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Amniotic Fluid Lactate Level as Predictor of Labour Progress and Perinatal Outcome in Nulliparous Women at Korle Bu Teaching Hospital, Accra, Ghana

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Abstract:

Background: *Labour dystocia is the most common complication of nulliparous labour. During labour, the myometrial muscle is highly glycolytic, producing lactate which is transferred by monocarboxylate transporter to the amniotic fluid.*

Amniotic fluid lactate level measured during the active phase of labour can help in interventional decision-making during labour. This study evaluated labour progress and perinatal outcome using amniotic fluid lactate level in nulliparous women at the Korle-Bu Teaching Hospital, Accra.

Methods: *A longitudinal study of 374 nulliparous women with singleton, viable fetus in cephalic presentation at term in active phase of labour. Data collected included socio-demographic, antenatal, intrapartum, postpartum characteristics, neonatal outcome, and amniotic fluid lactate levels. Data analysed using SPSS version 23.0. Chi-square test and student t-test were used for categorical and continuous data respectively. Multiple logistic regression was performed to measure the association between labour dystocia, cervical dilatation on admission, amniotic fluid lactate level using. Statistical significance was considered at p-value≤0.05 and confidence interval of 95%.*

Results: *Labour dystocia was diagnosed in 56.2% of the participants and amniotic fluid lactate level ≥ 10.1 mmol/L was associated with labour dystocia and low Apgar scores. AFL level ≥10.1 mmol/L had 5.5 odds of dystocia and 20.5times odds of caesarean delivery. AFL level ≥10.1 mmol/Lhad 6times odds of <7APGAR scores. Twenty (5.3%) neonates with low Apgar scores were sent to NICU.*

Conclusion: *The amniotic fluid lactate levels measured in the active phase of first stage of labour at a cut-off point of ≥ 10.1mmol/L was shown to be associated labour dystocia and caesarean section and low Apgar scores. Thus, AFL ≥ 10.1mmol/L is a predictor of labour dystocia, caesarean section and low Apgar score at 5minutes. It could be utilized in monitoring labour progress and timing interventions including augmentation and termination of labour.*

Keywords: *Amniotic fluid lactate, labour dystocia, Apgar score, Mode of Delivery*

1. INTRODUCTION

Labour dystocia is an important risk factor for birth-related complications.[(1)] It may be associated with fetal complications such as severe fetal hypoxia, which could lead to neurological damage of variable severity and even perinatal death**.** It may also be associated with maternal complications such as postpartum haemorrhage, uterine rupture, puerperal sepsis, obstetric fistula [(2)], fatigue, stress, anxiety as well as caesarean section [(3)].

The goal of labour management is to deliver healthy babies to healthy mothers with minimal side effects[(4)] and for labour to be successful, the uterus must produce strong, coordinated and effective contractions[(1)]. This goal is achieved through careful monitoring of maternal and fetal conditions during labour with appropriate interventions when necessary[(4)].

The common complication during labour in nulliparous is labour dystocia from ineffective uterine contractions[3]. Compared to multiparous women, nulliparous women are more likely to have prolonged labour and to develop labour abnormalities that require intervention[5,6,].

The uterus is highly glycolytic, producing lactate even under normal oxygenated conditions. Repeated transient hypoxia is a normal feature of labour because the uterine vessels are partially occluded during each contraction leading to the production of lactate, which lowers the pH levels in the tissues. The decrease in pH leads to intracellular acidification and inhibition of the calcium channel in myometrium cells. A decrease in the amount of calcium in the muscle means that the contraction will be weaker and therefore, less effective. Lactate has been recognized as a factor in uterine activity and pathophysiological processes during labour, with a close correlation between the lactate produced by the uterine unit and the lactate level in the amniotic fluid. Low levels of amniotic fluid lactate may support the decision to continue labour by increasing oxytocin, since the uterus appears to be receptive to the increase in oxytocin, while high levels of amniotic fluid lactate indicate an increased risk not only for caesarean section but also of complications postpartum.[1]Recent studies on the acid-base balance of the uterine tissue indicate that monocarboxylate transporter (MCT) proteins, appear to be activated when the myometrium is hypoxic, leading to lactic acid in the myometrium ~~is~~ transported into the surrounding amniotic fluid [7].

Although it is possible to measure lactate using laboratory-based spectrophotometric and fluorometric assays, this is not clinically useful for diagnosing dystocia during labour due to the lack of the availability of sophisticated equipment and time constraints in the clinical context of active labour [8]. Therefore, a rapid and accurate test of lactate in amniotic fluid must be available to improve diagnostic methods and clinical management of labour dystocia to reduce the high rate of labour intervention attributable to this condition[9]

The Lactate Pro meter used to measure lactate in whole blood has been validated in a study done by Hall B. et al as a reliable measure of lactate in amniotic fluid in samples collected from women during labour after spontaneous or artificial rupture of membranes. The test is carried out at the bedside, and the result available within 60 seconds[9][10][11]. The handheld StatStripXPress meter has been determined to be reliable in measuring lactate in amniotic fluid samples[8].

The appropriate timing of interventions in labour is crucial to intended labour outcomes and so this study sort as a proxy to timing of interventions to evaluate labour progress and perinatal outcome using amniotic fluid lactate measurement in the nulliparous women at the Korle-Bu Teaching Hospital, Accra.

2. METHODS

This was a longitudinal study of nulliparous women admitted to the labour ward of Korle-Bu Teaching Hospital in active phase of labour. Using an intervention rate of 32.7% among nulliparous labour for dystocia [12] and the formula $\mathbf{N = Z^2P\ (1\text{-}P) / d^2}$, three hundred and seventy-three (373) participants were recruited at the antenatal clinic during the third trimester using purposive sampling technique. The antenatal booklet was marked with a sticker when written informed consent was obtained from the patient after counselling. When recruited patients presented in active phase of labour, either as spontaneous or induced labour and met the inclusion criteria, they were counselled once more and verbal confirmation to their continued consent to participate obtained before final recruitment into the study. Inclusion criteria was labouring nulliparous women > 18 years, between 37 completed -42 weeks gestation with uneventful antenatal period and in active labour. Patients were excluded with any of the following; heavily stained meconium liquor (grade II and III) and blood stained liquor, prolonged prelabour term rupture of membranes and/or Chorioamnionitis, or unqualified to be monitored on the partograph (cervical dilatation ≥ 9cm or fetal distress). Information on the Socio-demographic details, Obstetrics information including antenatal, intrapartum, immediate postpartum events and neonatal outcomes from the patient admission records and interviews were collected into the Kobo Toolbox questionnaire application. The participants' amniotic fluid lactate levels were

measured in addition to information from the partograph and early neonatal records. Pretested interviewer administered questionnaire and the handheld analyser were used for data collection.

Data was collected from 3rd February 2020 to 31st May 2020. Labour ward was covered twenty-four hours every day for data collection and follow up.

2.1. Amniotic Fluid Sample Collection and Testing

After the participant is position, the caregiver cleans the vaginal canal with sterile cotton wool wet with savlon (cetrimide plus chlorhexidine gluconate) and then changes the gloves to perform the vaginal examination for cervical assessment and amniotic fluid lactate measurement. The amniotic fluid is collected as pool of fluid in the cupped, gloved palm or as drops from or wetness of the examination gloves. The amniotic fluid sample was taken only if the membrane was absent or ruptured spontaneously during examination or at the time of artificial rupture of membrane. The amniotic membrane was not to be rupture solely for the study. The subsequent amniotic fluid sample was taken four hourly during the active phase of labour. Only 50 µL (0.05 mL) of amniotic fluid was needed to perform the test with the test strip in situ.

The Statstrip Xpress lactate test strip once in contact with amniotic fluid indicates the result on the screen in mmol/L of lactate, which is then recorded. The amniotic fluid sample analyzed at the time of collection using the StatstripXpress analyser was according to the manufacturer's instructions.

The Statstrip Xpress lactate analyser had quality control checked once every 24 hours before testing amniotic fluid lactate from the patient. Two Quality control solutions with a known lactate concentration, Lac Control level 1 solution with a lactate range of 0.3-0.9 mmol/L and Lac Control level 2 solution with a lactate range 5.4-7.4 mmol/L was provided by the manufacturer to test the statstrip Xpress lactate machine with the lactate strip in situ.

External quality assessment on the Statstrip Xpress lactate machine, strips, and the control solutions (level 1 and level 2) was done at the central laboratory of Korle-Bu Teaching Hospital before commencement of the study and once every week.

All selected women were followed through the active first stage of labour, delivery and the immediate postpartum regardless of mode of delivery. The delivery records including the partograph, baby's weight, Apgar scores at 1 and 5 minutes, referral to the Neonatal Intensive Care Unit were reviewed and data extracted to complete the questionnaire.

Data was analysed with SPSS version 23.0. Data were grouped into participants whose amniotic fluid lactate ≥ 10.1 mmol/L and those that have amniotic fluid lactate < 10.0 mmol/l. Descriptive statistics on demography, obstetrics factor and the first stage of labour were drawn using frequency table. Categorized variables were compared using the Chi-squared test and numerical variables were compared using the student's t-test. The association between amniotic fluid lactate level, labour progress and perinatal outcome was assessed using logistic regression analyses. Cohen Kappa method was used to analyse the reliability of using one or two amniotic fluid sample. Odds ratio were calculated to measure the association between the age of participants, participants height, gestational age at onset of labour, cervical dilatation at admission to the labour ward, amniotic fluid lactate, duration of labour > 8 hrs. The results of the analysis were considered statistically significant at a 95% confidence interval with a p-value of ≤0.05.

Ethical approval for the study was sought from the Institutional Review Board of the Korle Bu Teaching Hospital with ethical clearance number KBTH-IRB/000112/2019. Permission was also obtained from the Department of Obstetrics and Gynaecology of the Korle-Bu Teaching Hospital to carry out the study in the department.

3. RESULTS

A total of three hundred and seventy-four (374) parturient who met the inclusion criteria and duly consented were included in the study. Forty (40) of them had labour induced.

The majority were between 18-26 years (57.5%) with a mean age of 25.9 ± 4.8 years. The socio-demographic characteristics were not significantly associated with amniotic fluid lactate during labour as shown in Table 1.

Table1. *Amniotic fluid lactate And Socio-Demographic Characteristics of Participants*

Variable	AFL≥ 10.1 mmol/L N=24 n (%)	AFL <10.0 mmol/L N=350 n (%)	Total N=374 n (%)	P-value
Age				0.090
18-26	11(45.8)	204(58.3)	215(57.5)	
27-35	9(37.5)	126(36.0)	135(36.1)	
36-44	4(16.7)	20(5.7)	24(6.4)	
Marital status				0.862
Single	6 (25.0)	121 (34.6)	127 (34.0)	
Married	14 (58.3)	192 (54.9)	206 (55.1)	
Cohabiting	4(6.7)	37(10.5)	41(10.9)	
Educational Level				0.677
None	1 (4.2)	14 (4.0)	15 (4.0)	
Primary	1 (4.2)	24 (6.9)	25 (6.7)	
Secondary	17 (70.8)	205 (58.6)	222 (59.4)	
Tertiary	5 (20.8)	107 (30.6)	112 (29.9)	
Employment				0.513
Salaried	9 (37.5)	160 (45.7)	169 (45.2)	
Non-salaried	0 (0.0)	17 (4.9)	17 (4.5)	
Self employed	9 (37.5)	100 (28.6)	109 (29.1)	
Unemployment	6 (25.0)	73 (20.9)	79 (21.1)	
Religion				0.708
Christian	23 (95.8)	321 (91.7)	344 (92.0)	
Islam	1(4.2)	29 (8.3)	30 (8.0)	
Location				0.086
Sub-Urban	14 (58.3)	106 (30.3)	120 (32.1)	
Urban	10(41.7)	244 (69.7)	254 (67.9)	

3.1. Amniotic Fluid Lactate and Antenatal Characteristics

The mean gestational at booking and delivery were of 13.8 ± 4.5 weeks and 39.8 ± 1.1weeks respectively. The mean haemoglobin level was 10.6 +1.2 g/dl within 2 weeks of delivery. There was no statistically significant association between antenatal characteristics and AFL during labour as shown in Table 2.

Table2. *Amniotic Fluid Lactate and Antenatal Characteristics*

Variable	AFL≥10.1 mmol/L N=24	AFL <10 mmol/L N=350	Total N=374	P-value
Previous history termination of pregnancy				0.654
Yes	9 (37.5)	113 (32.3)	122 (32.6)	
No	15 (62.5)	237 (67.7)	252 (67.4)	
Planned pregnancy				0.674
Yes	9 (37.5)	150 (42.9)	159 (42.5)	
No	15 (62.5)	200 (57.1)	215 (57.5)	
Mean gestational age at Booking	13.6 ± 4.8	13.9 ± 4.2	13.8 ± 4.5	0.752*
Last HB level (g/dl)	10.5 ±1.1	10.6 ±1.2	10.6 ±1.2	0.729*
Weight (Kg)	68.9 ±11.0	72.7 ±13.0	72.5 ±12.9	0.158*
Height (m)	1.54 (1.52-1.58)	1.57 (1.54-1.60)	1.57(1.53-1.60)	0.119#

**Independent T-test# Mann Whitney test*

3.2. Amniotic Fluid Lactate and Labour Characteristics

Majority 334/374(89.3%) of the participants had spontaneous onset of labour. The common indication for induction of labour was post-datism 36/40(90%) and induction was with 25 mcg Misoprostal vaginally administered. The mean cervical dilatation on admission to the labour ward was 5.3 ± 1.4cm. The mean duration of the first stage of labour was 5.2± 2.8 hr. Participants with inefficient uterine contraction were 203/374(54.3%), with

114/203(56.2%) had augmentation with oxytocin. Fetal heart rate abnormality was diagnosed in 25/374 (6.7%) of the fetuses. The duration of the first stage of labour was more than 8 hours in 50/374 (13.4%) and the duration of second stage of labour > 45 minutes in 1.3% of participants as shown in Table 4

The amniotic fluid lactate during labour was found to have a significant association with characteristic of uterine contraction, labour augmentation, duration of the first stage of labour, fetal heart rate pattern and mode of delivery with majority of the participants with high AFL≥ 10.1mmol/l delivered by CS (70.8 %), as shown in Table .

Table4. *Amniotic Fluid Lactate and Labour Characteristics*

Variable	AFL≥10.1 mmol/L N=24	AFL <10 mmol/L N=350	Total N=374	P-value
Mean gestational age at delivery (weeks)	40.0± 1.0	39.5± 1.2	39.8± 1.1	0.065
First stage of labour				
Labour onset				0.307
Induced	4 (16.7)	36 (10.3)	40 (10.7)	
Spontaneous	20 (83.3)	314 (89.7)	334 (89.3)	
Uterine contraction characteristics				0.001
Adequate	3 (12.5)	168 (48.0)	171 (45.7)	
Inadequate	21 (87.5)	182 (52.0)	203 (54.3)	
Augmentation (oxytocin)				0.005
Yes	14 (58.3)	100 (28.6)	114 (30.5)	
No	10 (41.7)	250 (71.4)	260 (69.5)	
Mean cervical dilatation on admission	4.8 ±1.7	5.3 ±1.4	5.3 ±1.4	0.091*
Mean duration of first stage of labour	6.7 ±2.7	5.1 ±2.8	5.2 ±2.8	0.006
Duration of first stage of labour(hrs)				0.008
≥8	8 (33.3)	42 (12.0)	50 (13.4)	
<8	16 (66.7)	308 (88.0)	324 (86.6)	
FHR abnormality				<0.001
Yes	7 (29.2)	18 (5.1)	25 (6.7)	
No	17 (70.8)	332 (94.9)	349 (93.3)	
Second stage of labour				
Mean duration of second stage of labour	16.6 ±8.6	13.6 ±10.1	13.7 ±10.1	0.440
Duration of second stage of labour (min)	N=10	N=310	N=320	0.763
≥45	3 (30.0)	1 (0.3)	4 (1.3)	
<45	7 (70.0)	309 (99.7)	316 (98.7)	
Mode of delivery				<0.001
SVD	6 (25.0)	302 (86.3)	308 (82.4)	
C/S	17 (70.8)	37 (10.6)	54 (14.4)	
Instrumental delivery/Vacuum	1(14.2)	11(3.1)	12(3.2)	
Episiotomy	N=7	N=313	N=320	0.454
Yes	5 (71.4)	166 (53.0)	171 (53.4)	
No	2 (28.6)	147 (47.0)	149 (46.6)	
Type of tear				0.423
First degree	0 (0.0)	41 (16.5)	41 (16.5)	
Second degree	7 (100)	194 (80.2)	201 (80.7)	
Third degree	0 (0.0)	7 (2.9)	7 (2.8)	
Fourth degree	0(0.0)	0(0.0)	0(0.0)	

3.3. Amniotic Fluid Lactate Levels and Delivery Outcomes

There was a significant association of AFL, Apgar score < 7 at 5minutes and NICU admission of parturients with AFL ≥ 10.1

mmol/l having Apgar score < 7 at 5min and 16.7% admission to NICU compared to 3.1 % of those with AFL<10mmol. Seventy-five percent of NICU admission was for low Apgar score. There was also a weak association between AFL and the birth weight. (Table 5)

Table5. *Amniotic Fluid Lactate Levels and Delivery Outcomes*

Variable	AFL≥ 10.1 mmol/L N=24	AFL <10 mmol/L N=350	Total N=374	P-value
Weight of Baby	3306.7 ±237.1	3150.2 ±390.1	3160.2 ±383.9	0.053*
Sex				0.833
Male	12 (50.0)	161 (46.0)	173 (46.3)	
Female	12 (50.0)	189 (54.0)	201 (53.7)	
APGAR SCORE				
1min	7 (5-8)	7 (7-8)	7 (7-8)	0.036#
5min	9 (8-9)	9 (8-9)	9 (8-9)	0.972
5 min APGAR Group				0.011
<7	4 (16.7)	11 (3.1)	15 (4.0)	
≥7	20 (83.3)	339 (96.9)	359 (96.0)	
Birth outcome				-
Live	24 (100.0)	350 (100.0)	374 (100.0)	
Still	0 (0.0)	0 (0.0)	0 (0.0)	
REFERRED TO NICU				0.032
Yes	4 (16.7)	16 (4.6)	20 (5.3)	
No	20 (83.3)	334 (95.4)	354 (94.7)	

**Independent T-test#Mann Whitney test*

Table6. *Indications for Referral to NICU*

Indication	Frequency	Percent
Big baby	2	10
Low APGAR	15	75
Meconium aspiration	1	5
Low Random blood sugar	1	5
Small for date	1	5
Total	20	100

3.4. Analyzing Amniotic Fluid Lactate Using One or Two Samples from Participants

Sixty-three (63/374; 16.8%) of the participants had two samples of amniotic fluid lactate analysed four hours apart. Using the Cohen kappa method to analyse the reliability of using the first and second sample to determine AFL indicates there was an agreement of 78% between the 1st and 2nd sample measures (Kappa= 0.784, p< 0.001) as shown in table 7.

Table7. *Accuracy Of Using One Or Two Samples Of Amniotic Fluid For Amniotic Fluid Lactate*

		Value	Asymptotic Standardized Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	0.784	.147	6.370	.000
No of Valid Cases		63			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					

3.5. Using One Amniotic Fluid Lactate Sample versus Two Amniotic Fluid Lactate Samples in Relation to Labour Dystocia and CS

Table 8, shows the diagnostic accuracy for using one or two lactate samples of AFL to predict labour dystocia and CS. Using one sample of amniotic fluid, when the amniotic fluid lactate ≥10.1mmol/l have a negative predictive value of

97.9 and a sensitivity of 83.3 to predict labour dystocia. When using two consecutive amniotic fluid sample for amniotic fluid lactate there was no significant difference to when one amniotic fluid sample was used to diagnosed labour dystocia. The odd ratio when one amniotic fluid lactate sample was used is 5.5 and increases slightly to 6.5 when two samples with AFL ≥ 10.1 mmol/L are used to diagnosed labour dystocia.

Using one sample of amniotic fluid, with the amniotic fluid lactate ≥10.1mmol/l had a negative predictive value of 97.8 and sensitivity of 70.8 to predict CS. Using two consecutive lactate sample shows negative predictive value of 98.1 and sensitivity of 71.4. The odd ratio for a positive test if one high lactate sample is used 20.5 and when two samples are used was 20.1 to predict CS.

Table8. *Using One Sample versus Two Samples of Amniotic Fluid Lactate in Relation to Labour Dystocia and CS*

Test result		PPV	NPV	Sensitivity	Specificity	Odds Ratio (95% C.I)
	Dystocia					
One lactate sample >10.1mmol/l		10.7	97.9	83.3	52.3	5.5 (1.8-16.4)*
Two consecutive lactate samples >10.1mmol/l		9.6	98.4	85.7	52.1	6.5 (1.9-22.6)*
	CS					
One lactate sample >10.1mmol/l		31.5	97.8	70.8	89.4	20.5 (7.9-52.8)*
Two consecutive lactate samples >10.1mmol/l		27.8	98.1	71.4	89.0	20.1 (7.4-55.0)*

**significant at α=0.05*

3.6. Analgesia and Pain Perception during Labour

In this study, 164/374 (43.9%) of the participants had analgesia during labour. The commonest analgesia given during this study for labour analgesia was pethidine with promethazine added as an antiemetic 160/164 (97.6%). Using the visual analogue pain score during labour, the mean pain score was 7.42±1.43. There was no statistically significant association between AFL levels and the labour pain as shown in table 10.

Table9. *Analgesia and Pain Perception during Labour*

Variable	AFL> 10.1 mmol/L N=24	AFL <10 mmol/L N=350	Total N=374	P-value
Analgesia during labour				0.264
Yes	8 (33.3)	156 (44.6)	164 (43.9)	
No	16 (66.7)	194 (55.4)	210(56.1)	
Type of analgesia	**N=8**	**N=156**	**N=164**	1.000
Pethidine +Promethazine	8 (100.0)	152(97.4)	160 (97.6)	
Epidural	0 (0.0)	4 (2.6)	4 (2.4)	
	N=18	**N=356**	**N=374**	
Pain score	7.57 ±1.31	7.42 ±1.44	7.42 ±1.43	0.777

4. DISCUSSION

The study showed a significant association between the amniotic fluid lactate level and the progress of labour at the set cut-off point of amniotic fluid lactate level ≥ 10.1 mmol/L. In this study, labour dystocia defined as inefficient contractions requiring augmentation, was diagnosed in 56.2% of parturient. Labour dystocia was diagnosed in 66.7% of parturient with amniotic fluid lactate level ≥ 10.1 mmol/L compared to 54.9% of parturient with amniotic fluid lactate level <10.1 mmol/L. This finding is similar to that of Wiberg-Itzel et al who concluded that amniotic fluid lactate level ≥ 10.1 mmol/L was strongly associated with dystocic labor and suggested it might be of value in clinical intrapartum management.[13] It is also similar to the findings by Murphy et al who

also stated that women with AFL between 5.0 – 9.9mmol/L with inadequate uterine contractions may be amendable to correction using the active management of labour protocol before the level rises to ≥ 10.1 mmol/L[14].

It has been noted that augmentation of labour with oxytocin when the amniotic fluid lactate level ≥ 10.1 mmol/L can further increase uterine production of lactate in the amniotic fluid which is associated with an increase in operative delivery, postpartum haemorrhage [1], postpartum fever[15], maternal anxiety[16] and increased neonatal admission to NICU.

There was no significant association between AFL levels and any socio-demographic characteristics similar to findings by Adeyemi et al[7]and Murphy et al[14].

This study did not find any significant association between AFL levels and antenatal characteristics such as GA at booking, previous pregnancies and deliveries, mean Hb, mean weight.

In this study 33.3 % of parturient with AFL level ≥ 10.1mmol/L during the first stage of labour was >8 hours of labour compared to 12% of parturient with AFL <10 mmol/L. This is consistent with findings from other studies[1,13, 17]. Also, when AFL level was ≥ 10.1mmol/L the likelihood of labour dystocia increased five times which is consistent with 4.5 times likelihood found by Wiberg-Itzel et al[1]. This is not surprising as it has been found that a high level of lactate in amniotic fluid decreased oxygenation to the myometrium leading to decrease or cessation of myometrial contractions.

In this study most participants had one sample of amniotic fluid lactate analysed and two samples of amniotic fluid lactate were analysed for sixty-three participants. This was due to admission of women with intact membrane, in advance labour (≥ 7cm cervical dilatation), subsequent development of amniotic fluid heavily stained with meconium, and liquor mixed with blood. It was observed that 78% agreement existed between the first and second sample analysed for amniotic fluid lactate level during this study. Using one or two amniotic fluid sample showed that when the AFL ≥10.1mmol/L it was strongly associated with the risk of labour dystocia or delivery by CS. This was similar to findings from Wiberg-Itzel et al and Murphy et al who both reported that using one or two samples of amniotic fluid lactate can accurately diagnose a patient at risk of labour dystocia and operative deliveries when the AFL was high[14,15].

During this study, it was shown that when one or two amniotic fluid sample with high AFL (≥10.1mmol/L) was present, the parturient was 20 times likely to have CS.In a multicentre study by Wiberg-Itzel et al [1] and another study by Murphy et al [14], indicates that high AFL can be used to independently predict parturient having CS.

Birth weight was found to be significantly associated with the amniotic fluid lactate level during labour and this is corroborated by Murphy M et al. [14] Certainly birth weight directly relate to pelvic capacity and labour progress and thus somehow predictive of labour dystocia.

It was shown that high amniotic fluid lactate level was associated with low Apgar score at delivery and participants with high AFL≥10.1mmol/L are 6 times more likely to have an Apgar score at 5min <7. Wiberg- Itzel et al[13], indicates that Apgar score less than 7 in 5minutes was associated with adverse neonatal outcome at delivery, this was associated with the level of lactate in amniotic fluid and with the use of oxytocin. Also, Murphy M et al showed that neonates delivered when AFL level ≥10.1mmol/L were more likely to be admitted at NICU with transient tachypneoa of the newborn.

In this study, gender of the newborn had no significant association of amniotic fluid lactate level which similar to the finding by Wiberg-Itzel et al[1]

Pain perception and analgesia had no significant association with amniotic fluid lactate level in labour in this study. This is in contrast with the findings of Ulfsdottir et al[18] that a high AFL level ≥ 10.1mmol/L was associated with negative pain perception during labour. The women in this study had a long latent phase of labour with high amniotic fluid lactate, experienced more painful and ineffective uterine contraction. In this study patients were recruited in active phase of labour.

5. CONCLUSION

Labour dystocia was diagnosed in 56.2 % of nulliparous women. The amniotic fluid lactate levels measured with was StatStrip Xpress hand-held lactate machine in the active phase of

first stage of labour at a cut-off point of ≥ 10.1mmol/L was shown to be associated with labour dystocia hence augmentation of labour. It was also associated with caesarean delivery and low Apgar scores though the numbers were small.

It was shown that there was an agreement between the first and second samples of amniotic fluid lactate when two samples were collected. Amniotic fluid lactate analysed at the bedside alongside the partograph can be used to monitor labour progress. This will help the caregiver to anticipate any difficulty if augmentation of labour is required, thereby reducing, adverse labour and perinatal outcome.

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