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A PROSPECTIVE STUDY OF SERUM ELECTROLYTES (SODIUM, POTASSIUM, CALCIUM) AND GLUCOSE LEVELS IN BIRTH ASPHYXIATED NEWBORNS AND CORRELATION WITH APGAR SCORE AT TERTIARY CARE CENTRE INDORE.

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Abstract
Aim of present study is to study of serum electrolytes (sodium, potassium, calcium) and glucose levels in birth asphyxiated newborns and correlation with apgar score, the study was conducted on 100 asphyxiated term neonates delivered at index medical college hospital. Venous blood sample was drawn in NICU and sent for analysis of serum sodium, potassium, calcium, serum glucose within one hour and 24 hours of birth.
The result is significant at $p < 0.05$. There is significant decrease in serum calcium level in asphyxiated newborns and this decrease is directly proportional to the degree of birth asphyxia and linear correlation with APGAR score. A total of 100 asphyxiated cases, 62 (62%) cases developed hypocalcemia and 38% have normal calcium level. In this study lower blood glucose levels are seen amongst asphyxiated newborns and are directly proportional to low APGAR score and severity of birth asphyxia. A total of 100 asphyxiated cases,61% developed hypoglycemia. . The chi-square statistic is 19.5358. The p value is 0.000212. The chi-square statistic is 72.4565. The p-value is < 0.00001. The result is significant at $p < .05$.
We conclude that the electrolytes and glucose levels in a newborn were in linear correlation with APGAR score and increase or decrease in studied parameters correlates with the severity of birth asphyxia. Our studies reinforce that asphyxiated newborns with abnormal levels of blood glucose or electrolytes require medical intervention immediately after birth. An adequate clinical evaluation and biochemical monitoring are urgently required for early diagnosis and proper management to prevent adverse neurological outcome and to improve long term prognosis with birth asphyxia.
- Finally our study has given a unique opportunity to correlate with the previous studies and a better understanding of the neonates with neonatal asphyxia.
Keywords: serum, electrolytes, asphyxiated, glucose & newborns.

Introduction

Birth asphyxia refers to a condition in which decreased oxygen, blood flow and impaired gas exchange to the fetus or newborn, leads to fetal acidosis, hypoxemia and hypercarbia[1].

Birth asphyxia is a devastating clinical condition because of its potential for causing permanent damage and even death of fetus[2&3].

Nearly one million children who survive to birth asphyxia, live with chronic neuro-developmental illnesses including cerebral palsy,mental retardation and various learning disabilities. Due to lack of resourses developing countries are more affected[[4]]. In india between 2.5 lakh to 3.5 lakh infants die every year due to birth asphyxia, mostly within the first three days of life. Data from national neonatal database (NNPD) tells that birth asphyxia contributes to almost 20% of neonatal mortality in India[5&6].

Despite the increasing understanding of the mechanisms, early identification of brain damage following hypoxic ischemic events still remains the toughest problems in neonatal care[7&8].

Hence this study is conducted to find out any correlation between the electrolyte status and glucose levels with the severity of asphyxia, so that problems could be anticipated early and appropriate measures are taken, so neonatal morbidity and mortality could be reduced[9,10,11].

Aim and objective

To evaluate electrolytes (sodium, potassium, calcium) and glucose disturbance in asphyxiated newborn in the early neonatal period and correlation with different severity of birth asphyxia.

Material and methods

The study was conducted on 100 asphyxiated term neonates delivered at index medical college hospital. Venous blood sample was drawn in NICU and sent for analysis of serum sodium, potassium, calcium, serum glucose within one hour and 24 hours of birth. All collected data was statistically analysed by applying chi-square test using SPSS 2.0 software.

Inclusion criteria-

1. All babies delivered at tertiary care centre with h/o birth asphyxia.
2. Birth weight 2.5 kg or more.
3. APGAR score < 7 at one minute of life.

Exclusion criteria-

4. Babies with congenital malformation.
5. Metabolic diseases.
6. Babies born to mother having hypertension ,diabetes mellitus, treated with diuretics, receiving general anesthesia, magnesium sulphate and other drugs likely to cause depression in babies.
7. Congenital infections.
8. Neonates born to mothers on antiepileptics.
9. Mothers with history of febrile attacks within two weeks before delivery.

Analysis and Results

Total 100 casesof birth asphyxia were included in this study and all the cases were investigated for study.

Table 1: Correlation of APGAR with serum sodium level in asphyxiated cases

APGAR	Hyponatremia	Normal sodium	Total no of cases	P Value
0-3	16 (89%)	02 (11%)	18	<0.05
4	10 (100%)	00	10	
5	26 (72%)	10 (28%)	36	
6	09 (25%)	27 (75%)	36	
total	61	39	100	

Serum sodium levels found to be lower in asphyxiated newborns and shows a positive linear correlation with the APGAR score in the asphyxiated newborns being proportional to the degree of asphyxia. A total of 100 asphyxiatedcases, 61 (61%) developed hyponatremia and 39 cases have normal sodium level.
The chi-square statistic is 30.2446. The p-value is < 0.00001. The result is significant at p < .05.

Table 2: Correlation of APGAR with serum potassium level in asphyxiated cases

APGAR	Hyperkalemia	Normal potassium	Total no of cases	P Value
0-3	17 (94.4%)	01 (5.6%)	18	< 0.05
4	10 (100%)	00	10	
5	20 (55.5%)	16 (45.5%)	36	
6	13 (36%)	23 (64%)	36	
total	60	40	100	

The serum potassium level among asphyxiated newborn is significantly higher and is showing a inverse correlation withAPGAR score. Out of 100 asphyxiated cases, 60% developed hyperkalemia and 40% have normal potassium level.
The chi-square statistic is 21.1923. The p-value is .000096. The result is significant at p < .05.

Table 3: Correlation of APGAR with serum calcium level in asphyxiated cases

APGAR	hypocalcemia	Normal calcium	Total no of cases	P Value
0-3	17 (94.4%)	01 (5.6%)	18	< 0.05
4	10 (100%)	00	10	
5	33 (92%)	03 (8%)	36	
6	02 (5.5%)	34 (95.5%)	36	
total	62	38	100	

There is significant decrease in serum calcium level in asphyxiated newborns and this decrease is directly proportional to the degree of birth asphyxia and linear correlation with APGAR score. A total of 100 asphyxiated cases, 62 (62%) cases developed hypocalcemia and 38% have normal calcium level.
The chi-square statistic is 72.4565. The p-value is < 0.00001. The result is significant at p < .05

Table 4: Correlation of APGAR with glucose level in severity of asphyxia.

APGAR	Hypoglycemia	Normal glucose	Total no of cases	P Value
0-3	17 (94%)	01 (5.5%)	18	<0.05
4	10 (100%	00	10	
5	20 (55.5%)	16 (44.4%)	36	
6	14 (39%)	22 (61%)	36	
total	61	39	100	

In this study lower blood glucose levels are seen amongst asphyxiated newborns and are directly proportional to low APGAR score and severity of birth asphyxia. A total of 100 asphyxiated cases ,61% developed hypoglycemia. .
The chi-square statistic is 19.5358. The p value is 0.000212. The result is significant at $p < 0.05$

Results

There is a significant decrease in serum sodium(61% cases, 126.1+-6 mEq/L, P<0.001), serum calcium(62% cases, 6.85+-0.9mg/dl, P<0.001) and glucose(61%, 34+-6mg/dl, P<0.001) level but serum potassium(60%, 5.5+-0.8mEq/L, P<0.001) level was found to be high[12,13&14]. This shows a strong positive linear correlation between serum sodium, calcium, glucose levels and their APGAR score and significant inverse correlation between APGAR and serum potassium level and severity of birth asphyxia[15,16&17].

Discussion

In this study we found that there is a significant decrease in serum sodium level, serum calcium level and glucose level but serum potassium level is found to be high. Among cases these findings shows a strong positive linear correlation between serum sodium, calcium, glucose levels and their APGAR scores and significant negative linear correlation between APGAR score and serum potassium level and severity of birth asphyxia.

Conclusion

We conclude that the electrolytes and glucose levels in a newborn were in linear correlation with APGAR score and increase or decrease in studied parameters correlates with the severity of birth asphyxia. Our studies reinforce that asphyxiated newborns with abnormal levels of blood glucose or electrolytes require medical intervention immediately after birth. An adequate clinical evaluation and biochemical monitoring are urgently required for early diagnosis and proper management to prevent adverse neurological outcome and to improve long term prognosis with birth asphyxia.

- Finally our study has given a unique opportunity to correlate with the previous studies and a better understanding of the neonates with neonatal asphyxia.

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