

## Study of Neonatal Outcome with Low Apgar Score in Term Neonates

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### ABSTRACT:

**Background:** Birth asphyxia is the most common and important cause of preventable cerebral injury occurring in the neonatal period. World Health Organisation (WHO) estimates that between four and nine million newborns worldwide suffer birth asphyxia annually with most occurring in developing countries. Twenty five to sixty percent of this number die or develop severe neurodevelopmental complications. The Apgar score has gained worldwide use as a marker of a child's vitality immediately after birth, but its value as a predictor of later disabilities is debated. The early neurological condition of the newborn is now recognized to be the best available indicator of significant preceding birth asphyxia and the best predictor of both death and future disability. Low Apgar score is a useful screening test for birth asphyxia. **Aims of the study:** 1. To study the neonatal outcome in term neonates with low Apgar score at RIMS hospital. 2. To evaluate whether Apgar score is a good screening test for birth asphyxia. 3. To ascertain neonatal encephalopathy as a confirmatory evidence for birth asphyxia. **Material and methods:** A descriptive study was carried out in the Department of Pediatrics, RIMS, Imphal during the period from November 2012 to June 2014 in term neonates admitted with history of low Apgar score <4 at 1minute. All the neonates admitted were assessed and followed up regularly and the immediate outcome was noted and the results were analysed. **Results:** Out of the 75 cases, 55(73.3%) cases were AGA. The mean birth weight in our study was 3.26± 0.586 Kg. The male to female ratio was 1.15:1. Among the maternal complications most common was fetal distress and was seen in 24(32%) cases, followed by MSL was seen in 17 (22.7%) and prolonged 2<sup>nd</sup> stage of labour in 17 (22.7%) cases. PROM was seen in 15 (20%) cases. NVD was the most common mode of delivery with 39 (52%) cases. There were 16 (21.3%) cases with no signs of HIE. There was a mild (grade I) HIE in 28(37.3%) cases, moderate (grade II) HIE in 20(26.6%) cases. There was severe (grade III) HIE in 11 (14.7%) cases. Features of sepsis was present in 18 (24%) cases. Mortality rate in the study was 13.3%. 62 (82.7%) cases were discharged in a stable condition and 3 (4%) cases left against medical advice (LAMA). **Conclusion:** Apgar score sometimes overestimates the risk of HIE but it diagnoses most of the HIE cases. It gives us a subset of cases which can be followed up for development of encephalopathy and continues to be a useful screening tool in both hospital and community settings. Neonatal encephalopathy is an evidence for severe birth asphyxia. In this study we found it's critical to say a score less than 5 at 5 minutes and a score less than 6 at 10 minutes is associated with poor neonatal outcome.

**Key words:** Apgar score, HIE (hypoxic ischemic encephalopathy), Birth asphyxia.

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### 1. Introduction

*Birth asphyxia is recognized as an important cause of increased neonatal morbidity and mortality, fresh still birth and long term neurodevelopmental sequelae globally. Birth asphyxia is the most common and important cause of preventable cerebral injury occurring in the neonatal period. World Health Organisation (WHO) estimates that between four and nine million newborns worldwide suffer birth asphyxia annually with most occurring in developing countries. (1) Twenty five to sixty percent of this number die or develop severe neurodevelopmental complications. (2) Many pathological, biochemical and metabolic changes occur as a result of birth asphyxia. Subsequent effects of it affects many organ systems like central nervous system, cardiovascular system, pulmonary, renal, adrenal, gastrointestinal tract, skin and haemopoietic systems. Among them, cerebral complications are the most devastating, as full recovery may not occur and child may develop neurological sequelae like cerebral palsy, mental retardation and cranial nerve palsies. An association between a low Apgar score combined with neonatal encephalopathy and subsequent death or major neurological handicap is well documented. (3) Low Apgar score is a useful screening test for birth asphyxia. The Apgar score has gained worldwide use as a marker of a child's vitality immediately after birth, but its value as a predictor of later disabilities is debated. The early neurological condition of the newborn is now recognized to be the best available indicator of significant preceding birth asphyxia and the best predictor of both death and future disability.(3)*

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## 2. Aims Of The Study

1. To study the neonatal outcome in term neonates with low Apgar score at RIMS hospital.
2. To evaluate whether Apgar score is a good screening test for birth asphyxia.
3. To ascertain neonatal encephalopathy as a confirmatory evidence for birth asphyxia.

## 3. Materials & Methods

The present study was carried out in the Department of Pediatrics, Regional Institute of Medical Sciences, Imphal, Manipur during the period from November 2012 to June 2014 in term neonates admitted with history low Apgar score <4 at 1minute. Ethical approval was obtained from the Institute Ethics Committee, RIMS, Imphal before beginning of the study. Consent from the parents was also obtained before starting of the study. It was a hospital based descriptive study with a sample size of 75 eligible cases. Low Apgar scores due to prematurity, very severe congenital malformations like neural tube defects, anencephaly, large congenital heart defects, certain inherited metabolic and genetic disorders, maternal intake of drugs, anesthesia or sedative overdose to mother were not included in the study.

All the patients were resuscitated as per the national resuscitation program (NRP) guidelines based on the clinical scenario with oropharyngeal and nasopharyngeal suction, bag and mask ventilation, chest compressions, and endotracheal intubation with or without oxygen supplementation. Detailed clinical history and Clinical examination was done after admission and findings were noted in a regular basis at the ward. Parameters like birth weight, mother's age, sex, antenatal care, parity of mother, religion, locality, education of mother, place of delivery, maternal risk factors, mode of delivery, income, Apgar score at 1minute, 5 minutes, and 10 minutes were all noted. The clinical feature of asphyxia including neonatal reflexes, tone changes, sucking reflex, presence of seizure, respiratory distress, and level of consciousness were all assessed. Based on the clinical features and significant natal history the diagnosis and grading of HIE was done clinically as mild, moderate and severe. The most important neonatal co morbidities like sepsis jaundice and MAS (meconium aspiration syndrome) were studied as they also influence the outcome. The outcome was recorded as discharge, dead, LAMA (leave against medical advice).

### Statistical Analysis:

The information about various demographical factors, maternal and neonatal risk factors, clinical features and lab parameters was collected and it was analyzed using the Statistical package for social sciences (SPSS) version 16 with chi-square test and ANOVA one way analysis for comparison of proportions. P-value of less than 0.05 was considered as statistically significant.

## 4. Results And Observations

Out of the 75 eligible cases studied majority of cases 55(73.3%) cases were AGA (appropriate for gestational age), 12 (16%) cases were SGA (small for gestational age) and 8 (10.7%) cases were LGA (large for gestational age). The mean birth weight in our study was  $3.26 \pm 0.586$  Kg, In the SGA group it was  $2.35 \pm 0.240$ , in the AGA group  $3.25 \pm 0.695$ , in the LGA group  $4.20 \pm 0.350$  respectively. 40 (53.3%) were male and 35 (46.7%) were female and the male to female ratio was 1.15:1. 48(64%) were Hindus. 17 (22.7%) were Christians and 10 (13.3%) were Muslims. 48 (64%) had history of at least one antenatal visit and 27 (36%) cases had no antenatal care and they were unbooked cases. 43 (57.3%) of the mothers were primiparous. Most of them were from the urban locality accounting for 46 (61.3%) cases. 5 (6.7%) of mothers were illiterates. 20 (26.7%) of them had gone up to primary school. 30 (40%) had passed higher secondary and 20 (26.7%) were graduates. 54 (72%) of the cases were inborn at RIMS hospital and 21(28%) of the cases were at outside health facilities.

**Table 1: Distribution of maternal risk factors**

| Risk factors                    | Yes n (%) | No n (%) | Total n |
|---------------------------------|-----------|----------|---------|
| Fetal distress                  | 24(32)    | 51(68)   | 75      |
| MSL                             | 17(22.7)  | 58(77.3) | 75      |
| Prolonged 2 <sup>nd</sup> stage | 17(22.7)  | 58(77.3) | 75      |
| PROM                            | 15(20)    | 60(80)   | 75      |
| PIH                             | 14(18.7)  | 61(81.3) | 75      |
| APH                             | 7(9.3)    | 68(90.7) | 75      |
| Others                          | 12(16)    | 63(84)   | 75      |

Among the maternal complications most common was fetal distress and was seen in 24(32%) cases, followed by MSL was seen in 17 (22.7%) and prolonged 2<sup>nd</sup> stage of labour in 17 (22.7%) cases. PROM was seen in 15 (20%) cases and PIH was seen in 14(18.7%) cases. APH was seen in 7 (9.3%) cases. NVD was the most common mode of delivery with 39 (52%) cases. 19 (25.3%) cases had assisted delivery, 10 (13.3%) had emergency LSCS and 7 (9.3%) cases had elective LSCS.

NNR was absent in 13 (17.3%) cases and normal in 40 (53.3%) cases. Tone abnormalities were seen in 40 (53.3%) cases. Sucking was absent in 13 (17.3%) cases and decreased in 40 (53.3%) cases. Seizure was seen in 30 (40%) cases. 7 (9.3%) cases had severe respiratory distress in the form of apneas. There were 16 (21.3%) cases with no signs of HIE. There was a mild (grade I) HIE in 28(37.3%) cases, moderate (grade II) HIE in 20(26.6%) cases. There was severe (grade III) HIE in 11 (14.7%) cases. 16 (25.3%) of them required 1 to 5 min and 10 (13.3%) of the cases took more than 5 min or even longer to establish spontaneous respiration. MAS was seen in 5 (6.7%) cases, features of sepsis was present in 18 (24%) cases, 23 (30.7%) of them had jaundice requiring phototherapy. Out of 75 cases 62 (82.7%) cases were discharged in a stable condition, 3 (4%) cases were LAMA, and 10 (13.3%) cases expired with a mortality of 13.3%.

On comparing the 1 minute Apgar score with the HIE the P- value was 0.097 showing clearly there was no proper association between the 1 minute Apgar score and the outcome of significant HIE. On comparing the 5 minute and 10 minute Apgar score with the degree of HIE the P-Value was 0.000 showing extremely significant association. ANC (P=0.016), Mode of delivery (P=0.010), duration of resuscitation (P=0.000), fetal distress (P=0.049), PROM (P=0.002), and prolonged 2nd stage of labour (P=0.000) had significant association with HIE. Mothers age (P=0.036), education (P=0.016), parity (0.023) which were not associated with HIE but were significantly associated with mortality. Among the maternal risk factors PROM (P=0.014), Prolonged 2<sup>nd</sup> stage of labour (P=0.000) were associated with the mortality. Among the neonatal co-morbidities sepsis was significantly associated with mortality (P=0.034). Clinical features of HIE studied NNR (P=0.000), tone (P=0.004), sucking (P=0.000), RDS (P=0.000), seizure (P=0.001) had an extremely significant association with outcome.

## 5. Discussion

Out of the 75 cases in this study 55(73.3%) cases were AGA (appropriate for gestational age). This was comparable to results obtained by Dalal EA et al<sup>(4)</sup> (2013) study with 62.5% of AGA neonates. The mean birth weight in our study was 3.26± 0.586 Kg. This was comparable with 3480 ± 496 Kg found in Prakesh SS et al<sup>(5)</sup> (2006). Male to female ratio in this study was 1.15:1. Similar results of male to female ratios as 1.16, 1.26, 1.27 was seen in studies conducted by Dalal EA et al<sup>(4)</sup> (2013), Dongol S et al<sup>(6)</sup> (2010), Chiabi A et al<sup>(7)</sup> (2013). 48 (64%) mothers had history of at least one antenatal visit. This was similar to results of Padayachee N et al<sup>(8)</sup> (2013), Dongol S et al<sup>(6)</sup> (2010) with 68% and 62% of mothers having had ANC done at least once. 43 (57.3%) of the mothers were primiparous which was similarly seen in studies conducted by Shireen N et al<sup>(9)</sup> (2010) and Dongol S et al<sup>(6)</sup> (2010) with 57% and 58%. 54 (72%) of the cases were inborn at RIMS hospital. This was comparable with Shireen N et al<sup>(9)</sup> (2010) with 60% same hospital born cases. There were 39 (52%) of them delivered by NVD. Similarly, Dongol S et al<sup>(6)</sup> (2010) had 51.96% normal deliveries.

Fetal distress was seen in 24(32%) cases which were comparable to Padayachee N et al<sup>(8)</sup> (2013) results as there were 39% of cases with fetal distress. There were 16% of cases with meconium stained liquor in the study done by Omovumi IO et al<sup>(10)</sup> (2011) which was comparable to our study with 17 (22.7%) cases. We had 17(22.7%) cases with prolonged second stage of labour. This was comparable to the results obtained in studies conducted by Onyearugha CN et al<sup>(11)</sup> (2010) with 20% cases. PROM (prolonged rupture of membranes) was seen in 15(20%) of cases which was comparable to results obtained by Dongol S et al<sup>(6)</sup> (2010) as 20.58%. At 1 minute most of the newborns had an Apgar score of 3 (62.7%), at 5 minutes most of the cases had a score of 6(25.3%) followed by 7 (20%) and then 5(18.7%). This was comparable to the study done by Padayachee N et al<sup>(8)</sup> (2013) where most of the scores at 1 minute, 5 minutes and 10 minutes were 3,4 and 6. At 10 minutes most of our cases in this study had an Apgar score of 8(29.3%) followed by 9 (24%), then 7 (14.7%). The mean scores at 1minute, 5 minutes, and 10 minutes was 2.53±0.664, 5.37±1.505, 7.12±1.692. The mean Apgar score in a study by Casey BM et al<sup>(12)</sup> (2001) at 5 minutes was 6.6±2.1. On comparing the 1 min Apgar score with the development risk of HIE, the cases with severe HIE which was seen in 11 (14.7%) cases had a 1 minute Apgar score of 2.09±0.701. This was in comparison to the study done by Ellis M et al<sup>(13)</sup> (1998), where there was 11.2% cases. On comparing the 5 minute Apgar score the severe HIE was seen in the range of 3.09±0.302 which had an extremely significant association with HIE with a P-Value of 0.000. This result could be compared with the one obtained by Prakesh SS et al<sup>(5)</sup> (2006). 16 (25.3%) of them required 2 to 5 min and 10 (13.3%) of the cases took more than 5 min or even longer to establish spontaneous respiration. This was comparable with Prakesh SS et al<sup>(5)</sup> (2006) where there were 19.6% cases with delayed onset of spontaneous breathing. There were 18 (24%) cases with features of sepsis which was similar to the result of 16% cases seen in the study conducted by Shireen N et al<sup>(9)</sup> (2010).

In the present study 62(82.7%) cases were discharged in a stable condition from the hospital. 3 (4%) cases left against medical advice (LAMA). 10 (13.3%) cases expired. The mortality in the present study is 13.3%. This mortality is comparable to studies done by Shireen N et al<sup>(9)</sup> (2010), Dongol S et al<sup>(6)</sup> (2010), Padayachee N et al<sup>(8)</sup> (2013) as 16%, 15.6%, and 13.3% respectively. 16 (21.3%) patients had no signs of HIE at birth, 28 (37.3%) cases were graded as mild (grade I), 20 (26.6%) cases were graded as moderate (grade II), 11

(14.7%) cases were severe HIE (grade III). These results were comparable to study done by Padayachee N et al<sup>(8)</sup> (2013) where there were 22.8% cases with no HIE, 28.8% cases with mild HIE, 32.4% cases with moderate HIE, 16.3% cases with severe HIE.

## **6. Conclusion**

The Apgar score has served as an important simple tool for more than 50 years to grade birth asphyxia. This score obtained at the delivery room determines the outcome of the newborn. Over time other advances such as umbilical cord pH and neonatal encephalopathy has gained lot of importance to diagnose birth asphyxia and to predict the outcome. But it is still difficult to completely utilise these resources in developing countries. The low one minute Apgar score overestimates the risk of developing HIE, but 5 and 10 minute score are generally associated with the neonatal outcome. Although Apgar score sometimes overestimates the risk of HIE, it diagnoses most of the HIE cases. It gives us a subset of cases which can be followed up for development of encephalopathy. It remains the most important tool at the community level to diagnose birth asphyxia based on which further referral to a hospital can be planned. In our study we found it's critical to say a score less than 5 at 5 minutes and a score less than 6 at 10 minutes is associated with poor neonatal outcome. So, to conclude low Apgar score is still considered important to assess the neonatal outcome and these neonates have to be closely observed for further development of signs of HIE and signs of neonatal encephalopathy is an evidence for severe birth asphyxia. It is important to assess high risk pregnancies and plan effective intervention before labour, appropriate intrauterine monitoring of labour, and safe mode of delivery to reduce the incidence of low Apgar scores. Our motto should be to "give a breath and save a life" as the consequences of perinatal asphyxia leads to a huge burden to the society.

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