



STUDY TO FIND OUT RENAL PARAMETER AND SERUM CALCIUM LEVEL IN PERINATAL ASPHYXIA

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ABSTRACT **Background:** Perinatal asphyxia is defined as lack of blood flow or gas exchange in the fetus at birth. As kidneys are very sensitive to oxygen deprivation, renal insufficiency may occur within 24 hours of a hypoxic ischaemic episode, which if prolonged, may even lead to irreversible cortical necrosis. Early detection of renal failure in newborns with HIE is critical for adequate fluid and electrolyte management, as a stable electrical milieu is critical. Many clinical and biochemical criteria are unreliable in this age range, making it difficult to diagnose renal failure. As a result, the current study aimed to find out the renal parameters and serum calcium levels in neonates with perinatal asphyxia. **Material and Methods:** Current study was hospital based prospective study conducted in the department of Paediatrics, SPMCHI, SMS Medical College, Jaipur from February 2021 to December 2022. In this study a total 100 participants were included. A detailed clinical examination was taken to identify the appropriate for gestational age by applying the New Ballard score and birth weight. Renal function parameters: urea, creatinine, and calcium were sent to the biochemistry lab by taking peripheral venous blood samples, initially within 24±6 hrs. of birth and later at 48±6 hrs. and 72±6 hrs. Data were analysed in SPSS v-24. Anova test and Chi-square test were applied. p value <0.05 was considered statistically significant. **Results:** A statistically significant decline was found in serum urea and serum creatinine level from 24 hours to 72 hours while a statistically significant increment was found in serum calcium level from 24 hours to 72 hours. A statistically significant gender and mode of delivery difference was found between different stage of HIE. Male newborn and LSCS were more in stage II and III. Serum urea, serum creatinine level was statistically significant increased while serum calcium level decreased as HIE stage increases at different time interval. **Conclusion:** Neonatal renal insufficiency is commonly caused by perinatal asphyxia. Serum calcium level and urea and creatinine were found to associated with HIE stages so frequent measurements of serum calcium, urea and creatinine levels aid in the early detection and management of renal failure.

KEYWORDS : Asphyxia, urea, creatinine, calcium, HIE etc.

INTRODUCTION

Perinatal asphyxia is defined as lack of blood flow or gas exchange in the fetus at birth. It may occur before, during and after the birth. It may resulted due to compromised placental or pulmonary gas exchange. Perinatal asphyxia can result in systemic and neurologic sequelae due to hypoxia to the vital organs¹. The hypoxia leads anaerobic glycolysis and lactic acidosis which affect vital organ. Neonatal hypoxic-ischemic encephalopathy(HIE) refers specifically to the neurologic sequelae of perinatal asphyxia².

Depending on the severity and timing of the hypoxic insult, a neonate with hypoxic-ischemic encephalopathy due to perinatal asphyxia can demonstrate a variety of neurologic findings. The severity can be graded by Sarnat and Sarnat staging for encephalopathy. Perinatal asphyxia leading to Hypoxic ischemic encephalopathy is a common problem causing multiorgan dysfunction including myocardial involvement which can affect the outcome.

Asphyxiated neonates show some biochemical and hematological variations in some of the variables in the form of acidosis, elevated lactate, hypoxia and hypercarbia. Among these variables nucleated red blood cells in neonates were also elevated because of perinatal asphyxia.³

Various metabolic abnormalities have been observed in asphyxiated newborns. Biochemical abnormalities related with poor prognosis in birth asphyxia include hypoglycemia, hyperkalemia, hyponatremia, hyperuricaemia, hypocalcaemia, and elevated creatinine levels.⁴⁻⁸

Because there is a lack of data on calcium levels in birth asphyxia, there are no clear guidelines for calcium as adjuvant therapy. Early detection of renal failure in newborns with HIE is critical for adequate fluid and electrolyte management, as a stable electrical milieu is critical. Many clinical and biochemical criteria are unreliable in this age range, making it difficult to diagnose renal failure.⁹⁻¹¹

As a result, the current study aimed to find out the renal parameters and serum calcium levels in neonates with birth asphyxia to normal healthy neonates.

MATERIAL AND METHODS

Current study was hospital based prospective study conducted in the department of Paediatrics, SPMCHI, SMS Medical College, Jaipur from February 2021 to December 2022. This study aimed to find out the renal parameters and serum calcium levels in perinatal asphyxia. In

this study a total 100 participants were included. In this study, term newborn (37-42 Weeks) with history of perinatal asphyxia, need for immediate neonatal resuscitation including bag and mask ventilation and evidence of neurological abnormalities suggestive of Hypoxic Ischemic Encephalopathy were included while Congenital abnormalities of CNS, Kidneys and Urinary tract, babies with septicemia, respiratory distress syndrome of other etiology, Newborn presenting after 30 hours of life and Preterm babies were excluded. A detailed clinical examination was taken to identify the appropriate for gestational age by applying the New Ballard score and birth weight. Renal function parameters: urea, creatinine, and calcium were sent to the biochemistry lab by taking peripheral venous blood samples, initially within 24±6 hrs. of birth and later at 48±6 hrs. and 72±6 hrs. Data were analysed in SPSS v-24. Anova test and Chi-square test were applied. p value <0.05 was considered statistically significant.

RESULTS

In the current study, mean age of the newborn was 19.68±5.97 hours, mean birth weight was 2.9±0.29 kg, mean APGAR at 1 min and 5 min was 4.12±0.92 and 6.34±1.12 respectively, most of the babies were male (62%), delivered by normal vaginal delivery (57%) and maximum 64% had HIE stage II followed by 26% had HIE stage III and 10% participants had HIE stage I. (Table 1)

A statistically significant decline was found in serum urea and serum creatinine level from 24 hours to 72 hours while a statistically significant increment was found in serum calcium level from 24 hours to 72 hours. (Table 2)

A statistically significant gender and mode of delivery difference was found between different stage of HIE. Male newborn and LSCS were more in stage II and III. Serum urea, serum creatinine level was statistically significant increased while serum calcium level decreased as HIE stage increases at different time interval. (Table 3).

DISCUSSION

In the present study, statistically significant decline was found in serum urea level from 24 hours (76.73±33.9) to 48 hours (75.23±42.1) and 72 hours (68.8±35.2) and it was statistically significant increased as HIE stage increases at different time interval and also a statistically significant decline was found in serum creatinine level from 24 hours (1.04±0.34) to 48 hours (0.96±0.34) and 72 hours (0.78±0.41) and this also was statistically significant increased as HIE stage increases at different time interval. While a statistically significant increase was found in serum calcium level from 24 hours (8.1±0.58) to 48 hours

(8.4±0.45) and 72 hours (08.7±.32) and it was statistically significant decreased as HIE stage increases at different time interval.

Similar to the current study, Patidar A et al¹² included 69 cases with the majority of boys. Mild, moderate, and severe birth asphyxia was 7%, 29%, and 64% of all cases respectively. The incidence of acute renal failure was 57% among cases of birth asphyxia. Incidence of renal failure with mild, moderate, and severe asphyxia was 40%, 50%, and 39% respectively. So deranged renal parameter was significantly increased as severity of asphyxia increased.

Venkatesh G et al¹³ revealed that renal failure was seen in nearly 26(62%) of the study participants. Among those subjects who had renal failure 12% of them did not had HIE, 15% were HIE Stage I, 50% were Stage II of HIE and 23 % of them were classified into HIE III. However, Serum Calcium levels were found to be statistically insignificant which in contrast to the current study Which supported the current study data where serum urea and creatinine level were significantly increased with the HIE stages.

Singh BB et al¹⁴ also supported the current study and revealed that total serum calcium and ionic calcium levels at birth were significantly lower in cases (8.04±0.89 mg/dL, 3.62±0.46 mg/dL) as compared to controls (9.32±0.72 mg/dL, 4.79±0.49 mg/dL). Total serum calcium and ionic calcium levels at 48 hours were also significantly lower in cases (9.03±0.84 mg/dL, 4.51±0.41 mg/dL) as compared to controls (9.56±0.49 mg/dL, 4.80±0.69 mg/dL).

Baranala SK et al¹⁵ revealed in its case control study that the BUN levels were 28+8.98 in the asphyxiated newborns as compared to controls who had BUN level was 20.3+2.65 and it was statistically significant. BUN level was higher among cases as compared to control and it was statistically significant. The mean serum creatinine levels were 1.7+0.29 in case group and 1.12+0.4 in control and it was statistically significant difference between both the groups.

In Acharya A et al¹⁶ study revealed that the degree of hyponatremia, hypocalcemia, and hyperkalemia (124.4±4.4 mmol/l, 0.83±0.08 mmol/l, and 6.17± 0.89 mmol/l, respectively) were more severely affected in HIE III as compared to HIE I (137.5±3.8 mmol/l, 1.06±0.17 mmol/l, and 5.0±0.79 mmol/l, respectively). similar to the current study serum urea and creatinine increased proportionately with an increase in the severity of HIE grade.

Bansal S et al¹⁷ did a case control study and in this study blood urea nitrogen (BUN) and creatinine level was higher among cases. Odo KE et al found that mean plasma ionized calcium level was significantly lower (1.10±0.14 mmol/l vs 1.25 0.11 mmol/l; P < 0.05) in subjects compared to controls

Rai S et al¹⁸ revealed that mean serum calcium level at 24 h of age is significantly lower (8.31 ± 0.48 mg/dl vs. 9.47 ± 0.49 mg/dl; P < 0.001), in cases than control group. Among cases there was significant negative correlation of serum calcium level and severity of asphyxia (P < 0.01).

Rahman MK et al¹⁹ found that In asphyxiated newborns, mean blood urea and serum creatinine levels were elevated. The mean SD for blood urea was 7.13.1mmol/L, and the mean SD for serum creatinine was 120.873.6mmol/L.

CONCLUSION

Neonatal renal insufficiency is commonly caused by perinatal asphyxia. Serum calcium level and urea and creatinine were found to be associated with HIE stages so Frequent and frequent measurements of serum calcium, urea and creatinine levels aid in the early detection and management of renal failure. Acute renal failure in birth asphyxia is strongly associated with HIE. ARF in birth asphyxia is mostly caused by intrinsic renal failure and varies according to the severity of the hypoxia. ARF in birth asphyxia is mostly caused by intrinsic renal failure and varies according to the severity of the hypoxia.

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