ORIGINAL ARTICLE

FREQUENCY OF METABOLIC ACIDOSIS IN EARLY ONSET SEPSIS IN NEONATES PRESENTING TO TERTIARY CARE HOSPITAL

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Background: Early Onset Neonatal Sepsis (EONS) is a serious blood infection mainly microbial in nature and has worse health complications. Metabolic acidosis is one of such complications that occur due to acid-base imbalance and may result in lectic acidosis, myocardial depression, hypo-perfusion, shock and even death in severe cases. Despite of its significance, limited local literature is available in this regard. Aims were to determine frequency of metabolic acidosis in early onset neonatal sepsis among neonates presenting in a tertiary care hospital. This was cross sectional study. **Methods:** Present study was conducted in department of Children's Hospital and Institute of Child Health Lahore. The data was collected through Non probability consecutive sampling from 242 neonates aged ≤72 hours of either gender diagnosed as EONS. Data was entered and analyzed in SPSS 22. For association, Chi-square test was applied and *p*-value ≤0.05 was considered as significant. **Results:** The mean age of patients was 36.49±18.33 hours with 137(56.61%) male and 105(43.39%) female cases in this study. The frequency of metabolic acidosis was 67(27.69%) of the cases with no association with age, birth weight, gestational age and gender (*p*-values >0.05). **Practical Implication:** Even recently, no local study has published the frequency of metabolic acidosis or found its association directly with EONS in Pakistan. Therefore, metabolic acidosis if found in EONS neonates, then in future every patient with early onset sepsis should be screened and can be managed timely. **Conclusion:** It is concluded that very high statistics of metabolic acidosis, i.e., 27.69% so every patient with early onset sepsis should be screened for metabolic acidosis to reduce worse health outcomes.

Keywords: Metabolic Acidosis; Neonates; Early Onset Sepsis; Tertiary Care Hospital; Mortality and Acid-Base Imbalance

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INTRODUCTION

World Health Organization (WHO) reports that among 130 million children born every year, almost 4 million die within first 28 days of their life.[1] Despite advances in medical research and clinical ability to detect and prevent risk factors of neonatal morbidity at early stages, neonatal sepsis,[2] unfortunately, remains one of the primary causes of neonatal mortality as well as morbidity globally as well as in Pakistan[3]. Early Onset Neonatal Sepsis (EONS) is a blood infection among neonates that occurs within first 7 days of life.[4] It is mostly a microbial infection caused by Group B streptococcus (GBS) and Escherichia coli, and may prove fatal if complicated or due to delay in management.[5] Reported prevalence of Early-Onset sepsis is 39% and it may cause neonatal mortality among 30–50% effected neonates.[6] Although neonatal sepsis is an alarming situation in both developed and developing countries, however, its prevalence as well as associated morbidity and mortality is higher in developing countries like Pakistan.[7]

Clinically, diagnosis for early onset sepsis is challenging due to its vague nature as it may confuse physicians with diseases like Respiratory Distress syndrome or maladaptation.[8] However, closely observing signs and symptoms and timely tests may help reach correct diagnosis early.[4] A number of unrelated signs and symptom, few or all may be presented by the patient including lathergy, fever, hypotension, weird cry, abnormal sleep pattern, diarrhoea, respiratory distress, renal failure, shock, necrosis and meningitis etc.[9] Physicians go through clinical presentation of neonate and may run non-specific blood tests such as C-reactive protein and blood cultures to confirm the diagnosis of sepsis among neonates.[10]

Neonatal sepsis may lead to other complications as well, one of them being metabolic acidosis.[11] Metabolic acidosis is an acid-base disease due to imbalance of the pH level in neonates.[12] In septic neonates, it may either develop due to decrease in plasma bicarbonate concentration or due to increase

in hydrogen ion concentration.[13] Acidosis has very adverse short and long-term effect on neonatal health and may cause bone diseases, muscle wasting, growth retardation, impaired glucose tolerance and disturbance in insulin function.[14] Complicated acidosis may result in shock, myocardial depression, seizures and multi-organ failure and in severe cases death too.[15]

Unfortunately, despite of its worse effects on neonatal health, literature regarding acidosis in neonates with early onset sepsis is very limited. One study reported that among 36 cases of early onset sepsis the frequency of metabolic acidosis was seen in 7 (19.4%) of neonates.[16] Even recently, no local study has published the frequency of metabolic acidosis or found its association directly with EONS in Pakistan. Few national and international studies have seen both phenomena separately or in form of lactic acidosis on not much related target population.

Therefore, this study aims that if high statistics of metabolic acidosis if found in EONS neonates, then in future every patient with early onset sepsis should be screened and can be managed timely. Because untreated metabolic syndrome may further complicate the situation of EONS, by hypoperfusion, cardiac arrest, lactic acidosis or even multi-organ failure. Hence, aim was to see the frequency of metabolic acidosis among EONS neonates in a tertiary care setting in Pakistan.

MATERIAL AND METHODS

Present study was done at department of Children's Hospital and ICH, Lahore. The data was collected through Non probability consecutive sampling from 242 neonates calculated at 5% margin of error, 955 confidence level and expected frequency of metabolic acidosis as 19.4%.[16] All neonates aged ≤72 hours of either gender diagnosed as early onset sepsis were taken in this study whereas neonates with major systemic malformation, i.e., ASD, VSD, PDA and TOC were excluded. After written informed consent from parents or attendants of each neonate, the basic demographic information (age, sex, and address) was taken and a blood sample was drawn to diagnose metabolic acidosis as per operational definition.

Data was entered and analyzed in SPSS 22. Quantitative data was presented as Mean±SD. Frequency and percentages was calculated for qualitative data gender, frequency of metabolic acidosis. Data was stratified for various variables like age, gender, gestational age and birthright to see modifiers effect. Post stratification Chi-square test was applied with *p*-value ≤0.05 was taken as significant.

RESULTS

The mean age of patients was 36.49±18.33 hours with minimum and maximum age of 13–72 hours. The average gestational age was 36.11±3.64 weeks. The mean birth weight was 2.80±0.61 kg with minimum and maximum birth weight as 1.20 and 3.81 kg respectively as shown in Table-1

There were 134 (55.37%) patients who were 1–36 hours old and 108 (44.63%) were 37–72 hours old. There were 137 (56.61%) male and 105 (43.39%) female cases in this study. A total of 83(34.30%) were preterm (had gestational age <37 weeks) and 159 (65.70%) were full term. There were 90 (37.19%) cases who had low birth weight and rests of 152 (62.81%) had birth weight ≥2.5kg as shown in Table-2. No significant difference was seen between modifiers and metabolic acidosis as *p*-value >0.05.

According to operational definition the frequency of metabolic acidosis was 67 (27.69%) of the cases as shown by Figure-1.

Table-1: Baseline quantitative variables

	Age (hours)	Gestational age (weeks)	Birth Weight (kg)
Mean	36.49	36.11	2.77
SD	18.33	3.64	0.61
Range	59	16.00	2.61
Minimum	13	27.00	1.20
Maximum	72	43.00	3.81

Table-2: Comparison of metabolic acidosis with age (h), gender, gestational age (weeks) and weight (kg)

		Metabolic acidosis		Chi-square	*p*-value
		Yes	No		
Age groups (h)	1-36 h	36(53.7%)	98(56%)	0.101	0.751
	37-72 h	31(46.3%)	77(44%)		
Gender	Male	35(52.2%)	102(58.3%)	0.721	0.396
	Female	32(47.8%)	73(41.7%)		
Gestational age (weeks)	<37	20(29.9%)	63(36%)	0.813	0.367
	37 or more	47(70.1%)	112(64%)		
Weight (kg)	<2.5	21(31.3%)	69(39.4%)	1.35	0.244
	2.5 or more	46(68.7%)	106(60.6%)		

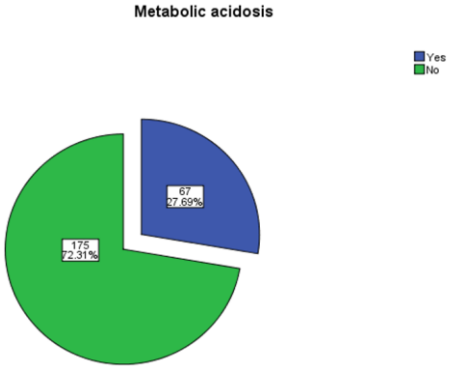

Figure-1: Frequency of metabolic acidosis the patients

DISCUSSION

Neonatal mortality is a critical issue worldwide especially in the developing and under-developed countries.[17] It effects almost 40% of children under 5 years of age, and almost 30% of deaths occur in first 28 days whereas 3/4th deaths occur in first week of life.[18] Unfortunately, almost 98% of deaths occur in developing countries.[18] Most common causes of neonatal death is sepsis. Sepsis is defined as a blood infection, mostly bacterial in nature.[19] Early onset neonatal sepsis occurs within first week of life of term babies. This may lead to worse health outcomes in newborns and may prove fatal if not diagnosed and treated in time.[20]

Early Onset Neonatal Sepsis mostly occurs due to GBS or Escherichia coli and is characterized by many signs and symptoms. It requires clinical observation and some blood culture tests to confirm diagnosis and may accompany some serious health complications. Metabolic acidosis is one of the most serious complications that occurs due to acid-base imbalance. One previous study showed that approximately 64% of patients in a large intensive care unit in the US were affected by metabolic acidosis.[21] It may effect neonatal health and if left untreated may result in cardiac arrest, shock and multi-organ failure.[22] Despite of its significance and critical importance, literature has reported very limited data about its frequency in EONS neonates. This study, hence, was designed to find frequency of metabolic acidosis in EONS neonates visiting in a tertiary care hospital.

Present study enrolled 137 (56.61%) male and 105 (43.39%) female cases in this study. The average gestational age was 36.11±3.64 weeks and the mean birth weight was 2.80±0.61 kg. Another study reported similar gender distribution i.e. male constitute 42 (58%) and females were 30(42%). In their study, among the infant with EOS, 26(36%) were VLBW and 63 (87.5%) were Pre-term.[23] We also found that there were 83 (34.30%) were preterm and 90 (37.19%) cases had low birth weight. One study reported that among 36 cases of early onset sepsis the frequency of metabolic acidosis was seen in 7 (19.4%) of neonates.[16] In this study the frequency of metabolic acidosis was 67 (27.69%) of the cases the frequency of metabolic acidosis is high in current study when compared to only available study. In this study when data was stratified for age, gender, gestational age and birth weight we found no significant difference between these effect modifiers and metabolic acidosis, *p*-value >0.05. As the studies are deficient on this subject so further studies are required to confirm and generalize the results. [24]

Limitations:

Single centered study with limited financial constrains and limited resources.

CONCLUSION

It was concluded that very high statistics of metabolic acidosis i.e. 27.69%. So every patient with early onset sepsis should be screened and managed accordingly to reduce the risk of vicious cycle of hypo-perfusion, worsening lactic acidosis and further cardiac suppression, causing multi-organ failure.

AUTHORS' CONTRIBUTION

MS&RN: Conceptualized the study, analyzed the data, and formulated the initial draft. AS&IA: Contributed to the proof reading. SM&MI: Collected data.

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