

Frequency of Electrolyte and Metabolic Abnormalities in Asphyxiated Newborns- An Experience at District Headquarter Hospital

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ABSTRACT

Aim: To fluid the status of electrolytes in asphyxiated neonates after birth.

Study Design: Cross Sectional Study.

Setting: Paediatric Department, DHQ- Teaching Hospital, Gujranwala, affiliated with Gujranwala Medical College.

Methodology: Study was done in asphyxiated newborns from February 2019 to October 2019. Babies weighing 2.5 Kg or more with no cry at birth, both male and female were included in the study. Venous samples were taken with aseptic technique and their Serum Sodium, Calcium and Glucose levels were measured at Hospital Laboratory. Data interpretation and analysis was conducted through SPSS version 21.

Results: Amongst 320 children, 66.25% (n=212) were between 1-3 hours of life and 33.75% (108) were between 4-6 hours of life with mean \pm SD 3.25 \pm 1.71 hours. Males were 60.31% (n=193) and 39.69% were females. Out of study population (320), 22.81% (73) had hypoglycaemia, 29.38% (94) had hypernatremia and 17.5% (56) had hypocalcaemia.

Conclusion: Hyponatraemia was the leading electrolyte disturbance in asphyxiated neonates followed by hypoglycaemia and hypocalcaemia.

Keywords: Asphyxia, Hyponatraemia, Hypoglycaemia, Hypocalcaemia

INTRODUCTION

Birth Asphyxia is defined as failure of initiation of breathing at birth¹. It is infact combination of chemical changes like hypoxia, hypercapnia and acidosis, ending up with systemic disturbances². Birth asphyxia is the leading cause of morbidity and mortality in newborns globally and imparts almost 23% of deaths in newborn babies. It is also the most common cause of mortality (28.8%) in Indian neonates³. Each year more than 9 million neonatal deaths occur due to asphyxia⁴. Its incidence all over the world is 1-3/1000 live births⁵. WHO data of 2011, showed that the commonest cause of death of newborns in Pakistan is birth asphyxia.⁶ Neonatal Sepsis is the second major reason of newborn deaths all around the globe, particularly in underdeveloped states like Pakistan⁷.

Asphyxia causes many complications like multi-organ failure, hypoxic ischemic encephalopathy, seizures and metabolic derangements.⁸ This can lead to permanent brain damage and neurological complications like cerebral palsy, epilepsy and mental retardation.⁹ Hypoxia can damage nearly every part of the human body, proving more detrimental to kidneys, brain, heart and lungs.¹⁰ Electrolyte and metabolic derangements are very important complications of birth asphyxia¹¹.

The most common electrolyte and metabolic imbalances in these patients are hyponatremia, hyperkalemia, hypocalcaemia and hypoglycaemia^{3,11}. Hyponatremia is caused by increased excretion of sodium in urine¹² and Syndrome of Inappropriate Secretion of Antidiuretic Hormone (SIADH)¹. Hyponatremia causes

cerebral oedema which can lead to seizures,¹² results in further worsening of neurological functions and leads to increase in mortality and morbidity due to Birth Asphyxia¹³.

Glucose requirements of brain is also increased during Asphyxia, hence, patients are prone to develop hypoglycaemia,¹⁴ associated with worse neurological outcome, therefore, warrant prompt recognition and treatment to prevent permanent brain damage¹⁵.

This study was intended to find the electrolytes status of asphyxiated neonates, as there are wide controversies in the results of previous studies and available data of electrolytes in these babies is scarce in local population.

METHODOLOGY

This cross-sectional study was carried out at Paediatric Department of District Head Quarter Hospital Gujranwala. The study period was February 2019 to October 2019. Inclusion criteria were newborns weighting 2.5 Kg or more delivered at term and with history of no crying at birth, including both males and females. Exclusion criteria were babies with congenital malformation, IUGR or low birth weight and babies with maternal history of sedation prior to delivery.

Data collection: After being approved from Ethical Committee of the hospital, 320 newborns, admitted in Neonatal Unit, meeting the inclusion criteria were enrolled into study. Informed consent was acquired from parents. Particulars like name, age, gender, and weight of the baby and socioeconomic status of parents were recorded. Venous samples of every baby were taken with aseptic techniques. Blood samples of selected newborns were sent within six hours of life to hospital laboratory for serum electrolyte (Sodium, Potassium and Glucose) levels. All

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relevant details were entered in SPSS version 21 for data interpretation and analysis. For quantitative variables like age, mean and standard deviation were estimated, while for qualitative variables e.g. gender and serum electrolyte disturbances (hyponatremia, hypocalcaemia and hypoglycaemia), frequency and percentage were measured.

RESULTS

Amongst 320 newborn who met the inclusion and exclusion criteria were recruited to find out the frequency of electrolyte disturbances amid Asphyxiated Neonates. Age distributions of patients was done at the time of admission in nursery, which shows that 212(66.25%) were between 1-3 hours of life and 108(33.75%) were within 4-6 hours, mean \pm SD was estimated as 3.25 ± 1.71 hours (Table 1).

Gender description of neonates was carried out which reveals that 193(60.31%) were boys and 127(39.69%) were girls (Table 2).

Frequency related to electrolyte disturbances in asphyxiated neonates were noted as 73(22.81%) of study population had hypoglycaemia, 94(29.38%) had hyponatraemia and 56(17.5%) had hypocalcaemia (Table. 3).

Table 1: Age distribution (n=320)

Age (in Hours)	Number	Percentage
1-3	212	66.25
4-6	108	33.75
Total	320	

Mean \pm SD: 3.25 ± 1.71

Table 2: Gender distribution (n=320)

Gender	Number	Percentage
Male	193	60.31
Female	127	39.69
Total	320	

Table 3: Frequency of electrolyte disturbances in asphyxiated neonates (n=320)

Electrolyte	Number	Percentage
Hypoglycaemia	73	22.81
Hyponatremia	94	29.38
Hypocalcaemia	56	17.5

DISCUSSION

Birth Asphyxia in newborns is a major reason of acute injury to brain, affecting 2-3/1000 live births in developed nations and much increased in underdeveloped states. Birth Asphyxia related long term neurodevelopmental disorders were seen in 25-60% of survivors. Different studies had shown that hyponatremia, hypophosphatemia, hypokalaemia and hypocalcaemia are associated with increased mortality in different ailments including Asphyxia and Sepsis^{7,16}.

This study was planned to find the electrolyte and metabolic status in Asphyxiated Neonates as limited local data is available in our population. In current study, amongst 320 newborns, 212(66.25%) babies were between 1-3 hours of life and 108(33.75%) were between

4-6 hours old, where mean \pm SD was measured as 3.25 ± 1.71 hours.

Description according to gender revealed 193(60.31%) were baby boys and 127(39.69%) were girls. Frequency of electrolyte disturbances in Asphyxiated Neonates showed that 73(22.81%) had hypoglycaemia, 94(29.38%) had hyponatremia and 56(17.5%) had hypocalcaemia.

These findings are in agreement with a study done in Nepal on asphyxiated Newborns that showed hyponatremia in 23.3%, hypocalcaemia in 11.7% and hypoglycaemia in 18.3% of enrolled children¹⁷. However, our results are in contrast with a study done on neonates with Asphyxia showing hyponatremia i.e., Serum Sodium <134meq/L in 48%, hypocalcaemia in 42% and hypoglycaemia in 8% of the newborns¹⁸.

Basu P and others¹¹ discussed condition of electrolytes in neonates with birth asphyxia of varying severeness and found that mean level of sodium was much decreased (122.1 ± 6.0 meq/L vs. 138.8 ± 2.7 meq/L; $P=0.001$), and mean potassium was increased (5.05 ± 0.63 meq/L vs. 4.19 ± 0.40 meq/L; $P<0.001$). Similarly, calcium was ascertained to be decreased (6.85 ± 0.95 mg/dl vs 9.50 ± 0.5 mg/dl; $P<0.001$), when equated with controls.

Thakur et al; found that degree of hyponatremia and hyperkalaemia was related to severeness of birth asphyxia and these changes in electrolytes must be taken care of while dealing the newborns with asphyxia².

Sateesh K.D et al; ascertained that serum sodium was much lower in every stage of asphyxia, increased potassium level was important with rising severeness of asphyxia, while low calcium levels was not an important determination.³ Another study by Jajoo et al; revealed a significant low serum calcium levels in newborns with asphyxia, when equated with controls¹⁹.

Present study revealed that hyponatremia was the leading electrolyte disturbance followed by hypoglycaemia and hypocalcaemia. However, the limitation of this study was that only three parameters (sodium, calcium and glucose) were studied while others electrolytes like potassium etc were not included. Another restriction of current study was that it did not admit control group. However, we are of the view that large, case control studies in this regard may be conducted to address the issue in local population.

CONCLUSION

It was concluded that frequency of hyponatremia was the main electrolyte disturbance in Asphyxiated Neonates, followed by hypocalcaemia while major metabolic disturbance was hypoglycaemia, though, they may not be symptomatic in most cases. However, these results are primarily in targeted population with limitations which need to be addressed in future trials.

REFERENCES

1. Spector JM, Daga S. preventing the so-called still births. Bull World Health Organ. 2008;86(4):315-16.
2. Thakur J, Bhatta NK, Singh RR, Poudel P, Lamsal M, Shakya A. Prevalence of electrolyte disturbances in perinatal asphyxia: a prospective study. Italian Journal of Pediatrics. 2018;44-56.

3. Kumar SD, Kumar TM. Electrolyte abnormalities in asphyxiated newborns. *Int J Contemp Pediatr.* 2018;5(3):1036-39.
4. M Hoque, S Haaq, R Islam. Causes of neonatal admissions and deaths at a rural hospital in KwaZulu-Natal, South Africa. *Southern African Journal of Epidemiology and Infection.* 2011;26(1):26-29.
5. Lai MC, Yang SN. Perinatal Hypoxic-Ischemic Encephalopathy. *J Biomed Biotechnol.* 2011; 2011: 609813. Published online 2010 Dec 13. doi: 10.1155/2011/609813.
6. Perveen F, Tayyab S, Zuberi B. Risk factors for perinatal deaths in Pakistan. *J ObstetGynaecol Res.* 2011;37(10):1359-64.
7. M.S Ahmad, Ahmad D, Medhat N, Zaidi SAH, Farooq H, Tabraiz SA. Electrolyte Abnormalities in Neonates with Probable and Culture-Proven Sepsis and its Association with Neonatal Mortality. *Journal of College of Physician and Surgeon Pakistan.* 2018;28(3):206-209.
8. Ambalavanan N, Carlo W. Hypoxic-Ischemic Encephalopathy in Kliegman RM, Stanton BF, St. Geme JW, Schor NF, Bherman RE, editors. *Nelson Text Book of Pediatrics.* 19th ed. Philadelphia; Saunders 2011:1323-39.
9. Padayachee N, Ballot D E. Outcomes of neonates with perinatal asphyxia at a tertiary academic hospital in Johannesburg, South Africa. *South African Journal of Child Health.* 2013;7(3):89-94.
10. Vandana, Amit V, Meena V, Anuradha B, Vivek B, Mishra VD, Salone R. Study Of Basic Biochemical And Haematological Parameters In Perinatal Asphyxia And Its Correlation With Hypoxic Ischemic Encephalopathy (HIE) Staging. *Journal of Advance Researches in Biological Sciences.* 2011;3(2):79-85.
11. Basu P, Som S, Das H, Choudhuri N. Electrolyte status in birth asphyxia. *Indian J Pediatr.* 2010;77(3):259-62.
12. Rahman MK, Islam MN, Siddika M, Bhuyan KJ, Chowdhury MA. Assessment of renal function by estimation of fractional excretion of sodium in asphyxiated newborns. *Mymensingh Med J.* 2012;21(3):516-21.
13. Ayus J, Moritz M. Bone Disease as a new Complication of Hyponatremia: Moving Beyond Brain Injury. *Clin J Am Soc Nephrol.* 2010;5(2):167-8.
14. Waqar T, Haque K. Birth Asphyxia: Brief Review of Pathogenesis and Pragmatic Guidelines for its Management in Resource Limited Countries. *Pak Paed J.* 2012;36(2):61-9.
15. Wong D, Poskitt K, Chau V, Miller S. Brain Injury Patterns in Hypoglycemia in Neonatal Encephalopathy. *Wong Jul.* 2013;34(7):1456-1461.
16. Stelfox HT, Ahmad SB, Kevin B, Laupland. The epidemiology of intensive care unit acquired hyponatremia and hypernatremia in medical-surgical intensive care units. *Crit Care.* 2008;12:R162.
17. Shah GS, Agrawal J, Mishra OP, Chalise S. Clinico-biochemical profile of Neonates with Birth Asphyxia in Eastern Nepal. *J. Nepal Paediatr. Soc.* 2012;32(3):206-209.
18. Jayaprakash K, Murali BH. Study of Electrolyte status, Glucose and Uric Acid level in Perinatal Asphyxia. *JEMDS.* 2014;3:4786-4790