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Original Research Article

To find the association between intrapartum amniotic fluid lactate level and labour outcome

Aravind Chander[2]*, Seetha Panicker[1], Reshma Shri[2]

[1]Department of Obstetrics and Gynecology, PSG hospitals, Peelamedu, Coimbatore, Tamilnadu, India
[2]Department of Obstetrics and Gynecology, Iswarya Women's Hospital and Fertility Center, Coimbatore, Tamilnadu, India

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***Correspondence:**
Dr. Aravind Chander,
E-mail: aravindqqj@gmail.com

ABSTRACT

Background: Inspite of good monitoring in labour, there are still adverse labour outcomes. There is a need for supplementary test for early prediction of prolonged labour and fetal hypoxia. This study was undertaken to find to find the association between intrapartum amniotic fluid lactate level and labour outcome.
Methods: 103 antenatal patients low risk at term, who entered into active labour either spontaneously or induced between September 2012 to August 2013 were included. Amniotic fluid was collected after doing ARM and lactate level was measured. Chi square test was used to find correlation between lactate level and duration of labour, mode of delivery and Apgar score.
Results: In our study, patients with duration of labour between 8-<20hours 88 % had lactate level <10mmol/l, thus intra partum amniotic fluid lactate levels had a good negative predictive value when it was compared with the duration of labour. When the mode of delivery was analysed using Chi square test there was no statistically significant correlation ($p<0.825$) with amniotic fluid lactate. Spearman Rank correlation was done to observe correlation between lactate levels and Apgar which showed a correlation of 0.20 with $p<0.05$.
Conclusions: Amniotic fluid lactate levels had better correlation with duration of labour and Apgar score. The lower the amniotic fluid lactate level, the better is the Apgar at birth. Better correlation could have been observed if amniotic fluid lactate levels were repeated every 3-4 hours during active labor. However, this was not possible due to practical difficulty in collection of sample.

Key words: Apgar score, Duration of labour, Lactate, Mode of delivery

INTRODUCTION

Inspite of close monitoring in labour according to established guidelines, there are still adverse labour outcomes.[1,2] One of the most important causes is dysfunctional labour.

The major cause for perinatal mortality and morbidity is birth asphyxia secondary to abnormalities occurring during labor. Many trials have been done in the past for detection of the abnormalities in labor, so that timely intervention can be done to improve perinatal outcome without increasing the caesarean section rate. Maintaining a partogram is very useful for assessing the dysfunctional labor.

However this alone was not sufficient in some patients. Many labors which were shown as abnormal had normal parturition without any adverse maternal or perinatal outcome, so there is a need for supplementary tests for early prediction of adverse labor outcomes.[3,4] So research are being carried out in this direction.

Studies have shown that if there is increased muscle activity there is accumulation of lactate in response to it. In cases of prolonged labour due to exhaustion of uterine musculature and hypoxia, there is to accumulation of lactate. Hypoxia is known to reduce the force and co-ordination of smooth muscle contraction[5]. Inefficient uterine action is one of the most common causes of poor progress in labor.[6] So based on this principle assessment of lactate in the amniotic fluid will help in the diagnosis of dysfunctional labor, This method has the advantage of being more precise and objective in diagnosis of prolonged labor which can cause adverse maternal and perinatal outcome.

So, the resulting increase in the acidity in the myometrium is the cause for the decreased force of further contractions which will lead to dysfunctional labour. The increased level of lactate in the uterus is measured in the amniotic fluid sample. Therefore it is believed that the raised amniotic fluid lactate levels are mostly associated with dysfunctional labour. Partogram along with the amniotic fluid lactate levels is better than using partogram alone in predicting the need for operative intervention in dysfunctional labor.[7] Level of amniotic fluid lactate may provide useful information while assessing progress of labour. Trials have shown that the lactate levels are many times lesser in the maternal and fetal blood when compared to amniotic fluid.

According to earlier studies when the level of lactate in the amniotic fluid is normal, it indicates that the likelihood of adverse neonatal outcome is very low [8], so that patient can be allowed for normal delivery if all other parameters are normal. A higher level of amniotic fluid lactate showed that the probability for normal delivery is less, if at all present it is almost always associated with instrumental delivery, and may have abnormal CTG findings. This study was conducted to find the association between intrapartum amniotic fluid lactate levels and labour outcome. The parameters studied were Duration of labour, Mode of delivery and APGAR score at birth.

METHODS

A prospective study was conducted in the Department of Obstetrics and Gynaecology, PSG Hospitals, Coimbatore from September 2012 to August 2013.

Study population

Study group consisted of low risk pregnant women at term admitted in PSG Hospitals, who entered into active labour either spontaneously or by induction

Inclusion criteria

- Women in active labour without any obstetrical complications
- Vertex, presentation
- Term, Post-dated pregnancy

Exclusion criteria

- <37 Weeks not in active labour
- Obstetrical complication
- Biohazard
- Multiple gestation
- Absent/Ruptured Membranes

Methodology

All patients who entered into labour during the study period and who were eligible for the study were included. They were given information about the study and collection of amniotic fluid. After obtaining informed written consent regarding the study, these patients were followed up accordingly.

When the patients entered into labour either spontaneously or by induction, initial per vaginal examination was done and Bishop Score was assessed. The fetal wellbeing and the pelvis were assessed. Based on the findings patient were allowed to progress spontaneously or further augmentation was done. In induced labour per vaginal examination was repeated after 6 or 12 hrs if PgE2 gel 0.5 mg kept intracervically, 24 hours later if the labour was induced by Foleys induction with or without extra amniotic saline infusion, 6 hours later if induced with oral misoprostol 25mcg, 4 hours if augumented with vaginal misoprostol 25 mcg. Once the patient entered active labour, vaginal examination was done every 4 hours.

ARM was done when cervix is at least 3 cm dilated. With the bladder empty the patient is put in supine position with legs dorsiflexed and under aseptic precautions speculum examination is done. ARM is done under vision with good light and the amniotic fluid is collected.

Once the patient enters active labour, labour progress is monitored with partogram. If a repeat PV examination finding crosses the alert line, labour was augmented with oxytocin or in patients who were in induced labour with oxytocin; the dose used was 2.5 Units in 500 ml of Ringer Lactate infused with infusion pump. Depending upon the uterine contractions infusion was increased by 4 drops per minute every half an hour. Choice of labour analgesia was selected according to the patient's wish, either with pethidine 50 mg and inj phenergan 12.5 mg or by epidural analgesia. Entonox gas inhalation also used if needed.

The amniotic fluid of at least 2 ml was collected in a syringe after doing ARM. Amniotic fluid was transferred into a biochemistry laboratory container and it was labelled with the patient's details (name and medical record number). The amniotic fluid used in the study only if it was clear and not blood or meconium stained, as this

might alter the value of lactate. The sample reached the laboratory within 5 minutes through the pneumatic system in the hospital. The amniotic fluid sample is centrifuged in the laboratory and analysed immediately by automated lactate analyser, and the reporting was done immediately. So the delay in reporting was prevented. The result was viewed from the labour ward using hospital information system.

Once the patient entered the second stage of labour, she was encouraged to bear down. When the fetal head was seen, the obstetric and neonatology team were ready for delivery and neonatal resuscitation. Normal delivery was done either with or without episiotomy. Instrumental delivery was done either with vacuum or forceps depending upon the obstetric indication. The duration of the first and second stages of labour were noted. The baby's weight, initial, 5 minute and 10 minute APGAR scores were noted. If the patient was taken up for emergency LSCS, the same details of the baby were noted. The indication for LSCS and instrumental delivery were also noted down. All the details were entered in the study proforma and the results were analysed finally through statistical analysis.

The objectives are to correlate:

- Amniotic fluid lactate levels with duration of labour
- Amniotic fluid lactate levels with mode of delivery
- Amniotic fluid lactate levels with APGAR score

RESULTS

Around 70 % of the study group whose lactate levels was 5-<8mmol/l had duration of labour between 8-<20 hours. Of the patients whose duration of labour was in 8-<20 hours, 88 % had lactate levels less than 10. The intra partum amniotic fluid lactate levels had a good negative predictive value when it was compared with the duration of labour.

In the group of 14 patients whose duration of labour >20 hours, 11 patients had normal lactate levels.

Table 1: Amniotic fluid lactate levels and duration of labour.

			Duration of labour			
			<8 hours	**8-<20 hours**	**≥20 hours**	**Total**
Lactate	5-<8	Count	9	31	4	44
		% within lactate	20.5%	70.5%	9.1%	100.0%
		% within duration of labour	52.9%	43.1%	28.6%	42.7%
	8-<10	Count	6	32	7	45
		% within lactate	13.3%	71.1%	15.6%	100.0%
		% within duration of labour	35.3%	44.4%	50.0%	43.7%
	≥10	Count	2	9	3	14
		% within lactate	14.3%	64.3%	21.4%	100.0%
		% within duration labour		12.5%	21.4%	13.6%
		Count	17	72	14	103
		% within lactate	16.5%	69.9%	13.6%	100.0%
Total	% within duration of labour		100.0%	100.0%	100.0%	100.0%
	Pearson Chi-square		2.222		P=0.695	

When the duration of labour was analysed there was no statistically significant correlation between amniotic fluid lactate and duration of labour. But it had good negative predictive value. When lactate level was >10 mmol/l, 10 patients had normal vaginal delivery.

When the mode of delivery were analysed there was no statistically significant correlation between amniotic fluid lactate and mode of delivery.

When we analysed amniotic fluid lactate and Apgar score:

- In lactate levels 5-<8 mmol/l-9.1% had Apgar <7
- In lactate levels 8-<10 mmol/l-15.6% had Apgar score <7.
- But in lactate levels mmol/l >10-35.7% had low Apgar score.

However spearman rank correlation showed a correlation of 0.20 with P < 0.05. When the Apgar score was analysed there was statistically significant correlation between amniotic fluid lactate and Apgar score.

Pearson chi –square test was used to find association between categorical variables. All statistical analysis was done using SPSS Software (statistical package for social sciences).

Chi square were used to find correlation between lactate

level and duration of labour, mode of delivery and apgar score. In addition Spearman Rank correlations were also done to observe correlation between lactate levels and apgar score.

Table 2: Amniotic fluid lactate versus mode of delivery.

			Mode of delivery				
			Normal	Vacuum	Forceps	LSCS	Total
Lactate	5-<8	Count	30	7	1	6	44
		% within lactate	68.2%	15.9%	2.3%	13.6%	100.0%
		% within duration of labour	42.3%	36.8%	33.3%	60.0%	42.7%
	8-<10	Count	31	10	1	3	45
		% within lactate	68.9%	22.2%	2.2%	6.7%	100.0%
		% within duration of labour	43.7%	52.6%	33.3%	30.0%	43.7%
	≥10	Count	10	2	1	1	14
		% within lactate	71.4%	14.3%	7.1%	7.1%	100.0%
		% within duration labour	14.1%	10.5%	33.3%	10.0%	13.6%
		Count	71	19	3	10	103
		% within lactate	68.9%	18.4%	2.9%	9.7%	100.0%
Total		% within duration of labour	100.0%	100.0%	100.0%	100.0%	100.0%
		Pearson Chi-square	2.868[a]	P=0.825			

Table 3: Amniotic fluid lactate versus Apgar score.

			Apgar score			
			Normal	**Vacuum**	**Forceps**	**Total**
Lactate	5-<8	Count	1	3	40	44
		% within lactate	2.3%	6.8%	90.9%	100.0%
		% within duration of labour	100.0%	20.0%	46.0%	42.7%
	8-<10	Count	0	7	38	45
		% within lactate	0%	15.6%	84.4%	100.0%
		% within duration of labour	0%	46.7%	43.7%	43.7%
	>=10	Count	0	5	9	14
		% within lactate	0%	35.7%	64.3%	100.0%
		% within duration labour	0%	33.3%	10.3%	13.6%
		Count	1	15	87	103
		% within lactate	1.0%	14.6%	84.5%	100.0%
Total		% within duration of labour	100.0%	100.0%	100.0%	100.0%
		Pearson Chi-square	8.376[a]	P=0.079		

Table 4: Correlation between lactate levels and Apgar score.

			lactate	Apgar score
Spearman's rho	lactate	Correlation coefficient	1.000	-0.200*
		Sig. (2-tailed)	-	.043
		N	103	103
	Apgar score	Correlation coefficient	-0.200*	1.000
		Sig. (2-tailed)	0.043	-
		N	103	103
*Correlation is significant at the 0.05 level (2-tailed)				

DISCUSSION

Amniotic fluid lactate levels were measured during active phase of labour, and the mode of delivery, duration of labour and the Apgar score were noted down and correlation was analysed with these three. Results

correlating amniotic fluid lactate levels and duration of labour: Around 70 % of the study group who had lactate level between 5-<8 mmol/l had duration of labour between 8-<20 hours. Of the patients whose duration of labour were between 8-<20 hours, 88 % had lactate levels <10 mmol/l.

The intra partum amniotic fluid lactate levels had a good negative predictive value when it was compared with the duration of labour. Results correlating amniotic fluid lactate level and mode of delivery:

When lactate levels were more than 10, only 14% had normal vaginal delivery. When the mode of delivery were analysed there was no statistically significant correlation between amniotic fluid lactate and mode of delivery (p value of 0.825). Result correlating amniotic fluid lactate level and Apgar score:

- In lactate levels 5-<8 mmol/l – 9.1% had Apgar <7
- In lactate levels 8-<10 mmol/l - 15.6 % had Apgar score <7.
- But in lactate levels > 10 mmol/l - 35.7 % had low Apgar score.

Chi square test for Apgar score was analysed P value=0.079, there was no statistically significant correlation between amniotic fluid lactate and Apgar score.

Spearman Rank correlation was also done to observe correlation between lactate levels and Apgar score and showed correlation of 0.20 ($P < 0.05$) and was found to be statically significant. Thus high lactate concentration in amniotic fluid before delivery indicated an increased risk of adverse neonatal outcome at delivery.[8]

In normal labour during contraction there is decrease in the uteroplacental blood flow which gets restored immediately after the contraction is over when the uterus gets relaxed. But when the uterine contractions become irregular, the uteroplacental blood flow gets reduced for longer period as there is lesser duration for uterine muscles to relax.

As a result feto-maternal unit gas exchange is reduced and this leads to fetal hypoxic-ischaemia and lactic acidosis. There is a hypothesis that when there is hypoxia of myometrium there is increased production of lactate which is reflected as increased concentration of lactate in the amniotic fluid. This explains the adverse neonatal outcome in patients having increased lactate level in amniotic fluid. So the labour duration by itself does not affect the neonatal outcome[1].

The neonatal outcome may not be affected if the myometrial tissue is oxygenated well. We were not able to repeat the lactate levels just before the delivery due to difficulty in collection. But if the lactate levels were repeated just before delivery then further correlation could have been found out.

CONCLUSION

The myometrial capillary blood lactate increases in women following prolonged labour. The amniotic fluid lactate is 4-6 times higher when compared with fetal and maternal blood, which occurs mainly during dysfunctional labour. The traditional partogram is a good tool used for diagnosing dysfunctional labour. The combination of intrapartum amniotic fluid lactate levels along with WHO partogram could be used as a better tool in diagnosing dysfunctional labour.

According to our study, the intra partum amniotic fluid lactate levels had a good negative predictive value for normal labour outcome. Amniotic fluid lactate levels had better correlation with duration of labour and fetal scalp lactate has been demonstrated to have good correlation with APGAR score. The lower the amniotic fluid lactate levels, the better is the APGAR score.

Better correlation could have been observed if amniotic fluid lactate levels were analysed 4-6 hours after the initial assessment. However, this was not possible due to practical difficulty in collection of sample. Lactate analysis is a simple easy method of analyzing the labour outcome and the results of this test can be obtained very fast since its analyzed with auto analyzer. The laboratory results are also standardised since its done with the auto analyzer. The intrapartum amniotic fluid lactate levels can be correlated with umbilical cord blood lactate and fetal scalp blood lactate for further analysis.

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