Original Article

Study Of Meconium Stained Amniotic Fluid And Its Relation With Foetal Heart Rate And Mode Of Delivery

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Abstract

Background: Obstetric teaching thought out this century has included the concept that meconium passage is a potential warning sign of foetal asphyxia. Whitridge J Williams, in 1903 observed the characteristic sign of impending asphyxia is escape of meconium. He attributed meconium passage to relaxation of sphincter muscle induced by faulty aeration of foetal blood. Though over time we have also realised that detection of meconium during labour is problematic in prediction of foetal distress or asyphyxia. Even though human labour is complicated by meconium, few of these are linked to infant mortality.

Methods: A clinical study of 70 cases of meconium stained amniotic fluid in cephalic presentation out of 200 deliveries. A careful clinical history was taken from all these cases particularly about age, parity, gravidity, previous obstetrics history and obstetric complications. Colour of amniotic fluid and type of meconium was noted at the time of amniotomy or spontaneous rupture of membrane and at the time of delivery and the eventual mode of delivery was recorded.

Conclusion: Meconium stained liquor is associated with increased rate of interventions, the decision regarding mode of delivery demands individual clinical judgement, weighing the estimated time until vaginal delivery against the estimated time until the onset of metabolic acidosis. Caesarean section rate in MSAF can be justified to ensure a better outcome for the neonate even in the presence of a normal CTG trace.

Keywords: meconium stain, mode of delivery, foetal heart rate, abnormal

INTRODUCTION

Obstetric teaching thought out this century has included the concept that meconium passage is a potential warning sign of foetal asphyxia. Whitridge J Williams, in 1903 observed the characteristic sign of impending asphyxia is escape of meconium. He attributed meconium passage to relaxation of sphincter muscle induced by faulty aeration of foetal blood. Though over time we have also realised that detection of meconium during labour is problematic in prediction of foetal distress or asyphyxia. Even though human labour is complicated by meconium, few of these are linked to infant mortality.

There is strong evidence that most meconium passage occurs by 3 main mechanisms

1) As a physiological maturational event
2) Response to acute hypoxic events occurring in late pregnancy.
3) Response to chronic intrauterine hypoxia.

Passage of of meconium in the mature foetus is facilitated by myleination of nerve fibres and increase in parasympathetic tone and increase in motilin. Meconium passed as a event of maturational event is thin in consistency. (1, 2, 3)

Newborns who suffer chronic intrauterine hypoxia are more likely to develop pulmonary artery muscularization and persistent pulmonary hypertension of the newborn and subsequently their response are more depressed at birth. Chronic hypoxia and hypercapnia stimulate both meconium passage and neonatal gasping, in such cases meconium passage can occur long before death. Complications can be due to passage of meconium or conditions causing chronic hypoxia. Katz & Bower (4) concluded from their review that etiology of meconium aspiration syndrome is primary chronic foetal asyphyxia rather than simply damage from meconium. The postulated that chronic antepartum asyphyxia causes pathophysiological changes leading to pulmonary vascular damage, pulmonary hypertension and persistent foetal circulation. Affected newborns are unable to clear aspirated meconium. Many maternal factors contribute to passage of meconium before birth with include maternal age, prolonged gestation, type of labour, anaemia,, hypertension, toxaemia of pregnancy, asthma and heart disease. (2, 5)

AIMS :

1) To study the relation between meconium staining and foetal heart variability
2) To study the mode of delivery during meconium stained amniotic fluid.

REVIEW OF LITERATURE:

Meconium the term was coined by Aristotle who derived it from the Greek word like ‘opium’. Chwartz in 1858 described as a sign of impending foetal death. According to Reed in 1918 & Brows in 1948 anoxia caused he anal sphincter to relax and the meconium subsequently passed into the surrounding fluid. Paulini TK Etal (6) concluded that in newborns with meconium stained amniotic fluid, immediate tracheal suction is a safe procedure that significantly lowers morbidity and mortality rates and produces no further respiratory depression of the newborn. Vinaya Pendse (7) the aim of this study was to find out the correlation of meconium stain with various other significant obstetrical condition and foetal outcome. Cases were divided into three groups :

Group 1 : Cases with meconium stained amniotic fluid showing other signs of acute foetal distress.

Group 2 : Cases with meconium stained fluid not showing other signs of acute foetal distress, but had significant association with antenatal and intrapartum factors.

Group 3 : Cases with meconium stained fluid not showing other signs of acute foetal distress, and no significant association with antenatal and intrapartum factors.

Higher incidence and mortality was associated with primi para, poor antenatal care, abnormal and difficulty delivery and birth through thick meconium. Ingermarsson I (8) studied the usefulness of a short electronic foetal heart rate recording at admission of patients in labour (admission test) was investigated in low risk patients in two prospective studies. Patients with reactive admission test had a low incidence intrauterine asyphyxia in labour. It is concluded that the admission test can detect foetal distress already present at admission and unnecessary delay in intervention can be delayed.

Lucas et al (3) suggested that levels of motilin an intestinal hormone responsible for bowel peristalsis and defecation are lower in premature infants and higher in infants who have passed meconium. It has been shown that infants with foetal distress had a four fold elevation of cord plasma motilin than normal.

Katz & Bower (4) concluded from their review that etiology of meconium aspiration syndrome is primary chronic foetal asyphyxia rather than simply damage from meconium. The postulated that chronic antepartum asyphyxia causes pathophysiological changes leading to pulmonary vascular damage, pulmonary hypertension and persistent foetal circulation. Affected newborns are unable to clear aspirated meconium.

Vineta Gupta et al (9) in this study said that electronic FHR monitoring was significantly better in detecting all types of academia : metabolic, mixed & respiratory. This data suggest that electronic FHR monitoring is superior to intermittent auscultation in detecting foetal acidaemia at birth.

Kulkarni et al (10) correlated the perinatal outcome with initial FHR pattern. The incidence of operative delivery for fetal distress showed a progressive rise from reactive to ominous pattern group. The reactive pattern was assuring of the foetal well being for next 5 hours. Presence of late decelerations & decelerations of 60 beats or more below the baseline were additional ominous characteristics, associated with increase in perinatal morbidity.

Reactive admission test appears to be predictive of foetal well being in high risk labours also. Rossi et al (11) concluded that thick meconium presence of foetal tachycardia and absence of intrapartum foetal cardiac accelerations identified foetus at high risk of meconium staining. Ghandi (12) revealed that most cases of severe meconium aspiration syndrome are not infant casually related to the aspiration of meconium but rather are caused by other pathological processes occurring in utero like primary chronic hypoxia and infection.
Mechanisms of meconium aspiration and meconium aspiration syndrome(13) - The pathophysiology of meconium aspiration and meconium aspiration syndrome is complex and the timing of initial insult remains controversial. 1) Intrauterine foetal gasping 2) Mechanical airway obstruction 3) Pneumonitis 4) Surfactant inactivation 5) Damage to umbilical vessels all play roles in pathophysiology of meconium staining.
There are different opinions about the mode of delivery. Some experts believe that even if meconium is present in amniotic fluid, clinician may allow patients to labor in the presence of reassuring fetal heart rate and some prefer for immediate operative delivery. (14) Grignaffini et al found that meconium-stained amniotic fluid was associated with lower SpO2 values only when fetal heart monitoring showed a "non- reassuring" pattern. (15) Shaikh EM found it was not uncommon for obstetricians to be more aggressive in labors with meconium stained amniotic fluid leading to higher caesarean section rate, which was 82% in their study. (16)

MATERIALS AND METHODS:

A clinical study of 70 cases of meconium stained amniotic fluid in cephalic presentation out of 200 deliveries. A careful clinical history was taken from all these cases particularly about age, parity, gravidity, previous obstetrics history and obstetric complications. Colour of amniotic fluid and type of meconium was noted at the time of amniotomy or spontaneous rupture of membrane and at the time of delivery.

Inclusion criteria : Primigravida, full term pregnant women in labour with cephalic presentation
Exclusion criteria : Malpresentation & multiple pregnancies.

Patients who were admitted in labour room were examined in detail as follows.

a) History taking : Age, Parity, History of previous pregnancies, Nature of delivery, Past & Personal history, Post natal or Post Operative notes.
b) General examination : Pulse, Blood pressure, general condition & built was noted down.
c) Systemic examination : Cardio pulmonary assessment was done to rule out any abnormalities.
d) Obstetric examination : Height of the uterus, girth of abdomen, position & lie of the foetus are noted down. Foetal heart auscultated & uterine action noted down.
e) Pelvic examination : The position of cervix, dilatation, the presence or absence of membranes, the level of presenting part, type of pelvis are noted down. If membranes are absent, type of liquor. If uterine action is good and cervical dilation is 3cm or more, membranes were ruptured artificially and colour of liquor is noted down.
f) Investigations : CBC, Urine routine and microscopy, Blood grouping and Rh typing, RFT, LFT, USG, CTG

Management during labour :
The patient who were having meconium stained amniotic fluid with or without heart rate variation were given left lateral position, IV fluids and oxygen inhalation to mother. The rate of cervical dilatation duration of labour were noted. If there were any associated complications like PIH, eclampsia, heart disease, anaemia, the specific treatment were given.

The markedly abnormal tracings were considered to be present when at least 1 of the following abnormalities was observed: 1) baseline FHR less than 110 beats/min during more than 5 minutes; (2) baseline variability less than 5 beats/min during more than 30 minutes; (3) 4 or more late decelerations in a 1-hour period; and (4) 2 or more prolonged decelerations in a 1-hour period. A tracing was considered as moderately abnormal in the presence of at least 1 of the following abnormalities: (1) baseline FHR more than 160 beats/min; (2) more than 5 mild variable decelerations per hour; (3) more than 1 severe variable deceleration per hour; (4) late decelerations but at a frequency of less than 4 per hour; (5) less than 2 prolonged decelerations per hour; or (6) any of the above with

normal baseline variability more than 5 beats/min. A normal FHR tracing was defined by the absence of abnormalities presented in the 2 other categories.

The mode of delivery was dependent upon the foetal & maternal condition. Depending on conditions the delivery was either spontaneous or with interventions like forceps & lower segment caesarean section. Presence of meconium in absence of fetal heart abnormalities is generally not suggestive of fetal compromise and does not warrant immediate delivery. However, after the initial hypoxic bout initiating meconium passage, subsequent repetitive bouts due to prolonged labour or abnormal uterine activity may cause severe asphyxia and acidosis in the fetus. (17)

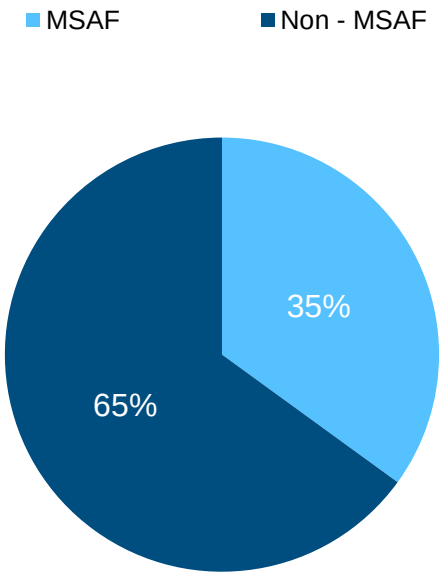
STATISTICS

Sample size was was calculated using Epi - Info software. All data was entered into an excel sheet. Statistical analysis was performed using STATAIC version 13. Descriptive statistics used were Pearson's Chi-square with Fisher Exact test, Odd's ratio with 95% confidence intervals and diagnostic tests of evaluation. A probability value of <0.05 was considered significant.

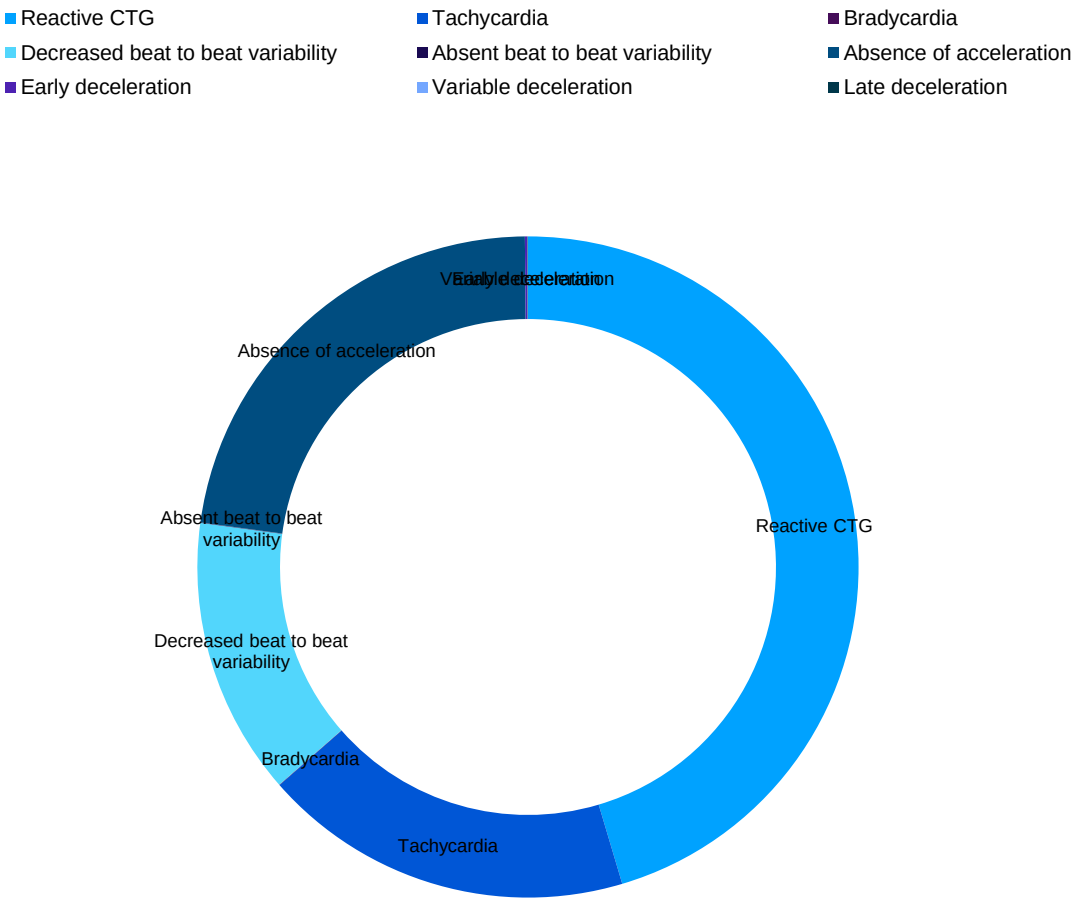
OBSERVATIONS :

The data collected in this study is presented in the following tables as seen in 200 patients with meconium stained amniotic fluid.

	Number	Percentage
Non - MSAF	130	65%
MSAF	70	35%



FHR abnormalities in meconium stained amniotic fluid



FHR	Number	Percent
Reactive CTG	30	42.8%
Tachycardia	12	17.1%
Bradycardia	2	0.02%
Decreased beat to beat variability	9	12.8%
Absent beat to beat variability	2	0.02%

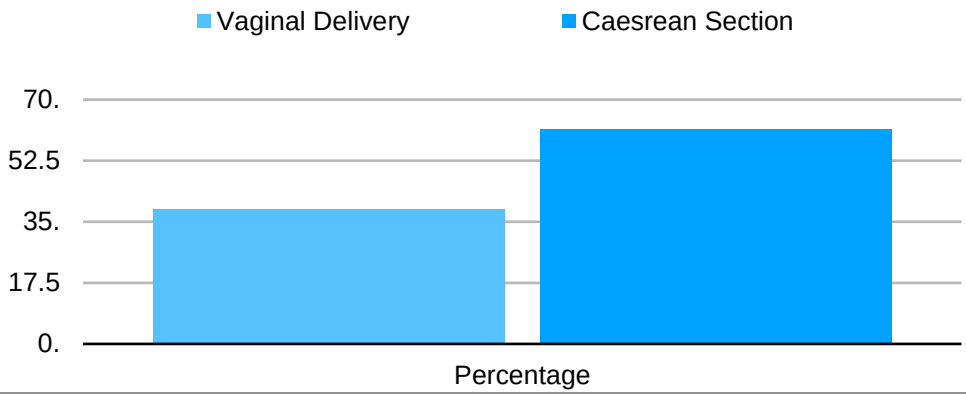
Absence of acceleration	15	21.4%
Early deceleration	7	0.1%
Variable deceleration	2	0.02%
Late deceleration	2	0.02%

Mode of delivery

Mode of Delivery	Number	Percentage
Vaginal Delivery	27	38.5%
Caesarean Section	43	61.5%

DISCUSSION

Comparison of FHR in meconium stained liquor

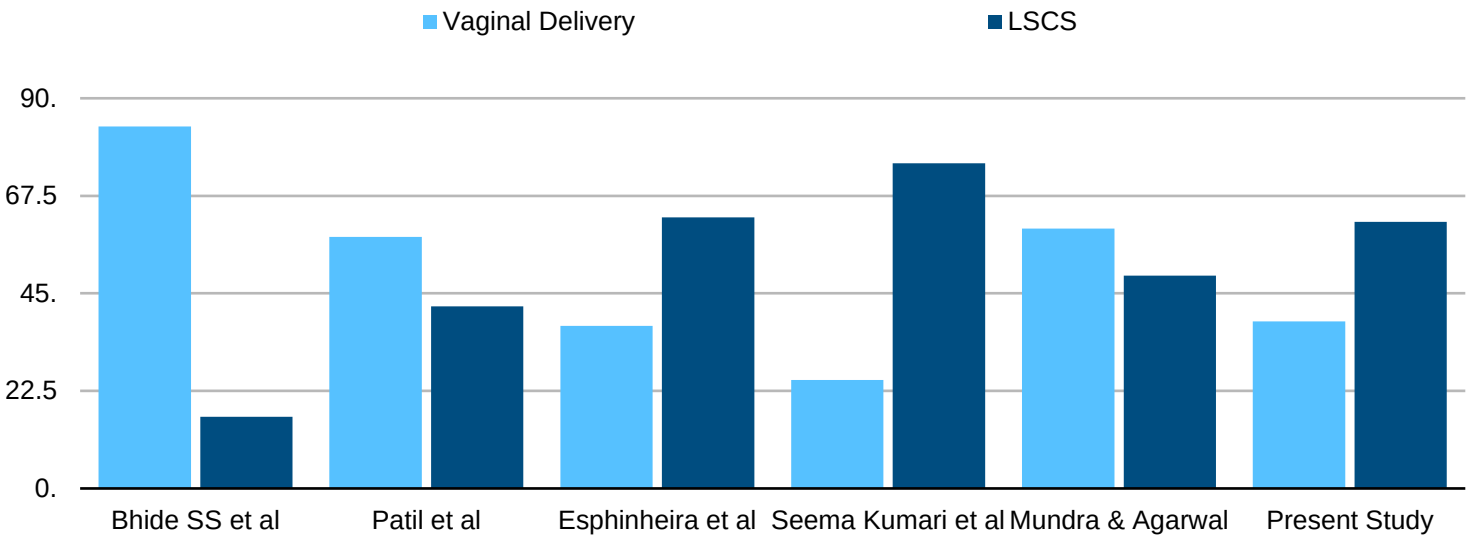


Meconium Stained Amniotic Fluid	Present Study	Vijayashree M Etal
Normal FHR	42.8%	60%
Abnormalities in FHR	57.2%	40%

Comparison of incidence of mode of delivery

Mode of delivery	Bhide SS et al	Patil et al	Espinheira et al	Seema Kumariet al	Mundra and Agarwal	Present Study

Vaginal Delivery	83.5%	58%	37.5%	25%	59.91%	38.5%
LSCS	16.5%	42%	62.5%	75%	49.09%	61.5%



This small study could not estimate the prevalence of MSAF in the hospital population due to the study design. Study did not compare normal cardio-tocograph patterns in the control group with that of MSAF group. The facility for fetal scalp blood sampling and estimation of cord blood pH are not available in the hospital and were not used in the study.

RESULTS

The results of our study showed that in meconium stained amniotic fluid the rate of caesarean section was much higher, about 61.5% as compared to vaginal delivery which was 38.5%. These proportions were similar to various studies conducted over the years with a rising trend of caesarean sections seen. Abnormal foetal heart rate patterns were seen in about 57.2% of the meconium stained liquor cases, which need not necessarily warranted the decision of caesarean section

CONCLUSIONS

Antepartum complication statistically significantly associated with meconium stained liquor because risk factors lead to placental insufficiency & intrauterine foetal hypoxia which were responsible for passing meconium. Thus preventing antepartum complication providing good antenatal care & early detection of antepartum complication and treating them we an reduce the incidence of meconium stained amniotic fluid. Meconium stained amniotic fluid alone is not an indicator of foetal distress it co relation with other factors like foetal heart variations should be viewed seriously. Meconium stained liquor is also associated with increased rate of interventions. , the decision regarding mode of delivery demands individual clinical judgement, weighing the estimated time until vaginal delivery against the estimated time until the onset of metabolic acidosis. Caesarean section rate in thick MSAF can be justified to ensure a better outcome for the neonate even in the presence of a normal CTG trace.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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