and socio-cultural differences in relation to maternal experiences and behaviours

**Table 1: Distribution of newborn babies according to birth weight (n=40)**

| Parameter | Frequency | Percentage |
|---|---|---|
| <2500g | 19 | 47.5% |
| ≥2500g | 21 | 52.5% |
| Total | 40 | 100% |

**Descriptive analysis of SGA/AGA in the study population (n=40)**

| SGA/AGA | Frequency | Percentages |
|---|---|---|
| Appropriate for gestational age (AGA) | 25 | 62.50% |
| Small for gestational age (SGA) | 15 | 37.50% |

**Descriptive analysis of Study variables and Anthropometry in the study population (n=40)**

| Parameter | Mean ± SD | Median | Minimum | Maximum |
|---|---|---|---|---|
| Gestational Age (Weeks) | 36.5±3.53 | 37.00 | 30.00 | 41.00 |
| Age in Days | 1.2 ±1.12 | 1.00 | 0.00 | 3.00 |
| Birth Weight in Grams | 2487.62±627.43 | 2594.00 | 1616.00 | 3464.00 |
| Length (Cm) | 48.05±1.94 | 48.66 | 44.06 | 50.68 |
| Head circumference(cm) | 32.49±1.45 | 33.27 | 29.85 | 34.00 |

**Comparisons of outcome variables in relation to Gestational age in weeks (n=40)**

| | Gestational Age (Weeks) | | |
|---|---|---|---|
| Parameter | <37 weeks Median (IQR) | >37 weeks Median (IQR) | Mann-Whitney U P value |
| Habituation | | | |
| Response decibel to Light | 5 (5-6) | 6 (5-7) | 0.029* |
| Response decibel to Rattle | 5 (3-6) | 6 (5-7) | 0.031* |
| Response decibel to Bell | 5 (4-7) | 5 (4-7) | 0.414 |
| Response decibel to Foot | 5 (4-6) | 5 (5-7) | 0.311 |
| Social interactive | | | |
| Animate Visual | 5 (4-7) | 4 (2.5-4) | 0.019* |
| Animate Visual and Auditory | 5 (3-6) | 4 (3-6) | 0.729 |
| Inanimate Visual | 7 (4-7) | 5 (4-7) | 0.211 |
| Inanimate Visual and Auditory | 6 (4-7) | 4 (4-5.5) | 0.127 |
| Animate Auditory | 5 (3-7) | 5 (5-6.5) | 0.517 |
| Inanimate Auditory | 5 (5-8) | 5 (4.5-6.5) | 0.323 |
| Alertness | 4 (3-7) | 5 (3-6) | 0.911 |
| Motor system | | | |
| General Tone | 3 (2-5) | 4 (3-5) | 0.352 |
| Motor Maturity | 4 (3-6) | 4 (3-6) | 0.771 |
| Pull to Sit | 5 (3-6) | 5 (4-6) | 0.214 |
| Defensive | 5 (3-5) | 6 (4-7) | 0.017* |
| Activity Level | 4 (2-6) | 4 (3 6) | 0.591 |
| State organization | | | |
| Peak of Excitement | 3 (2-4) | 5 (4-7) | <0.001* |
| Rapidity of Build-up | 5 (4-6) | 5 (4-7) | 0.223 |
| Irritability | 5 (3-6) | 6 (4-7) | 0.176 |
| Lability of States | 6 (5-7) | 5 (4.5-7.5) | 0.489 |
| State regulation | | | |
| Cuddliness | 5 (5-5) | 6 (5-7) | 0.003* |
| Consolability | 4 (3-5) | 5 (3.5-5.5) | 0.161 |
| Self-Quieting | 5 (2-5) | 5 (4-6.5) | 0.051 |
| Hand to Mouth | 5 (3-6) | 6 (5-7) | 0.008* |
| Autonomic system | | | |
| Tremulousness | 5 (4-7) | 7 (7-7.5) | 0.001* |
| Startles | 5 (4-6) | 6 (5-7) | 0.031* |
| Lability of Skin Colour | 5 (4-5) | 5 (5-6) | 0.026* |
| Supplementary items | | | |
| Quality of Alertness | 4 (3- ) | 6 (6-7) | <0.001* |
| Cost of Attention | 6 (5-7) | 7 (6-8) | 0.053 |
| Examiner Facilitation | 6 (5-7) | 7 (6-8) | 0.012* |
| General Irritability | 6 (5-6) | 6 (5-7.5) | 0.148 |
| Robustness / Endurance | 5 (4-5) | 5 (4-6) | 0.279 |
| State Regulation | 4 (3-6) | 5 (3.5-5.5) | 0.409 |
| Examiners Emotional Response | 5 (4-6) | 4 (3-5) | 0.208 |
| Reflexes | 2 (1-2) | 2 (1-3) | 0.999 |

**Table 15: Comparisons of outcome variables in relation to Birth weight (n=40)**

| | Birth Weight (kg) | | |
|---|---|---|---|
| Parameter | <2.5 kg Median (IQR) | >2.5 kg Median (IQR) | Mann-Whitney U P value |
| Habituation | | | |
| Response decibel to Light | 5 (5-6) | 6 (5.5-7) | 0.002* |
| Response decibel to Rattle | 5 (3-6) | 6 (5-7) | 0.001* |
| Response decibel to Bell | 6 (4-7) | 5 (4-7) | 0.729 |
| Response decibel to Foot | 5 (5-6) | 5 (4-6.5) | 0.844 |
| Social interactive | | | |
| Animate Visual | 5 (3-7) | 4 (2.5-4.5) | 0.090 |
| Animate Visual and Auditory | 5 (5-7) | 3 (3 -4.5) | 0.001* |
| Inanimate Visual | 6 (5-7) | 5 (4-7) | 0.192 |
| Inanimate Visual and Auditory | 5 (4-7) | 4 (4-6) | 0.047* |
| Animate Auditory | 5 (3-7) | 5 (4-6.5) | 0.858 |
| Inanimate Auditory | 5 (5-8) | 5 (4-6) | 0.075 |
| Alertness | 4 (3-5) | 5 (3-6) | 0.443 |
| Motor system | | | |
| General Tone | 3 (2-5) | 4 (3-5) | 0.472 |
| Motor Maturity | 4 (3-6) | 4 (3-6) | 0.890 |

| | | | |
|---|---|---|---|
| Pull to Sit | 4 (3-5) | 6 (5-7) | 0.002* |
| Defensive | 4 (3-6) | 6 (4.5-6.5) | 0.045* |
| Activity Level | 3 (2-5) | 5 (4 – 6) | 0.003* |
| State organization | | | |
| Peak of Excitement | 3 (2-4) | 5 (4-7) | 0.001* |
| Rapidity of Build-up | 5 (4-6) | 6 (4-7) | 0.142 |
| Irritability | 5 (3-6) | 6 (4.5-7) | 0.032* |
| Lability of States | 6 (5-7) | 6 (4.5-8) | 0.956 |
| State regulation | | | |
| Cuddliness | 5 (4-5) | 6 (5-7) | 0.001* |
| Consolability | 4 (3-5) | 5 (3.5-5.5) | 0.325 |
| Self-Quieting | 4 (2-5) | 5 (5-7) | 0.003* |
| Hand to Mouth | 5 (3-6) | 6 (4.5-7) | 0.129 |
| Autonomic system | | | |
| Tremulousness | 6 (4-7) | 7 (7-8) | 0.001* |
| Startles | 5 (4-7) | 6 (5-7) | 0.037* |
| Lability of Skin Colour | 5 (4-5) | 5 (5-6) | 0.011* |
| Supplementary items | | | |
| Quality of Alertness | 4 (3-5) | 6 (6-7) | <0.001* |
| Cost of Attention | 7 (5-7) | 6 (6-7) | 0.801 |
| Examiner Facilitation | 5 (4-6) | 7 (6.5-8) | <0.001* |
| General Irritability | 6 (5-6) | 6 (5-7.5) | 0.032* |
| Robustness / Endurance | 5 (4-6) | 5 (4-6) | 0.999 |
| State Regulation | 5 (3-6) | 4 (3-5) | 0.624 |
| Examiners Emotional Response | 5 (3-6) | 4 (3.5-6) | 0.889 |
| Reflexes | 2 (1-2) | 2 (1-3) | 0.707 |

**Comparisons of outcome variables in relation to mode of delivery (n=40)**

| | **Mode of delivery** | | |
|---|---|---|---|
| **Parameter** | **Normal vaginal delivery Median (IQR)** | **LSCS Median (IQR)** | **Mann-Whitney U P value** |
| Habituation | | | |
| Response decibel to Light | 5 (5-7) | 6 (5-6) | 0.598 |
| Response decibel to Rattle | 6 (4-6) | 6 (5-7) | 0.261 |
| Response decibel to Bell | 6 (4-7) | 5 (4-7) | 0.975 |
| Response decibel to Foot | 5 (5-6) | 5 (4-7) | 0.450 |
| Social interactive | | | |
| Animate Visual | 4 (2.5-6) | 4 (3-5) | 0.926 |
| Animate Visual and Auditory | 4 (3-5.5) | 5 (4- 6) | 0.279 |
| Inanimate Visual | 6 (4-7) | 5 (3-7) | 0.926 |
| Inanimate Visual and Auditory | 5 (4-6.5) | 4 (4-6) | 0.429 |
| Animate Auditory | 5 (3.5-6.5) | 6 (5-7) | 0.073 |
| Inanimate Auditory | 5 (5-7) | 5 (4-6) | 0.213 |
| Alertness | 4 (3-6) | 5 (3-6) | 0.803 |
| Motor system | | | |
| General Tone | 3 (3-5) | 4 (3-5) | 0.625 |
| Motor Maturity | 4 (3-6) | 4 (4-6) | 0.158 |
| Pull to Sit | 5 (4-6) | 5 (4-7) | 0.279 |
| Defensive | 5 (3.5-6) | 5 (3-6) | 0.999 |
| Activity Level | 4 (3-5.5) | 5 (3-6) | 0.415 |
| State organization | | | |
| Peak of Excitement | 4 (2.5-5.5) | 4 (3-6) | 0.611 |
| Rapidity of Build-up | 5 (4-6) | 5 (4-6) | 0.631 |
| Irritability | 6 (5-6) | 4 (4-6) | 0.210 |
| Lability of States | 7 (5-8) | 5 (4-6) | 0.016* |
| State regulation | | | |
| Cuddliness | 5 (5-7) | 5 (5-6) | 0.862 |
| Consolability | 4 (3-5) | 5 (4-5) | 0.145 |
| Self-Quieting | 5 (4-6) | 5 (4-7) | 0.901 |
| Hand to Mouth | 5 (4.5-7) | 5 (4-7) | 0.589 |
| Autonomic system | | | |
| Tremulousness | 6 (5-7) | 7 (7-7) | 0.106 |
| Startles | 6 (5-7) | 6 (5-7) | 0.793 |
| Lability of Skin Colour | 5 (4.5-5.5) | 4 (4-6) | 0.524 |
| Supplementary items | | | |
| Quality of Alertness | 6 (3-7) | 6 (5-7) | 0.747 |
| Cost of Attention | 6 (5-7) | 7 (6-7) | 0.551 |
| Examiner Facilitation | 6 (5-7) | 7 (5- 8) | 0.298 |
| General Irritability | 6 (5-6) | 7 (5-8) | 0.074 |
| Robustness / Endurance | 5 (4-6) | 5 (3-6) | 0.789 |
| State Regulation | 4 (3-5) | 5 (4-6) | 0.103 |
| Examiners Emotional Response | 5 (4-6) | 5 (3-6) | 0.754 |
| Reflexes | 2 (1-2) | 2 (1-3) | 0.651 |

**Comparisons of outcome variables in relation to gender (n=40)**

| **Parameter** | **Male Median (IQR)** | **Female Median (IQR)** | **Mann-Whitney U P value** |
|---|---|---|---|
| Habituation | | | |
| Response Dec. to Light | 5 (5-7) | 6 (5-6) | 0.831 |
| Response Dec. to Rattle | 6 (4-6) | 6 (3.5-7) | 0.388 |
| Response Dec to Bell | 5 (4-7) | 5 (4-6.5) | 0.859 |
| Response Dec. to Foot | 5 (4-6) | 5 (5-6) | 0.569 |
| Social interactive | | | |
| Animate Visual | 4 (3-5) | 4 (3-6) | 0.953 |
| Animate Visual and Auditory | 5 (3-6) | 3 (3-5) | 0.244 |
| Inanimate Visual | 5 (3-7) | 7 (4.5-7) | 0.178 |
| Inanimate Visual and Auditory | 5 (4-7) | 4 (4-5.5) | 0.407 |

| | | | |
|---|---|---|---|
| Animate Auditory | 5 (4-6) | 6 (4.5-7) | 0.245 |
| Inanimate Auditory | 6 (5-7) | 5 (4-7) | 0.272 |
| Alertness | 5 (3-6) | 4 (3-5.5) | 0.582 |
| Motor system | | | |
| General Tone | 4 (3-5) | 3 (3-5) | 0.787 |
| Motor Maturity | 4 (3-5) | 4 (3-6) | 0.496 |
| Pull to Sit | 5 (4-6) | 5 (4.5-6) | 0.257 |
| Defensive | 5 (3-6) | 6 (4.5-6.5) | 0.179 |
| Activity Level | 4 (3-6) | 5 (3.5-6) | 0.490 |
| State organization | | | |
| Peak of Excitement | 4 (3-6) | 5 (2-6.5) | 0.566 |
| Rapidity of Build-up | 5 (4-6) | 5 (4-7) | 0.525 |
| Irritability | 5 (4-6) | 6 (4.5-6.5) | 0.331 |
| Lability of States | 6 (5-8) | 6 (4-7) | 0.575 |
| State regulation | | | |
| Cuddliness | 5 (5-6) | 5 (5-7) | 0.527 |
| Consolability | 4 (3-5) | 5 (4-5.5) | 0.294 |
| Self-Quieting | 5 (4-6) | 5 (4-5) | 0.711 |
| Hand to Mouth | 6 (5-7) | 5 (3.5-6) | 0.096 |
| Autonomic system | | | |
| Tremulousness | 7 (5-7) | 7 (6-8) | 0.193 |
| Startles | 6 (5-7) | 6 (4.5- 6.5) | 0.384 |
| Lability of Skin Colour | 5 (4-6) | 5 (4.5-5.5) | 0.574 |
| Supplementary items | | | |
| Quality of Alertness | 6 (3-7) | 5 (4-6.5) | 0.815 |
| Cost of Attention | 7 (5-7) | 6 (5.5-7) | 0.611 |
| Examiner Facilitation | 6 (5-7) | 7 (5-7) | 0.953 |
| General Irritability | 6 (5-7) | 6 (5-6.5) | 0.834 |
| Robustness / Endurance | 5 (4-6) | 5 (4-5.5) | 0.822 |
| State Regulation | 4 (3-5) | 5 (3.5-6) | 0.317 |
| Examiners Emotional Response | 5 (3-6) | 4 (4-5) | 0.493 |
| Reflexes | 2 (1-2.75) | 1 (1-2) | 0.579 |

**Gestational age and birth weight, AGA/SGA:** In this study, a total of 40 newborn babies, 20 term and 20 preterm, 52.5% were low birth weight, examined within 72 hours of delivery 62.5% were AGA and the rest were SGA . The Male to Female ratio was 1.3:1. Other variables like gestational age and postnatal age were shown to have a positive correlation with behavioural performance. Mode of delivery: 72.5% were born by vaginal delivery and rest by Caesarean section . The caesarean section rates were much lower than that reported in the Korean study by Shin[4] (78%). NBAS is likely to be altered by the type of delivery and the medications used during surgery.

**Anthropometric Parameters:** Mean weight, length and head circumference were lower in thus compared to the Korean study Shin[4], as 50% were preterm babies in this study.

**Comparisons of outcome variables in relation to gestational age in weeks:** Among the study population, the median difference of habituation parameter (Response Dec. to Light, Response decibel to Rattle) between Gestational Age (Weeks) was statistically significant. (P<0.05). The median difference of social interactive parameter (Animate Visual) between Gestational Age (Weeks) was statistically significant. (P<0.05)

The median difference of motor system parameter (Defensive) between Gestational Age (Weeks) was statistically significant. (P<0.05). The median difference of state organization parameter (Peak of Excitement) between Gestational Age (Weeks) was statistically significant. (P<0.05).The median difference of State regulation parameter (Cuddliness, Hand to Mouth) between Gestational Age (Weeks) was statistically significant. (P<0.05). The median difference of Autonomic system parameter (Tremulousness, Startles, Lability of Skin Colour) between Gestational Age (Weeks) was statistically significant. (P<0.05). The median difference of supplementary items parameter (Quality of Alertness, Examiner Facilitation) between Gestational Age (Weeks) was statistically significant. (P<0.05)

In the study conducted by Shin[4], newborn demographic variables such as gestational age and postnatal age were also associated with behavioural performance. Gestational age of the newborn was associated with both Motor System (t = 2.25, df = 48, p = .03) and Autonomic Stability performance (t = 2.30, df = 48, p = .03)., that is, new-borns within the < 38 weeks gestational age group showed significantly lower mean scores than 39-42-week-old new-borns. Postnatal ages of the new-borns were associated with State Regulation., 2- day-old new-borns showed higher scores than those of 1- day-old or 3-day-old new-borns (F = 3.94, df = 2, p = .03). Variables such as gestational age and postnatal age were positively correlated with behavioural performances. Neonates of 37-38 weeks gestational age showed significantly lower mean scores than those of 39-42 weeks gestation. Mouradian[7] also noted that, although full-term new-borns and close-to-full-term new-borns were behaviourally similar to one another, the older gestational new-borns showed better Motor and Autonomic stability.

Advancement in gestational age of newborns was positively associated with improved Motor System (t = 2.55, df = 48, p = .016) and Autonomic Stability (t = 2.55, df = 48, p = .028) in the Korean study. Mean scores of those with gestational age of 37-38 weeks were significantly lower than the 39-42 weekers.

Mouradian, Als and Coster (2000)7 had reported that, full-term and near-term newborns were behaviourally similar, but Motor and Autonomic stability was better in the older babies.

**Comparisons of outcome variables in relation to birth weight:** Among the study population, the median difference of habituation parameter (Response decibel to Light, Response decibel to Rattle) between Birth weight was statistically significant. (P<0.05). The median difference of social interactive parameter (Animate Visual and Auditory, Inanimate Visual and Auditory) between Birth weight was statistically significant. (P<0.05). The median difference of motor system parameter (Pull to Sit, Defensive, Activity Level) between Birth weight was statistically significant. (P<0.05). The median difference of state organization parameter (Peak of Excitement, Irritability) between Birth weight was statistically significant. (P<0.05). The median difference of State regulation parameter (Cuddliness, Self-Quieting) between Birth weight was statistically significant. (P<0.05). The median difference of Autonomic system parameter (Tremulousness, Startles, Lability of Skin Colour) between Birth weight was statistically significant. (P<0.05). The median difference of supplementary items parameter (Quality of Alertness, Examiner Facilitation, General Irritability) between Birth weight was statistically significant. (P<0.05).

In the study conducted by J. Canals[5] noted the weight of the child at birth is related to motor cluster score at 3 days. The heaviest babies in the normal range had a more advanced motor development at 3 days, but this difference did not persist to the age of 4 weeks. In the first 4 weeks of postnatal development, the influence of such biological factors as weight and parity on behaviour may have disappeared due to the baby's interaction with the family environment and maternal psychological factors may have become more important[5].

**Comparisons of outcome variables in relation to mode of delivery:** Among the study population, the median difference of habituation parameters, social interactive parameters, Motor system parameters, State regulation parameters, Autonomic system parameters, Supplementary items parameters and reflexes between Mode of delivery were not statistically significant. (P>0.05). The median difference of State organization parameter (Lability of States) between Mode of delivery was statistically significant. (P<0.05). In this study, majority of mothers (78%) in this study had normal vaginal delivery and may explain some of the differences with respect to the other studies.

**Comparisons of outcome variables in relation to gender:** Among the study population, the median difference of habituation parameter, social interactive parameter, Motor system parameter, State organization parameter, State regulation parameter, Autonomic system parameter, Supplementary items parameter and reflexes between males and females were not statistically significant. (P>0.05).

In this study as well as in the Korean study4, gender showed no difference. However, among Swedish newborns (Lundqvist and Sabel, 2000)3, female babies had a higher score than males in all NBAS items except Autonomic and Motor clusters.

Postnatal age of the newborn was also directly correlated with improved ability of state regulation. Two-day-old newborns showed higher scores than those of 1-day-old or 3- day-old newborns. Stewart et al6 also observed that newborns performed better on day 2 than day 1.

In the study conducted by J. Canals[5] they noted that there were no statistical differences between genders at either 3 days or 4 weeks of age. However, the mean score of orientation was higher in male than in female at 3 days and slightly higher in female than in males at 4 weeks.

## CONCLUSION

In this study, all the 40 newborns were examined within 72 hours of study. There was a statistically significant association of the neurobehavioral pattern of the newborns with gestational age and birth weight in many of the neurobehavioral items studied. Mode of delivery showed a significant association with state organisation-lability of states. Gender had no association with any of the newborn behavioural parameters. This is especially useful in 'At Risk babies', who may need early stimulation and early intervention. Those with lower scores can be identified and followed up with extra care and stimulation.

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