# Relationship between Amniotic Fluid Lactate and Delivery by CS Due to Dystocia

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# ABSTRACT:

## **BACKGROUND:**

Lactate level in uterine muscles can be visualized by analysis of amniotic fluid lactase which used as bedside test with partogram to acquire good prediction of labour outcome. **OBJECTIVE:** 

To assess the relationship between amniotic fluid lactase level of full term pregnant women and their mode of delivery.

**PATIENTS AND METHODS:** 

A cross sectional study carried out in Labour room of Al-Yarmouk Teaching Hospital through the period from the 1<sup>st</sup> of July to the end of December, 2015 on a convenient sample of 100 women of term pregnancy. Each woman participated in the study was in an active phase of labour with cervical dilation > 4 cm and before artificial rupture of membranes .By coscus speculum the cervix was visualized with 2-3 ml of liquor was taken by a syringe while the amniotic fluid still in the uterus to prevent vaginal contamination, then collected liquor in plain tube after centrifuge was stored in refrigerator at -20° for not more than 3 days before it sent to a private laboratory for analysis of lactase.

## **RESULTS:**

Mean maternal age was  $26.5\pm5.4$  years and mean gestational age was  $38.6\pm1.1$  weeks. Thirty three pregnant women had elevated lactase level and 31 women were delivered with cesarean section. A significant association was observed between elevated amniotic fluid lactate level ( $\geq 10$ nm) among pregnant women and cesarean section delivery mode (p<0.001). Amniotic fluid lactate was a significant predictor of delivery mode (p=0.001) with odds ratio (5.5).

**CONCLUSION:** 

Amniotic fluid lactate could be a significant predictor of labour outcome for term pregnant women. **KEYWORDS:** amniotic fluid lactate, delivery mode, cesarean section.

## **INTRODUCTION:**

Dystocia (Greek, means difficult birth) definition is a labour difficulty that is associated with abnormal contraction of uterus which might be attributed to certain factors related to the passenger, the passage and the uterine contractions <sup>(1)</sup>. Dystocia is a common obstetrical problem globally with prevalence ranging 4-40% <sup>(2)</sup>. In one study conducted in Iraq, it was found the dystocia as the main indication of cesarean sections reached a rate of 20.1% of deliveries <sup>(3)</sup>. World Health Organization stated that CS rates more than 10-15% is linked with elevated mortality and morbidity rates of women and neonates <sup>(4)</sup>.

Labour is a complex event requiring full scheduled antenatal care and monitoring of

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women before labour to predict labour type. Diagnosis of dystocia nowadays is done by partogram which assessed the labour graphically that is used by modern obstetric care center and had great advantages in lowering rates of oxytocin use and cesarean sections but unfortunately, had а low validity in differentiating between low and high risk deliveries <sup>(5)</sup>. The essential need to developed diagnostic tools predicting bad labour outcome and early intervention encouraged researchers to search for biochemical parameters indicating early rupture of amniotic membrane<sup>(6)</sup>.

Amniotic fluid lactate (AFL) was reported by many literatures as a predictor of dystocia and adverse neonatal outcome <sup>(7-9)</sup>. AFL in the amniotic fluid was found to be higher four to six times than its level in maternal and fetal blood. Previous studies suggested that AFL is excreted from the fetus or as a result of uterine muscle anaerobic metabolism  $^{(10)}$ .

Amniotic fluid lactate level in the uterine tissue increased during labour contractions as a start for anaerobic metabolism with accumulation of metabolites, which in turn lead to low uterine power and labour dysfunction. Lactate level in uterine muscles can be visualized by analysis of AFL which can be used as a bedside test together with partogram to acquire good prediction of labour outcome<sup>(8, 9)</sup>. The measurement of amniotic fluid lactate among women delivered either by normal vaginal deliver (VD) or by cesarean section (CS) short time before labour help in determining labour pathway. For that reason, our study aimed to assess the relationship between AFL level of full term pregnant women and their mode of delivery.

## **PATIENTS AND METHODS:**

A cross sectional study carried out in Obstetric Department of Al-Yarmouk Teaching Hospital through the period from 1<sup>st</sup> of July to end of December, 2015. Inclusion criteria were singleton, viable fetus, cephalic presentation, in active phase of labour with cervical dilation  $\geq$ 4cm, term size pregnancy with gestational age  $\geq$ 37-40 weeks. Exclusion criteria were premature rupture of membrane, chronic medical diseases (HT & DM) inefficient uterine contraction with evidence of fetal distress diagnosed by fetal heart abnormality or meconium staining of the liqour.

An informed verbal consent was taken from each woman before participating and approval of research was taken from hospital authority, in addition to that participated women were received an appropriate management and delivered by the researcher.

Full history was taken from selected women included maternal age, gravidity, parity, gestational age, last menstrual period, mode of deliver and AFL level. General and obstetrical examinations of pregnant women were done by the researcher. A convenient sample of 100 at term pregnant women fulfilled inclusion and exclusion criteria & agreement to participitate from women attending Labour room were included in the study.

Partogram was set for each pregnant woman in the active phase. Then speculum examination was used to visualize the amniotic membrane and by mean of syringe 2-3 ml of liquor was taken while the amniotic fluid still in the uterus to prevent vaginal contamination. The selected women were all followed till the time of delivery

whether delivered by vaginal rout or CS. Regarding delivery by CS are only those taken CS for dystocia were included . The liquor were then collected in sodium chloride preservative tube, centrifuged within one hour and stored in plain tube in the refrigerator at  $-20^{\circ}$  for not more than 3 days before it sent to a private laboratory for analysis.

The lactate was measured by an assay system (Lactate-Pro<sup>TM</sup> consist of single-use test strip of an enzyme-coated electrode and small meter. AFL normal range adopted in present study as previous studies was <10nm<sup>7</sup>.

All the data were analyzed by Statistical Package of Social Sciences software version 20.A 10 nm were taken as a cut of value for lactate level & its relation with dystocia <sup>7</sup>. The statistical analysis was done by a specialist in Community Medicine. The result presented as tables and/or graphs. Kolmogorov Smirnov analysis verified the normality of the data set. Multiple contingency tables conducted and appropriate statistical tests performed, Chi-square used for categorical variables and Independent Samples t-test was used to compare between two means. In all statistical analysis, level of significance (p value) set at  $\leq 0.05$ .

## **RESULTS:**

A total of one hundred women were included in the present study with a mean maternal age was  $26.5\pm5.4$  years, 61% of them were aging 20-29 years. Mean gestational age of studied women was  $38.6\pm1.1$  weeks, 32% of them were at  $39^{\text{th}}$ week of gestation. Twenty three women in the present study were nulliparus, 31 women had one child, 20 women had two children and 26 women had three children and more. All these findings were shown in table 1.

More than half (67%) of pregnant women in present study had AFL less than 10 nm and 33% of them had AFL level  $\geq$ 10nm. The total numbers of pregnant women were  $\geq$  117, those who required vaginal delivery or CS for dystocia were only included while (e.g. CS for fetal distress or meconium were excluded) & so only 100 pregnant women were included , Sixty nine pregnant women were delivered with vaginal delivery and 31 women were delivered with cesarean section. All these findings were shown in table 2 and figure 1.

There was a significant association between each of increased maternal age and parity with vaginal delivery mode (p<0.05). A significant association was observed between elevated AFL level

 $(\geq 10$ nm) among pregnant women and CS delivery mode (p<0.001). No significant difference was observed between women with different delivery modes regarding gestational age (p=0.1). All these findings were shown in table 3 and figure 4.

Multivariate analysis with binary logistic regression revealed that AFL level, maternal age

and parity were significant predictors of labour outcome (delivery modes). AFL was a significant predictor of delivery mode (p=0.001) with odds ratio (5.5). AFL level  $\geq$ 10nm among pregnant women had odds of 5.5 times to have CS (dystocia) than women with AFL less than 10 nm. All these findings were shown in table 4.

Variable	No.	%			
Maternal age mean±SD (26.5±5.4 years)					
18-20 years	8	8.0			
20-29 years	61	61.0			
30-39 years	31	31.0			
Total	100	100.0			
Gestational age mean±SD (38.6±1.1 weeks)					
37weeks	23	23.0			
38weeks	20	20.0			
39weeks	32	32.0			
40weeks	25	25.0			
Total	100	100.0			
Parity					
Nulliparus	23	23.0			
1	31	31.0			
2	20	20.0			
≥3	26	26.0			
Total	100	100.0			

 Table 1: Demographic characteristics of the women in this study.

Variable	No.	%			
AFL					
<10nm	67	67.0			
≥10nm	33	33.0			
Total	100	100.0			
Modes of delivery					
VD	69	69.0			
CS	31	31.0			
Total	100	100.0			

Table 2: Aminiotic fluid lactate and delivery modes of studied women.



Figure 1: Distribution of AFL.

Table 3: Distribution of women characteristics according to delivery modes.

Variable		VD	CS		CS		Р
	No.	%	No.	%			
Maternal age					0.009*		
18-20 years	4	50.0	4	50.0			
20-29 years	49	80.3	12	19.7			
30-39 years	16	51.6	15	48.4			
Gestational age					0.1*		
37weeks	13	56.5	10	43.5			
38weeks	14	70.0	6	30.0			
39weeks	27	84.4	5	15.6			
40weeks	15	60.0	10	40.0			
Parity					0.006*		

# AMNIOTIC FLUID LACTATE

Numparus	11	47.8	12	52.2	
1	19	61.3	12	38.7	
2	15	75.0	5	25.0	
≥3	24	92.3	2	7.7	
AFL					<0.001 *
<10nm	51	85.0	9	15.0	
≥10nm	18	45.0	22	55.0	
*Chi-square test.					



Figure 2: Distribution of AFL according to delivery modes.

Table 4: Binary logistic regression analysis for variables according to delivery modes.

Variable	β	SE	Wald $\chi^2$	Р	OR
Constant	-4.5	1.3	11.7	0.001	0.01
AFL	1.7	0.5	10.6	0.001	5.5
Maternal age	1.0	0.4	5.2	0.02	2.7
Parity	-0.7	1.3	8.1	0.004	0.4

### **DISCUSSION:**

In clinical practice, dystocia is treated by augmenting with oxytocin for labour progress acceleration <sup>(11)</sup>. Recently, there is need for highly developed diagnostic tools facilitate early detection of dystocia which in turn decline morbidity and mortality caused by invasive interventions related to obstructed labour <sup>(12)</sup>.

Present study revealed that high AFL level of pregnant women was significantly higher among women delivered with CS (p=0.001). This finding is similar to results of Wiberg-Itzel et al <sup>(7)</sup> study in Sweden which found a higher AFL levels among pregnant women with dystocia that end in CS. Consistently, Hall et al <sup>(13)</sup> study in Australia reported that AFL was higher among

women with labour difficulties and it encouraged the use hand held lactate meters at labour. The explanation of high AFL associated with dystocia might be attributed to accumulation of lactic acidosis related to uterine contractions <sup>(2)</sup>. Physiologically, human myometrium is highly sensitive to low PH caused by AFL which led to decrease in contractility of uterus <sup>(14, 15)</sup>. Another explanation showed that MCT4 proteins produced as a result of myometrial hypoxia played role in lactic acid transportation to amniotic fluid <sup>(16)</sup>.

Current study showed that AFL was a significant predictor of delivery mode and in turn the dystocia (p=0.001). This finding coincides with

that reported by Murphy et al <sup>(17)</sup> study in USA which revealed that AFL among term pregnant women was an independent predictor of dystocia and CS. Use of AFL in conjunction with partogram showed excellent results in determining high risk women and facilitating early intervention <sup>1</sup>. Previous Indian study showed that higher lactate level in vaginal fluid was a significant predictor of spontaneous labour within 24 and 48 hours and lactate vaginal fluid lactate was inversely related to amniotic fluid lactate <sup>(18)</sup>.

In present study, increased maternal age associated significantly with vaginal delivery (p=0.009). This is similar to findings of Hsieh et al <sup>(19)</sup> study in Taiwan that stated high chance of vaginal delivery among women aging 30-39 years as our study but chance of CS increased after 40 years. The nulliparus women in this study were significantly delivered with CS (p=0.006). This is consistent with results of Wiberg-Itzel et al <sup>(8)</sup> study in Sweden.

Main limitation of our study was its small size and constrained only in one center, in addition to short follow up period during which the AFL should be collected.

Our study concluded that amniotic fluid lactate was a significant predictor of labour outcome for term pregnant women. Availability of AFL<sup>TM</sup> monitoring system in labour room with further wide sized studies on AFL is needed to be supported in our country.

# **REFERENCES:**

- 1. Jamil U, Nanu D. Dystocia the most important cause of primary cesarean section. Fascicula XVII nr. 2013; 2: 111-16.
- 2. Quenby S, Pierce SJ, Brigham S, Wray S. Dysfunctional labor and myometrial lactic acidosis. Obstet Gynecol. 2004;103:718-23.
- **3.** Al-dobony SJ PhD thesis, Iraqi Board of Medical Specialization, community medicine. Rate, Indications and risk factors of cesarean section in maternity hospital in Baghdad city 2009.
- World Health Organization. WHO Statement on Caesarean Section Rates. Human Reproduction Program, 2015. WHO/RHR/15.02.
- 5. Neal JL, Lowe NK. Physiologic partograph to improve birth safety and outcomes among low-risk, nulliparous women with spontaneous labor onset.Medical Hypotheses. 2012;78:319-26.

- 6. Kariman N, Afrakhte M, Hedayati M, Fallahian M, Alavi Majd H. Diagnosis of premature rupture of membranes by assessment of urea and creatinine in vaginal washing fluid. Iranian Journal of Reproductive Medicine. 2013;11:93-100.
- 7. Wiberg-Itzel E, Pettersson H, Cnattingius S, Nordström L. Association between lactate concentration in amniotic fluid and dysfunctional labor. Acta Obstet Gynecol Scand. 2008; 87:924-28.
- Wiberg-Itzel E, Akerud H, Andolf E, Hellström-Westas L, Winbladh B, Wennerholm UB. Association between adverse neonatal outcome and lactate concentration in amniotic fluid. Obstet Gynecol. 2011; 118:135-42.
- **9.** Wiberg-Itzel E, Pettersson H, Andolf E, Hansson A, Winbladh B, Akerud H. Lactate concentration in amniotic fluid: a good predictor of labor outcome. Eur J Obstet Gynecol Reprod Biol. 2010;152:34-38.
- **10.** Wiberg-Itzel E, Pettersson H, Cnattingius S, Nordstrom L. Association between lactate in vaginal fluid and time to spontaneous onset of labour for women with suspected prelabour rupture of the membranes. BJOG 2006;113:1426-30.
- **11.** Kjærgaard H, Olsen J, Ottesen B, Nyberg P, Dykes A-K. Obstetric risk indicators for labour dystocia in nulliparous women: A multi-centre cohort study. BMC Pregnancy and Childbirth 2008; 8:45.
- **12.** Hall B, Iwasenko J, Moriatis M, Rawlinson WD, Tracy MB, Tracy SK. A pilot study to determine the feasibility of collecting amniotic fluid samples from women during labour and measuring amniotic fluid lactate at point of care.BMC Research Notes 2013;6:112.
- **13.** Hall B, Wong DD, Rawlinson WD, Tracy MB, Tracy SK. A validation study: assessing the reliability of the hand held StatStripXPress lactate meter to test lactate in amniotic fluid. BMC Research Notes 2014; 7:935.
- **14.** Wray S. Insights into the uterus. Exp Physiol 2007; 92:621–31.
- **15.** Fanos V, Atzori L, Makarenko K, Melis GB, Ferrazzi E. Metabolomics Application in Maternal-Fetal Medicine. BioMed Research International 2013; Article ID 720514, 9.

- **16.** Ullah M, Davies A, Halestrap A. The plasma membrane lactate transporter MCT 4, but Not MCT1, is up regulated by hypoxi through a HIF-1\_ dependent mechanism. Joural of Biology and Chemistry2006; 281:9030–37.
- Murphy M, Robson M, Brennan D, Butler M, Coughlan B, O'Herlihy C. Amniotic fluid lactate (AFL) at diagnosis of labour predicts dystocia and caesarean section (CS) in spontaneously labouring single cephalic nulliparous women>37 weeks gestation (SSCNT). American Journal of Obstetrics 2014; 610: S299.
- 18. Jaiswar SP, Natu SM, Gupta A, Chaurasia S. Association Between Lactate Levels in Vaginal Fluid and Time of Spontaneous Onset of Labor in Suspected Cases of Prelabor Rupture of Membranes. Journal of Obstetrics and Gynaecology of India 2013; 63:182-85.
- **19.** Hsieh TT, Liou JD, Hsu JJ, Lo LM, Chen SF, Hung TH. Advanced maternal age and adverse perinatal outcomes in an Asian population. Eur J Obstet Gynecol Reprod Biol. 2010; 148:21-26.