



## Correlation between Amniotic Fluid Index at Admission and Intrapartum Foetal Wellbeing in Women with Pre-labour Rupture of membranes at Term

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### ABSTRACT

**Objective:** To evaluate measurement of Amniotic Fluid Index (AFI) at admission as a predictor of intrapartum foetal compromise in women with pre-labour rupture of membranes (PROM).

**Material and Methods:** Sonographic record of AFI was made on singleton pregnancies at early and full term admitted in early labour with PROM. The clinical team treating the cases was not aware of the admission AFI values. The labour outcome was studied with respect to the AFI values to find out influence of duration of rupture of membranes (DROM) on intrapartum foetal status, neonatal outcome and infective morbidity.

**Results:** Higher proportion of cases with non-reassuring foetal status (NRFS) was found when admission AFI was less than 5 cm. No baby with low Apgar was born to women recording admission AFI of at least 8 cm. NRFS was not influenced by DROM or period of gestation. High specificity (82%) and negative predictive value (81.9%) was found with low AFI for NRFS.

**Conclusion:** AFI at admission in women with PROM is not a sensitive determinant to predict occurrence of intrapartum foetal compromise. But, AFI less than 5 cm is associated with higher incidence of NRFS in primipara, women aged between 20 to 25 years, or those receiving oxytocin.

**Keywords:** Amniotic fluid index; labour admission test; pre-labour rupture of membranes; intrapartum foetal compromise.

### INTRODUCTION

It is not uncommon to find women reporting to labour ward with ruptured membranes much before start of labour uterine contractions. The

### SOMMARIO

**Obiettivo:** Valutare la misura dell'indice di fluido amniotico (AFI) al ricovero come fattore predittivo di compromissione fetale perinatale nelle donne con rottura della membrana prima del travaglio (PROM).

**Materiale e metodi:** Il dato ecografico di AFI è stato fatto su singoli parti prematuri e a scadenza del termine, in donne ricoverate prima del travaglio con PROM. Il team clinico che ha trattato i casi non era a conoscenza dei valori AFI al momento del ricovero. Il risultato del lavoro è stato studiato nel rispetto dei dati AFI per trovare l'influenza e la durata della rottura delle membrane (DROM) sullo stato fetale perinatale, l'outcome neonatale e la morbilità infettiva.

**Risultati:** La più alta percentuale dei casi con stato fetale non rassicurante (NRFS) è stato riscontrato quando, all'ammissione AFI, era inferiore ai 5 cm. Nessun bambino con Apgar basso è nato da donne con valore di ammissione AFI di almeno 8 cm. NRFS non è stato influenzato dal DROM o dal periodo di gestazione. Un'alta specificità (82%) e un valore predittivo negativo (81,9%), è stato trovato in pazienti con AFI basso per NRFS.

**Conclusione:** Il valore AFI al ricovero in donne con PROM non è un fattore sensibilmente determinante nel predire episodi di compromissione fetale perinatale. Ma un valore AFI inferiore a 5 cm è associato a una maggiore incidenza di NRFS in donne primipare, donne di età compresa fra i 20 e i 25 anni o quelle che ricevono ossitocina.

pre-labour rupture of membranes (PROM) is seen in 10% of all pregnancies. The resulting reduction in amniotic fluid volume in cases with PROM will lead to umbilical cord and placental compression, and ascending infection. This is reflected in increased incidence of non-reassuring foetal/ neonatal outcomes during labour<sup>(1)</sup>, foetal

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and maternal infection<sup>(2,3)</sup>, and perinatal death<sup>(4)</sup>. These patients also have a high caesarean rate due to severe variable decelerations<sup>(1)</sup>.

The concept of admission test in early labour-labour admission test (LAT) using either an initial period of foetal heart rate monitoring<sup>(5,6)</sup> or the foetal response to acoustic stimulation<sup>(7)</sup> was an attractive suggestion because it provided an assessment of current foetal condition and risk. The studies have shown that the LATs cannot be recommended as a screening test for foetal compromise in low risk women since the sensitivity is too low and false positive rates are high<sup>(8)</sup>.

Measurement of amniotic fluid index (AFI) or volume forms an important and influential component of antepartum foetal surveillance through biophysical profiling. Since significant number of women present with ruptured membranes prior to onset of labour, the present study was designed to evaluate the effectiveness of AFI at admission in labour as a predictor of foetal status by correlating incidence of non-reassuring foetal status with amniotic fluid index, and finding out relationship of rupture of membranes with maternal and neonatal outcome.

## **MATERIALS AND METHODS**

A prospective observational study was carried out in the Labour ward Facility of District Government Hospital, attached to a Medical College, from July 2012 to July 2013.

The Study was approved by Institutes Scientific and Ethics Committee. All the cases recruited were informed of the study and their written consent was obtained. Sample size required was calculated on the basis of incidence for non-reassuring foetal status (15%) in the hospital to obtain the results with 95% confidence interval.

Consecutive consenting 100 women with singleton live term pregnancies with pre-labour rupture of membranes were recruited to the study. Women were with cephalic presentation of foetus and vertex as presenting part and had known gestational age. Women excluded were high risk pregnancies, uterus with fibroid/ scar/ anomalies, medical disorders complicating pregnancy (anaemia, gestational diabetes, hypertension), foetal growth restriction, non-reassuring foetal status at admission, choriamnionitis at admission and women in active phase of labour (cervix dilation  $\geq$  3 cm).

For the purpose of the study following definitions and descriptions were considered:

(a) Term pregnancy: Period of pregnancy from 37 completed weeks to 40 weeks was considered as term. This period was further subdivided in to early term (37 to 38.6 weeks) and full term (39 to 40 weeks).

(b) Pre-labour rupture of membranes: Women with complaint of leak of amniotic fluid without uterine contractions or in early labour (cervix up to 3 cm dilatation). The amniotic fluid leak should be visible on speculum examination and the fluid should have alkaline pH.

(c) Known gestational age: The calculated period of gestation in weeks of parturient with regular 28-30 day menstrual cycle and the known last menstrual period (LMP) in agreement with either uterine size at the pelvic examination in 1st trimester and/ or ultrasound determined period of gestation.

(d) Non-reassuring foetal-neonatal status (NRFS): Presence of any of the following - meconium stained liquor during labour, foetal heart rate (FHR) variations during labour, Apgar of  $\leq$  7 at 1 and/ or 5 minutes, or neonatal intensive care unit (NICU) stays, i.e., newborns requiring transfer to NICU soon after birth and monitoring for more than 24 hours.

(e) Chorioamnionitis: was considered to be present if maternal fever of  $>37.8^{\circ}\text{C}$  was present with any two of the following - maternal tachycardia of  $>120$  beats/ min, foetal tachycardia 160 beats/ min, purulent or smelling amniotic fluid vaginal discharge, uterine tenderness, or maternal leucocytosis  $>15,000$  cells/ mL.

The particulars regarding pregnancy and the findings at admission and follow-up were recorded on the format designed for the study.

At the outset,

(a) Speculum examination with sterile Sim speculum was performed to confirm the rupture of membranes. Rupture of membranes was confirmed if the pooling of amniotic fluid on speculum was seen and determination of alkaline pH of the fluid using red litmus paper. Change of colour to blue on contact with fluid was taken as alkaline.

(b) A vaginal swab was taken for culture studies, and Inj. Ampicillin 2g followed by 500mg 6th hourly was administered, intravenously.

(c) A single digit vaginal examination was performed with aseptic observations to note cervical dilatation, effacement, station of the presenting part, and to assess pelvic capacity for ruling out disproportion.

Following recruitment, women were subjected to:

(a) Admission cardiotocography: to obtain foetal heart traces for a minimum of 20 minutes using tocodynamometer (EDAN Foetal Monitor, China; Model F3). The machine had the paper speed of 3cm/minute. Foetal heart rate traces obtained at admission were interpreted as 'reassuring' and 'non-reassuring'<sup>(9)</sup>.

(b) Admission record of AFI: Amniotic fluid index was recorded using ultrasound unit (Philips HD7 XE BOTHELL, WA USA) equipped with 3.5MHz curvilinear transducer. The four-quadrant AFI<sup>(10)</sup> was measured and to study its effect the cases were grouped, for the purpose of the study, as with low (< 5 cm), average (5.1-8 cm), or high (> 8 cm) AFI.

#### **Blinding policy in the study:**

The measured AFI was not informed to the obstetrician managing the cases in the labour ward. The investigator knowing the value of measured AFI was not involved in the labour management of any of the cases.

#### **Foetal and maternal monitoring:**

The maternal wellbeing in labour was monitored by recording pulse rate and blood pressure at 30 minutes interval. Foetal well-being was monitored by foetal heart trace recording and inspecting the colour of liquor on vulvar diaper.

#### **Labour-delivery management:**

Labour was managed as per the hospital policy. Labour was either induced with oxytocics or expectant management was carried out. Progress of labour was monitored and documented on modified WHO partogram. Episiotomy was made to all primigravidas and in multigravidas when needed. Delivery of the head was assisted by Ritgen manoeuvre and oro-nasopharyngeal suctioning done following the delivery of the baby. After the placental delivery piece of chorio-amnion near the placental edge was collected for culture studies.

#### **Neonatal Care:**

Asphyxia status of the new-born was assessed by Apgar at 1 and 5 minute. Neonatal assessment included estimation of the gestational age by new Ballard scores, birth weight and recognition of congenital abnormalities and soft tissue injuries if any.

In cases where meconium stained liquor was present, laryngoscopic visualization of the foetal larynx and glottis for meconium was done and if detected, endotracheal suctioning through a suction catheter was carried out. Baby was kept in neonatal intensive care unit for observation

and management. Any neonate requiring stay in neonatal intensive care unit, the duration and the indication for the same was noted.

#### **Work-up for sepsis:**

Maternal septic work-up included high vaginal swab for culture sensitivity (collected at first examination), determination of total leucocyte count and placental membrane culture examination.

Neonatal septic work-up consisted estimation of C-reactive protein, total leucocyte count and study of peripheral smear for band neutrophils.

The route of delivery, Apgar scores, birth weight, and information about septic workup, neonatal problems, and perinatal deaths were recorded in the designed proforma.

#### **Statistical analysis:**

Outcome of labour, delivery and neonate were studied in relation to AFI. The statistical methods applied to analyse the data were chi square test and Fisher's t test. To validate the significance of admission AFI, the cases were grouped as those with under or more than 5 cm of AFI. A statistical package SPSS version 17.0 was used and p value <0.05 was considered significant.

## **RESULTS**

The mean age of parturient was  $25 \pm 4.03$  years with majority (47%) in the age group of 20-25 years. Nullipara formed 2/3rd of the study population. Nearly half (56%) of the pregnancies were at early term gestation. Normal AFI of >8 cm was found in 47% of parturients and low AFI of <5 cm was recorded in 17% of women with PROM. The mean AFI was  $7.9 \pm 2.7$  cm. Almost all cases had reported early on occurrence of leaking, except 4 women who spent more than 12 hours at home awaiting onset of labour or in transit. The mean duration of PROM at admission was  $4.1 \pm 3.2$  hours.

The evidence of compromise was identified in 18 foetus/ neonates of 100 parturients. Non-reassuring foetal heart trace was recorded in 38.9 percent and 22.2 percent were associated with low Apgar scores of these 18 cases with non-reassuring foetal-neonatal status. The incidence of caesarean delivery was 12 percent in the study group. Although cases with foetal growth restriction were excluded there were 19 percent neonates with birth weight lesser than 2.5 kg. However, the mean birth weight was  $2.8 \pm 0.4$  kg.

An effort was made to explore and find out the association of AFI estimates, if any, with some of the patient characteristics and pregnancy outcome.

Proportion of cases with admission AFI of less than 5 cm was found to be higher in the peripheral age groups being highest (40%) among the age cohorts of  $\leq 20$  years ( $p= 0.655$ ).

Incidence of less AFI (<5 cm) did not appear to be different in the two parity groups, despite number of nullipara being two-times that of multipara in the study. The proportions of cases with lesser AFI were similar across the term gestational period phases - early and full term pregnancies. There was only one woman with less AFI in the group who had PROM beyond 12 hours when reporting to hospital. Point of interest to note was despite varying amount of time since leak, proportion of cases with average to high AFI was similar (**Table 1**).

Association between AFI groups and the admission-delivery interval (ADI) showed that women with higher AFI took longer time to deliver ( $4.2 \pm 1.1$  and  $11.4 \pm 5.1$  hours in women with mean AFI  $7.2 \pm 2.6$  and  $8.2 \pm 2.7$  cm, respectively). No definite trend was seen with caesarean delivery and AFI stratification. However, in women with AFI of lesser than 5 cm, the decision for caesarean was much commoner (4 of 12 vs. 13 of 88 cases with caesarean and vaginal delivery, respectively;  $p = 0.819$ ) (**Table 2**).

No association was seen for occurrence of

abnormal foetal heart trace and AFI at admission. Abnormal FHR trace was recorded in 11.8% of women with AFI of lesser than 5 cm (2 of 17 cases) and it was 6% in women with admission AFI beyond 8 cm (5 of 83 cases;  $p=0.2$ ). There were 4 cases with meconium stained amniotic fluid, but none in the group with AFI of < 5cm at admission. There were 4 babies with low Apgar among 53 mothers who had admission AFI of up to 8 cm (7.5%) and no baby was born with low Apgar when mother's admission AFI was higher than 8 cm. If the child required transfer to intensive neonatal care nursery within 24 hour of birth and stay for more than 12 hours was considered to indicate indirectly the intrapartum insult. Even though there were 17 women with AFI less than 5 cm none of them had their babies requiring NICU transfer (**Table 3**).

The interdependency of maternal characteristics with AFI at admission on the effect of foetus/neonate was explored. There were a total of 18% occurrences with compromised foetal outcome as indicated by abnormal FHR traces, appearance of meconium with liquor, low Apgar of lesser than 7 at 1 or 5 minutes of birth or the early requirement for neonatal intensive care. Incidence of non-reassuring foetal status was higher if the mother had low admission AFI of less than 5 cm, more so

**Table 1.**  
AFI and maternal characteristics (N=100).

Characteristics	Cases	AFI in cm (n,%)			Significance	
		<5	5.1 - 8	>8		
Age (years)	$\leq 20$	5	2 (40.0)	0	3 (60.0)	Fishers exact test $p=0.655$
	20.1 - 25	47	7 (14.9)	17 (36.2)	23 (48.9)	
	25.1 - 30	34	4 (11.8)	15 (44.1)	15 (44.1)	
	> 30	14	4 (28.6)	4 (28.6)	6 (42.9)	
Parity	Nullipara	67	11 (16.4)	22 (32.8)	34 (50.7)	$\chi^2 = 1.21$ ; $p=0.546$
	Multipara	33	6 (18.2)	14 (42.4)	13 (39.4)	
Gestation (weeks)	37 - 38	26	4 (15.4)	9 (34.6)	13 (50.0)	$\chi^2 = 0.140$ ; $p = 0.932$
	38.1 - 39	30	5 (16.7)	10 (33.3)	15 (50.0)	
	39.1 - 40	44	8 (17.0)	17 (36.0)	19 (47.0)	
PROM (hour)	< 12	96	16 (16.7)	35 (36.5)	45 (46.9)	Fishers exact test $p=0.819$
	> 12	4	1 (25.0)	1 (25.0)	2 (50.0)	

**Table 2.**  
AFI and Labour-Delivery (N=100).

Labour-Delivery		Cases	AFI in cm (n,%)			Significance (Fishers exact test)
			<5	5.1 - 8	>8	
Oxytocics	PGE1	20	3 (15.0)	3 (15.0)	14 (70.0)	p=0.204
	PGE2	6	1 (16.7)	3 (50.0)	2 (33.3)	
	Oxytocin	67	13 (19.4)	26 (38.8)	28 (41.8)	
	None	7	0	4 (57.1)	3 (42.9)	
ADI (hours)	< 6	29	5 (17.2)	16 (55.2)	8 (27.6)	p=0.023
	6 - 12	45	8 (17.8)	16 (35.6)	21 (46.7)	
	12 - 24	24	4 (16.6)	4 (16.6)	16 (66.6)	
	> 24	2	0	0	2 (100.0)	
Mode of Delivery	Vaginal	88	13 (14.8)	34 (38.6)	41 (46.6)	p=0.819
	Caesarean	12	4 (33.3)	2 (16.7)	6 (50.0)	

ADI: Admission Delivery Interval; AFI: Amniotic Fluid Index; PG: Prostaglandin

**Table 3.**  
AFI and Non-Reassuring Foetal-Neonatal Status (N=100).

Non-Reassuring Foetal-Neonatal Status		Cases	AFI in cm (n,%)			Significance (Fishers exact test)
			<5	5.1 - 8	>8	
FHR abnormality	Present	7	2 (28.5)	1 (14.2)	4 (57.1)	p=0.287
	Absent	93	15 (16.1)	35 (37.6)	43 (46.2)	
MSAF	Present	4	0	2 (50.0)	2 (50.0)	p=0.998
	Absent	96	17 (17.7)	34 (35.4)	45 (46.8)	
APGAR <7	Present	4	1 (25.0)	3 (75.0)	0	p=0.086
	Absent	96	16 (16.7)	33 (34.4)	47 (49.0)	
NICU Stay	Yes	3	0	3 (100.0)	0	p=0.043
	No	97	17 (17.5)	33 (34.0)	47 (48.5)	

FHR: Foetal Heart Rate trace; AFI: Amniotic Fluid Index; MSAF: Meconium Stained Amniotic Fluid;  
NICU: Neonatal Intensive Care Unit

if she was aged between 20-25 years ( $p=0.243$ ) and was a nullipara ( $p=0.208$ ). Period of gestation and duration after rupture of membranes did not show any meaningful relationship with occurrence of NRFS.

In women who required oxytocin for induction

of labour had higher incidence of NRFS if AFI at admission was less than 5 cm ( $p=0.654$ ). The duration in labour did not show any correlation with occurrence of NRFS. Influence of NRFS did not appear to dictate mode of delivery since distribution of cases according to admission AFI

and compromised foetal status in them was similar between vaginal and caesarean delivery (**Table 4**).

There were only two neonates that showed perinatal infection. Both of their mothers had average AFI and the total duration after rupture of membranes till delivery was 17 hours 20 minutes and 9 hours 10 minutes, respectively. (p=0.483) Only case of chorioamnionitis was in one who had total duration after rupture of membranes of 23 hours and ADI of 20 hours. Her labour was induced with oral PGE1. She had above average AFI of 11.6 cm at admission. (p=0.558). These

cases of infective morbidity were associated with women having admission AFI of > 5 cm and they had rupture of membranes to delivery interval of > 12hours.

To validate the significance of admission AFI, the cases were grouped as those with under or more than 5 cm of AFI. Number of cases with non-reassuring foetal status was 3 of 17 with less than 5 cm AFI group and that in the other group were 15 cases of 83 women. Based on these findings, the AFI of <5 cm at admission, although found to have poor sensitivity and positive predictive value, it

**Table 4.**

Proportion of NRFS cases in relation to some maternal characteristics and delivery factors in relation to AFI at admission (n,%).

Maternal Characteristics	AFI in cm (n,%)			Significance (Fishers exact test)
	<5 (n=17)	5.1 - 8 (n=36)	>8 (n=47)	
Age /years	≤ 20	0	0	p=0.243
	20.1-25	3 (17.6)	2 (5.6)	
	25.1-30	0	3 (8.3)	
	> 30	1 (5.9)	3 (8.3)	
Parity	Nullipara	4 (23.5)	4 (11.1)	p=0.208
	Multipara	0	4 (11.1)	
Gestation (week)	37-38	1 (5.9)	1 (2.8)	p=0.944
	38.1-39	1 (5.9)	1 (2.8)	
	39.1-40	2 (11.8)	5 (13.9)	
PROM (hour)	< 12	3 (17.6)	8 (22.2)	p=0.22
	> 12	1 (5.9)	0	
Oxytocics	PGE1	1 (5.9)	3 (8.3)	p=0.654
	PGE2	0	0	
	Oxytocin	3 (17.6)	5 (13.9)	
	None	0	0	
ADI (hours)	< 6	1 (5.9)	1 (2.8)	p=0.305
	6-12	2 (11.8)	5 (13.9)	
	12-24	1 (5.9)	2 (5.6)	
	> 24	0	0	
Made of Delivery	Vaginal	2 (11.8)	5 (13.9)	p=0.830
	Caesarean	2 (11.8)	3 (8.3)	

Figures are number of cases with NRFS (percent of AFI group)

AFI: Amniotic Fluid Index; PROM: Pre-labour Rupture Of Membranes; ADI: Admission Delivery Interval; NRFS: Non Reassuring Foetal-neonatal Status

**Table 5.**  
Validation of low AFI at admission as predictor of intrapartum non-reassuring foetal-neonatal status.

Admission AFI (cm)	Non-reassuring Foetal-Neonatal Status (cases)	
	Present	Absent
< 5 (n=17)	3	14
> 5 (n=83)	15	68
Sensitivity	16.6%	
Specificity	82.0%	
Positive Predictive Value	17.6%	
Negative Predictive Value	81.9%	

demonstrated to have acceptable high specificity higher negative predictive value (Table 5).

There were no cases of stillbirths, early neonatal deaths and maternal deaths in the study group.

## DISCUSSION

Every foetus is prone to develop intrapartum hypoxia as labour is a process of repeated foetal hypoxic events. It is difficult to predict with accuracy which foetus would develop hypoxia in labour and the degree of hypoxia the baby would undergo. Mostly because of presence of differing risk factors and different indicators the reported incidence of intrapartum foetal compromise has a wide variation.

Women with AFI < 5 cm have been shown to be at significantly higher relative risk of 6.83 for caesarean delivery if the foetal heart trace showed variable decelerations<sup>(11)</sup>. Other studies have reported a high 25% occurrence of foetal distress<sup>(6)</sup>. The figure for non-reassuring foetal status in the present study was 17% in women with AFI < 5 cm. The protective importance of intact membranes is known and rupture of it prior to the onset of labour or in early labour does impart high risk nature affecting foetal wellbeing.

The participant characteristics like age and parity did not appear to be the influencing factors for occurrence of PROM in the studied group. The reason for preponderance of nulliparous women in the recruited could be because of increased alertness and apprehension in them coupled with multipara reporting late in advanced labour for being indifferent to the appearance of leak having gone through labours earlier. It is only

an assumption. Because of the early reporting when leak occurred, in a nullipara lesser AFI at admission may be considered as a significant finding. It was found that nullipara with AFI of < 5 cm had higher proportion of cases with non-reassuring foetal status (Table 4).

Majority of the cases had AFI >8 (47%) and mean duration of PROM at admission was 4.13 hours in the present study. This can be accounted by increased health awareness resulting in timely reporting to the labour ward.

The finding of women with AFI < 8 cm having shorter admission-delivery interval than the counterparts with higher AFI make one to search for the answer for variation in compromise to foetal wellbeing in the mean AFI values among AFI cohorts.

The cases with AFI < 5 cm in whom labour was induced and maintained with oxytocin infusion the occurrence of intrapartum foetal compromise was commoner. In the absence of intrauterine pressure monitoring data it will be difficult to comment on the finding. It may be incidental that most patients in other group receiving prostaglandin preparations had AFI of > 5 cm. Moreover administration of different oxytocics was not randomized and oxytocin was the most frequently used preparation (67 of 93 cases, 72%).

The incidence of operative intervention to deliver for foetal compromise was reported to be 3-times commoner in low AFI groups<sup>(12)</sup>. The present study noted frequency of caesarean delivery twice than vaginal delivery in the group with AFI < 5 cm. It was seen that even with the not-so stringent criterion used for defining non-reassuring foetal status, heir occurrence was similar in both the delivery modes.

Despite patients with PROM having admission-delivery interval of more than 12 hours forming nearly 3rd of the study group, the infective morbidity and foetal compromise was similar in the two cohorts of labour duration on either side of 12 hours. It is in contrast to reported 68.4% overall incidence of significant maternal and foetal infection rates in the study group with low AFI. That study<sup>(13)</sup> also included preterm pregnancies with expectant management. Use of liberal antimicrobials could be the reason behind the only 1 and 2% of maternal and perinatal infection, respectively in the present report.

The present study accorded a high specificity (82%) and negative predictive value (81.9%) to the predictability of admission AFI of < 5 cm in women with PROM to pre-suggest possibility of intrapartum foetal compromise. But, the

sensitivity of the indicator was a poor 17%. The good results for prediction by Baron and associates (1995)<sup>(11)</sup> based on study with intact membranes could not be reproduced and probably they cannot be extrapolated to the situations with ruptured membranes (Table 5).

The higher specificity and negative predictive values attached to the low AFI in identifying pregnancies likely to develop intrapartum foetal non-reassuring nature based on the observations made in the present study appear substantial in the light of incorporated blinded component that kept the treating obstetricians unprejudiced. To look in to influence of confounding variables such as maternal characteristics including socio-economic and educational status of the patient

and labour-delivery events, type of oxytocic used more number of cases need to be studied under those cohort subgroups.

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## DECLARATION

Authors declare no conflict of interest.

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