ORIGINAL ARTICLE

Mean Plasma Lactate Level in Neonates with Birth Asphyxia

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ABSTRACT

Aim: To determine the mean plasma lactate level in neonates with birth asphyxia.
Study Design: It was a cross sectional study.
Duration: From   Jan 2013 to Dec 2013.
Method: Neonates with APGAR score <5 at 5 minutes, Fetal distress (presence of meconium-stained liquor), Gestational age >34 weeks, Weight >2000 grams and Umbilical arterial gas pH <7.0 were included in our study. Plasma lactate investigation was sent to PNS Shifa laboratory within 6 hours of delivery. Data was analyzed on SPSS version 10. Mean and standard deviation was presented for age, gestational age, weight of the neonates and plasma lactate level. Effect modifiers like gender, gestational age and weight of the neonates were controlled through stratification, t test was applied
Results: The average age of the patients was 4.58±0.29hours. The average Weight of the Neonates in kg was 2.78±0.04 (95%CI: 2.70 to 2.86), Gestational age in weeks 37.81±0.208 (95%CI: 37.39 to 38.22) similarly Mean Plasma Lactate 6.57±2.399 mmol/L (95%CI: 5.38 to 7.12) On comparison of Plasma lactate with gender no significant difference observed, mean value of Plasma lactate among Males was 5.9609 ± 3.499 mmol/L which was lower than Female Patients 6.7438 ± 4.85 mmol/L.
Conclusion: The mean plasma lactate level in neonates with birth asphyxia in our study was found to be 6.57±2.399 mmol/L
Keywords: Birth Asphyxia, plasma lactate level, meconium-stained liquor, Fetal distress

INTRODUCTION

Birth Asphyxia is defined by the World Health Organization (WHO) as "the failure to initiate and sustain breathing at birth[1]". Birth asphyxia is most common cause of neonatal morbidity and mortality[2]. WHO estimates that globally between 4 and 9 million new born suffer birth asphyxia each year, an estimated 1.2 million die and almost the same number developed severe neurological consequences[2-3]. WHO also estimates that globally 29 percent of neonatal death are caused by birth asphyxia. Additionally, birth asphyxia leads to substantial burden of long term neurological disability and impairment[4].

Prenatal asphyxia results from inadequate supply of oxygen immediately before during or after delivery[5]. Antepartum events accounts for approximately 20 percent of cases[5-6]. Intrapartum events account for approximately 35%[5,6,7]. Postnatal insults account for approximately 10% cases and intrauterine growth retardation account for another 35 percent[7]. In addition to central nervous system dysfunction, congestive heart failure and cardiogenic shock, persistent pulmonary hypertension, respiratory distress syndrome, gastro intestinal perforations are associated with prenatal asphyxia[8-9]. Apart from birth asphyxia conditions such as prematurity or congenital

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anomaly can result in a failure to establish adequate breathing at birth and manifest as asphyxia[5,6,7].

Biochemical markers are valuable tools for the detection of hypoxic-ischemic events. Historically, fetal umbilical pH and base excess (BE) have been used as markers of hypoxic-ischemic insult, reflecting the cellular production of metabolic acids in consequence of hypoxemia. Lactate has been proposed as a useful method for the detection of fetal hypoxia.[10]In birth asphyxia, plasma lactate levels was found to be 8.34±9.14[11]. The rationale of the study was to measure the mean plasma lactate level in neonates with birth asphyxia, if found to be higher than further studies could be carried out to assess the diagnostic accuracy so that it could be used as screening tool.

MATERIAL AND METHODS

A total of 85 neonates with APGAR score <5 at 5 minutes, fetal distress, gestational age >34 weeks, weight >2000 grams, umbilical arterial gas pH <7.0, either gender presenting to PNS Shifa Naval Hospital, Karachi were enrolled in the study while neonates with congenital malformations, chromosomal abnormalities, intracranial haemorrhage, septicaemia, coagulation disorder and trauma were excluded from the study. An informed consent from the parents was obtianed. Confidentiality was ensured to the parents. Brief birth history was taken from the mother for gestational

age. Plasma lactate investigation was sent to PNS Shifa laboratory within 6 hours of delivery. Results of the investigation were entered by the researcher into the proforma. SPSS version 10 was used for data entry and analysis. Mean and standard deviation was presented for age, gestational age, weight of the neonates and plasma lactate level. Male: female ratio was calculated.

RESULTS

Eighty-Five diagnosed cases of Plasma Lactate in neonates' birth asphyxia were included in this study. The average age of the patients was 4.58±0.29hours. Minimum age was 01 hour and maximum was 10 hour with a range of 10-01 hour (Table 1). The average Weight of the Neonates in kg was 2.78±0.04 (95%CI: 2.70 to 2.86), Gestational Age in weeks 37.81±0.208 (95%CI: 37.39 to 38.22) similarly Mean Plasma Lactate 6.57±2.399 (95%CI: 5.38 to 7.12) (Table 2). Regarding Gender of the babies, 53(62.4%) were male and 32(37.6%) were female with 5:3 male to female ratio (Table 3). Most of the Babies 43(50.6%) was in the 2 to 5 hour & 10(11.8%) babies below were of more than 8 hour of age (Table 4). Birth weight of the newborn less than and equal to 1.5 kg was observed in 01 case (1.2%), similarly 1.6 to 2kg was measured in 02 (2.4%) cases & 2.1 to 3 kg was observed in 70(82.4%)cases where as above 3kg was observed in 12 (14.1%) cases (Table 5)

The Comparison of Plasma lactate with Gender Groups (Male/Female) we observed that there is a non- significance difference in variable between the Gender, mean value of Male Patients 5.9609±3.499 is lower than Female Patients 6.7438±4.85 so, it can be concluded that Female patients have higher mean among Male patients (P=0.391) (Table 6).

The Comparison of Plasma lactate with Gestational age were observed that there is a non-significance difference in variable between the gestational age , mean value of < 38 is 6.0348 ± 3.1375 is lower than >38 is 6.5433 ± 5.03 so, it can be concluded that Gestation age <38 have higher mean among >38 gestation age (P=0.570) (Table 7).

Table 1: Statistics of characteristics of the patients (n=85)

Variables	Mean±SD	95%CI	Median	Max-min
Age (In Hours)	4.58±0.29	3.99 to 5.18	04	10-01
Weight(Kg)	2.78±0.04	2.70 to 2.86	2.8	53-20
Gestational Age(weeks)	37.81±0.208	37.39to 38.22	38	41-32
Plasma Lactate	6.57±2.399	5.38 to 7.12	5.9	28.10-0.60

Table 2: Gender distribution in total patient (n=85)

Gender	Frequency	%age
Male	53	62.4
Female	32	37.6

Male: Female =5:3

Table-3: Age groups of the neonatal babies (n=85)

Age	Frequency	%age
≤ 1Hour	13	15.3
2 to 5 Hour	43	50.6
5 to 8Hour	19	22.4
> 8Hour	10	11.8

Table 4: Birth weight of the neonatal babies (n=85)

Birth weight	Frequency	%age
≤ 1.5kg	1	1.2
1.6 to 2 kg	2	2.4
2.1 to 3kg	70	82.4
> 3kg	12	14.1

Table-5: Comparison of mean plasma lactate in neonates by gender (n=85)

Mean ± Standard Deviation	Plasma Lactate Level (mmol/L) Male	Plasma Lactate Level(mmol/L) Female
Mean	5.9609	6.7438
Standard Deviation	3.499	4.85

P value: 0.391

Table 6: Comparison of Mean Plasma Lactate in Neonate by Gestational Age in Weeks (n=85)

Mean±Standard Deviation(mmol/L)	Plasma Lactate Level (Gestational Age in Wks) <38	Plasma Lactate Level (Gestational age in Wks) >38
Mean	6.0348	6.5422
Standard Deviation	3.1375	5.03147

P value: 0.570

Table 7: Comparison of Mean Plasma Lactate in Neonate by Weight in kg(n=85)

Mean ± Standard Deviation	Plasma Lactate Level (Weight of baby) <2.8	Plasma Lactate Level (Weight of the baby) >2.8
Mean	6.6822	4.49764
Standard Deviation	5.6750	3.32663

P value: 0.260

DISCUSSION

Asphyxia is a global problem causing serious sequelae regarding morbidity and mortality[12]. It is a leading factor contributing in perinatal and neonatal mortality which reflects social, educational and economical standards of a community. Though the topic has been extensively studied and reviewed

worldwide, limited local data is available. When available, the data reflects hospital deliveries, where all kind of resuscitation facilities are available, while almost 80% deliveries are conducted at home in our community where availability of trained personnel and paediatric supervision is lacking[13,14].

Previously published data proved that there is huge difference in the neonatal deaths among those mothers who had regular antenatal visits as compared to unbooked cases. In a study conducted by Shaheen et al, perinatal mortality rate was 111/1000 live births in non-booked cases as compared to 17/1000 in booked cases[12].

Data from Mayo Hospital, Lahore, Pakistan[15], also stress importance of intervention to reduce the neonatal mortality. In that study, mortality was 27% and again 45% were home-born by untrained persons. Mean plasma lactate level in the study of Lekhwani S.et al[11] was found to be 8.34 ± 9.14 mmol/L. Somewhat similar results was found in our study also. Mean Plasma Lactate in our study was 6.57±2.399 mmol/L. Birth asphyxia presented with highest plasma lactate levels among all pathological conditions in this study. These findings are similar to da Silva et al.'s study in term neonates[10].

The Comparison of Plasma lactate with Gender Groups (Male/Female) was observed in our study and it showed that there is a non- significance difference among gender, mean value of Male Patients 5.9609 ± 3.499 mmol/L was lower than Female Patients 6.7438±4.85 mmol/L so, it can be concluded that Female patients have higher mean among male patients (P=0.391).

Our results were supported by the study in which the median (range) age of patients was 2 days (3 h to 1 month). The male-to-female ratio was 4.56:1 (41 males to 9 females)[11].

Hyperlactatemia was observed to be more severe in neonates. Neonates were unable to compensate metabolic acidosis by hyperventilating compared to infants as is clear from the finding that negative correlation was found between lactate and pH, also between lactate and BE in neonates[11].

There is no data available in which risk factors are highlighted in asphyxiated newborns. The possible causes of asphyxia could be as simple as hypothermia or hypoglycemia or even diaphragmatic hernia or congenital myopathy, which had to be managed accordingly. So it is important to train people and paramedics about the early recognition and referral of asphyxiated newborns with outcome which depends upon level and duration of neuronal insult at the time of birth, clinical presentations of HIE, involvement of other organs, stage of HIE and treatment modalities[16,17].

Despite lot of improvement in the public health over the past many years, it is still a major contributing factor in neonatal mortality[18]. Early identification of high-risk cases with improved antenatal and perinatal care can decrease such high mortality.

CONCLUSION

The mean plasma lactate level in neonates with birth asphyxia in our study was found to be 6.57±2.399 mmol/L

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