

## EVALUATION OF URIC ACID AND CREATININE RATIO IN BIRTH ASPHYXIA IN NORTH KARNATAKA POPULATION

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### Abstract

**Background:** Perinatal asphyxia is a medical condition resulting from the deprivation of oxygen in newborn infants that may cause mortality and morbidity. Urinary uric acid and creatinine ratio in a diagnostic asphyxia, which is a diagnostic value for the severity of hypoxic. **Materials and Methods:** 40 (forty) birth asphyxia neonates were compared with 40 (normal) controlled neonates. Gestational age, mean body weight, and APGAR score at different interval 1, 5, and 10 minutes were studied, and urinary uric acid and creatinine were also estimated to predict the severity of hypoxia. **Result:** Gestational age was 36–37 weeks in the asphyxia and controlled groups; mean body weight 2.1 to 3.1 kg in asphyxia and 2.3 to 3.6 kg in the controlled group. Vaginal delivery: 28 in asphyxia cases, 32 in controlled, 12 LSCS in asphyxia cases, and 8 in controlled. APGAR score in minute had 30; asphyxia had 0.3; 10 had 4.6 APGAR score; and >7 in the controlled group. Urinary uric acid/creatinine ratio: 0.86–4.62 in asphyxia neonates and 0.32–2.18 in the controlled group. **Conclusion:** A reduced APGAR score and an elevated urinary uric acid/creatinine ratio are the ideal diagnostic values to predict the severity of hypoxia. These parameters help the pediatrician treat perinatal hypoxic neonates efficiently to avoid morbidity and mortality.

## INTRODUCTION

According to WHO report 4 (four) million neonates die each year. Out of which perinatal asphyxia and birth injuries together contribute to almost 29% of these deaths.<sup>[1]</sup> In India, perinatal asphyxia is responsible for 20% of all neonatal deaths. The manifestation of hypoxic ischemic encephalopathy (HIE) was seen in 1.5% of babies. Perinatal asphyxia is also known as neonatal asphyxia or birth asphyxia. It is the medical condition resulting from deprivation of oxygen to a newborn infant that lasts long enough during the birth process to cause physical harm, usually to brain. It is also the inability to establish and sustain adequate or spontaneous respiration upon delivery of the newborn. It remains a serious condition which causes significant mortality and morbidity.

APGAR score and umbilical artery blood PH, both predict neonatal mortality in terms and preterm infants.<sup>[2]</sup> Indicators such as PH, lactase and base deficits subside with the establishment of respiration,<sup>[3]</sup> these techniques are however costly and sophisticated. Hence attempt was made to study ratio of uric acid to creatinine ratio which is simple, cost-effective noninvasive and early biochemical means of asphyxia diagnosis.<sup>[4]</sup> It is a valuable

indicator of severity of tissue hypoxia in patients with intact renal functions.

## MATERIALS AND METHODS

40 (forty) cases of neonatal birth asphyxia neonatal in the department of pediatrics at ESIC Medical College, Kalaburgi-585106 were studied.

### Inclusive Criteria

Gestation age > 37 weeks. Intrapartum signs of fetal distress and an Apgar score <7 at one minute of life were included in the study.

### Exclusive Criteria

Infants with congenital malformation, suspected of having metabolic disease and congenital kidney disease, and infants born from mothers with preeclampsia using drugs for respiratory depression, hypertension, and diabetes were excluded from the study.

**Method:** Neonates admitted to the NICU with a history of intrapartum fetal distress with or without the presence of conium staining of amniotic fluid or an Apgar score <7 at 1 minute of birth or requiring immediate neonatal resuscitation with ventilation by bag and mask or via an endotracheal tube for more than one minute.

The same number of forty (40) controlled (health) neonates was also included in the study to compare the detailed history and neurological examinations. Asphyxiated neonates were monitored for seizures, hypotonia, and hypoxic-ischemic encephalopathy in the immediate neonatal period in the NICU. The severity of hypoxic-ischemic encephalopathy was graded using SARNAT, and SARNAT-staged cord blood from the umbilical artery was sent to PH analysis. The spot urine samples were collected within 6–24 hours of life. The urinary uric acid ratio level was studied using an auto analyzer by the spectra photometric uricase method, while the urinary creatinine level was estimated using Jaffe’s alkaline picrate method.

The duration of the study was from July 2023 to April 2024.

**Statistical Analysis:** Various parameters like gestation age, mean body weight of neonates, Apgar scores, urinary urea acid/creatinine ratio in asphyxia birth neonates, and the control group were compared and noted. The statistical analysis was carried out in SPSS software. The ratio of male and female neonates was 2:1.

## RESULTS

[Table 1] Demographic study of birth asphyxia neonates Gestational age: 36–37 weeks in asphyxia neonates and controlled groups, The mean birth weight in asphyxia cases was 2.1 to 3.1 kg and 2.3 to 3.6 kg in the normal group.

- The number of vaginal deliveries is 28 in asphyxia cases and 32 in the controlled group.

- Number LSCS: 12 in asphyxia cases and 8 in the controlled group

[Table 2] Study of Apgar Score in Birth Asphyxia Neonates

- 30 cases had a 0–3 Apgar score. 10 cases had a 4–6 Apgar score in asphyxia patients, and 40 controlled groups had a >7 Apgar score in 1 minute.
- Apgar score at 5 minutes
- 6 had a 0–3 Apgar score, 15 had a 4–6 Apgar score, 19 had a >7 Apgar score in asphyxia neonates, and 40 controlled groups had a >7 Apgar score.
- Apgar score at 10 minutes 8 asphyxia neonates had a 4–6 Apgar score, 32 had a >7 Apgar score, and 40 controlled groups had a >7 Apgar score.

[Table 3] Urinary/creatinine ratio: 0.86–4.62 in asphyxia patients, 0.32–2.18 in the controlled group.

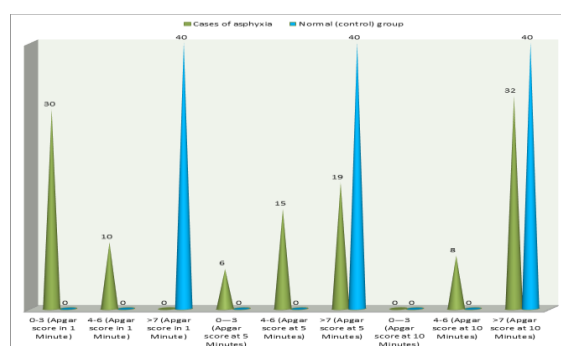


Figure 1: Study of Apgar score in birth asphyxia neonates.

Table 1: Demographic study of Neonates

Sl. No		Cases of asphyxia	Control (Normal)
1	Gestational age	36 – 37 weeks	36 – 37 weeks
2	Mean Birth weight	2.1 to 3.1 Kg	2.3 to 3.6 kg
3	Number of vaginal delivery	28	32
4	Number of LSCS	12	8

Table 2: Study of Apgar score in birth asphyxia neonates

Group of patients	Cases of asphyxia	Normal (control) group
Number of patients	40	40
Apgar score in 1 Minute		
0-3	30	0
4-6	10	0
>7	0	40
Apgar score at 5 Minutes		
0-3	6	--
4-6	15	--
>7	19	40
Apgar score at 10 minutes		
0-3	0	--
4-6	8	--
>7	32	40

Table 3: Estimation of Urinary Uric acid/creatinine ratio in both group

Group	Cases of asphyxia	Control group (Normal)
Urinary Uric acid/creatinine Ratio	0.86-4.62	0.32-2.18

## DISCUSSION

Present study of uric acid and creatinine ratio in birth asphyxia in neonates. In the demographic study, the gestational age was 36–37 weeks in both groups. The mean birth weight was 2.1 to 3.1 kg in asphyxia patients and 2.3 to 3.6 kg in the control group. 28 babies were born through vaginal delivery, and 12 were born through LSCS in asphyxia neonates; 32 had vaginal delivery, and 8 had LSCS delivery [Table 1]. In the APGAR score study in 1 minute, 30 had a 1-3, 10 had a 4-6 score in asphyxia cases, and 40 controlled had >7 APGAR score. APGAR score at 5 minutes: 6 had 0-3, 15 had 4-6, 19 had >7, and 40 had >7. At 10th minutes, the APGAR score was 8 with a 4-6, 32 with a >7 score in asphyxia cases, and 40 in the controlled group had >7 score [Table 2]. Uric acid level creatinine ratio was 0.86-4.62 in asphyxia cases and 0.32 and 2.18 controlled group [Table 3]. These findings are more or less in agreement with previous studies.<sup>[5-7]</sup>

Perinatal asphyxia is a common neonatal condition, contributing significantly to neonatal morbidity and mortality. It is a debilitating condition because of its potential to cause permanent damage and even the death of the neonate. The signs of asphyxia injuries are nonspecific and may overlap with other injuries. Urinary UA/ Cr. ratio is a simple, non-invasive, painless, and economical investigation for the diagnosis of perinatal asphyxia. The combined use of arterial blood PH, APGAR scores, and the UA/Cr ratio can help in early decision-making about the level of care the newborn requires. In the present study, there is an elevation of the UA/Cr ratio. It is confirmed by previous studies.<sup>[8]</sup> Moderate asphyxia is defined as an APGAR score of 4-6 at minutes of age; severe asphyxia is defined as no breathing or an APGAR score of 0–3 at 1 minute of age.<sup>[9]</sup> The APGAR score is a useful criteria for predicting long-term outcomes in infants with prenatal asphyxia.<sup>[10]</sup> It is suggested that asphyxia occurs when there is hypoxia together with the accumulation of carbon dioxide, and if prolonged, this leads to an eventual state of respiratory distress. Metabolic acidosis ignores the fact that this may be an entirely normal sequence of physiological events. Severe fetal or cord blood acidosis is a marker of impaired tissue gas exchange, but there is no evidence that acidosis perse is a cause of further tissue damage.<sup>[11]</sup>

Heavy or thick meconium staining is considered to be a marker of more prolonged or severe asphyxia episodes. Meconium staining is seen in approximately 15% of all labors.

Brief hypoxia impairs oxidative metabolism, leading to anaerobic glucose to generate ATP. During prolonged hypoxia, cardiac output falls, cerebral blood flow (CBF) is compromised, and a combined hypoxic-ischemic insult produces further failure of oxidative phosphorylation and ATP production sufficient to cause cellular damage.

## CONCLUSION

The present study has proven that the urinary UA/Cr ratio increases considerably after birth asphyxia. An increase is associated with the severity of HIE and a poorer outcome. Hence, the UA/Cr ratio might have an important role in diagnosing and predicting the outcome of perinatal asphyxia. Such clinical trials must be conducted on a large number of patients in hi-tech hospital where the latest techniques are available to confirm the present findings and results. Because little is known about the factors that cause birth asphyxia.

**Limitation of study:** Owing to the tertiary location of the research center, the small number of patients, and the lack of the latest techniques, we have limited findings and results.

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