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Original Research Article

Duration of meconium-stained labor-prevalence and association with adverse maternal and neonatal outcomes

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ABSTRACT

Background: Meconium-stained amniotic fluid (MSAF) is the result of the passage of fetal intestinal contents by normal intestinal peristalsis of the mature fetus or by vagal stimulation in utero. It affects up to 9-20% of deliveries. The incidence of MSAF increases with gestational age from 31 weeks to the end of pregnancy. MSAF is known to be associated with neonatal adverse effects. To provide insight on the correlation between secondary Meconium stained amniotic fluid and adverse pregnancy outcomes including maternal and neonatal morbidities, compared with Primary MSAF.

Methods: This was a prospective longitudinal observational study done at Fernandez Hospital, Hyderabad over a period of 1 year 5 months-Aug 2022 to Dec 2023. All women with Term gestation, singleton pregnancy, with spontaneous or induced labour, who were booked or referred delivering at Fernandez Hospitals and were included in this study Sample size received during study was 500.

Results: Secondary MSL was seen more to occur with Primigravida and Nulliparous women (p=0.045). Association of secondary MSL was found to be more with Induced labor whereas occurrence of Primary MSL was more seen in spontaneous labor (p=0.042). Complications such as PPH, Non-reassuring FHR were more in secondary MSL group and were statistically significant. Composite neonatal outcomes of Acidemia, low apgar at 1 min, Need for resuciation and Meconium aspiration were significant in secondary MSL Group.

Conclusions: MSAF remains a stigma. This study showed complications more with secondary MSL than Primary MSL. The findings would be useful in counselling couples in such case scenarios and make informed choices and help in decision making.

Keywords: Duration of meconium stained labour, Meconium aspiration syndrome, Meconium stained amniotic fluid, Primary meconium stained liquor, Secondary meconium stained liquor

INTRODUCTION

The word "meconium" is derived from the Greek word mekoni, meaning "poppy juice" or "opium-like," referring to the belief that fetal exposure to meconium would lead to neonatal drowsiness or depression, a concept commonly attributed to Aristotle. Meconium is the fetal intestinal contents consisting mainly of water (72%–80%), exfoliated skin cells, lanugo, vernix caseosa and gastrointestinal secretions and is sterile. The typical greenish-yellow color of the meconium is attributed to bile pigments.[1] MSAF is the result of the passage of fetal intestinal contents by normal intestinal peristalsis of the mature fetus or by vagal stimulation in utero. It affects up to 9 - 20% of deliveries with most occurring during or after labor.[2] However during hypoxia there is stimulation and release of arginine vasopressin (AVP) from the fetal pituitary gland which stimulates the smooth muscle of the

colon to contract, leading to intraamniotic defecation (Rosenfeld, 1985). Meconium is toxic to the respiratory tract and its inhalation can lead to meconium aspiration syndrome.[3] The incidence of MSAF increases with gestational age from 31 weeks to the end of pregnancy. Independent predictors of MSAF include advanced gestation, advanced maternal age, preeclampsia, prolonged labor, induction of labour, black or South Asian ethnicity and vaginal breech deliveries.[4]

MSAF is known to be associated with neonatal adverse effects, including acidosis, admission to the ICU, respiratory distress, hypoglycemia, seizures and meconium aspiration syndrome. Maternal adverse effects include an increased caesarean section rate, a higher rate of operative deliveries, chorioamnionitis and neonatal sepsis associated with MSAF deliveries This association has been shown to correlate with the thickness of the meconium.[4]

Aim

To provide insight on the correlation between secondary Meconium stained amniotic fluid and adverse pregnancy outcomes including maternal and neonatal morbidities, compared with Primary MSAF.

Objectives

Primary objectives: *composite neonatal outcomes*

Number of babies having. Low Apgar scores at birth 1 min, 5 min, birth asphyxia, neonatal sepsis, neonatal intensive care unit admission, neonatal death, meconium aspiration syndrome, respiratory distress syndrome, necrotizing enterocolitis, phototherapy, sepsis, transfusion.

A comparison of the neonatal outcomes was performed for the cases of secondary MSAF between those in which the transition to meconium occurred < 3 h vs >3 h from delivery.

Secondary objectives: maternal outcomes

Mode of delivery (vaginal, assisted vaginal or caesarean including the indication for CDs), intrapartum fever/chorioamnionitis, manual removal of the placenta, postpartum hemorrhage, wound infection, puerperal sepsis.

METHODS

This was a prospective longitudinal observational study done at Fernandez Hospital Foundation, Hyderabad over a period of 1 year 5 months-August 2022 to December 2023. All women with Term gestation, singleton pregnancy, with spontaneous or induced labour, who were booked or referred delivering at Fernandez Hospitals and were included in this study.

Women who had preterm labour, TOLAC, multiple pregnancies, non-vertex presentation, IUFD, terminations of pregnancy, known foetal malformations, clear/bloody amniotic fluid labours were excluded from the study.

Calculation of sample size

Sample size was calculated assuming the proportion of meconium-stained liquor as 16.88% as per the study by Tairy et al.[4] The other parameters considered for sample size calculation were 5% Relative precision and 95% confidence level. The following formula was used for sample size as per the study.

Formula

$$n = \frac{\left(z^{2}_{1-\frac{\alpha}{2}}\right)(1-p)p}{\xi^{2}p}$$

Where,

p : Expected proportion

ξ : Relative precision

1- $\alpha/2$: Desired Confidence level

The sample size was calculated as single proportion - relative precision, expected proportion - 0.1688, relative precision (%) – 20, desired confidence level (1-alpha) %-95, Required sample size–473, sample size received during the course of study–500. Both the groups were studied for.

Maternal demographic details

gravida, parity, age, BMI at booking and delivery including total weight gain in pregnancy. Medical disorders in pregnancy like hypothyroidism, anemia, diabetes, hypertension, thrombocytopenia and IHCP. Scan for amniotic fluid level at term-oligohydramnios and polyhydramnios.

Delivery details

Type of labor spontaneous/induced, rupture of membranes, epidural as pain relief method, fetal heart rate tracing-reassuring/non reassuring, mode of delivery-vaginal birth/LSCS, duration of exposure to meconium-stained amniotic fluid, occurrence of intrapartum fever including chorioamnionitis, occurrence of postpartum hemorrhage, wound infection post delivery

Neonatal outcome details

Gestational age at delivery, Birth weight and GROW centile, cord blood gases and pH, Apgar score at birth, Requirement of resuscitation at birth, NICU admission, NICU supports if required

Occurrence of MAS (meconium aspiration syndrome), occurrence of necrotizing enterocolitis, occurrence of neonatal sepsis, occurrence of respiratory distress, need for mechanical ventilation, neonatal death, variables and their definitions.

Primary meconium-stained amniotic fluid

Cases where meconium-stained liquor present at inception of membrane rupture.

Secondary MSAF

Cases in which transition happened from clear to MSL during any stage of labor.

Statistical analysis

Categorical variables were presented as frequency and percentage whereas continuous variables were presented as mean±SD. Independent t-test was used to compare the mean±SD of continuous variables between the two groups. Chi-squared test was used to test statistical significance of cross tabulation between categorical variables. P value<0.05 was considered statistically significant. Data was analyzed by using coGuide REAP software version 2.0 (Reference: coGuide. Research Enablement and Productivity Platform (REAP), version 2.0. Released 2022;India:BDSS corp.).

RESULTS

A total of 6618 deliveries occurred at our institution during the study period, after excluding cases of multiple pregnancies, Trial of labour after caesarean sections (TOLAC), non-vertex presentation, preterm deliveries, IUFD, terminations of pregnancy, known malformations, clear/bloody amniotic fluid and cases with missing data.

We had a total of 500 (7.55%) births were analyzed in which 350 (70%) were in the primary MSAF group and 150 (30%) in the secondary MSAF group. Among the secondary MSAF group, 124 (82.6%) transitioned to MSAF in less than 3 hours before delivery and 26 (17.3%) transitioned to MSAF prior to 3 hours before delivery.

Maternal demographics details of the two groups are presented and compared in Table 1. Secondary MSL was seen more to occur with Primigravida and Nulliparous women and this was found to be statistically significant (p=0.045). Secondary MSAF group had higher incidence of coexisting medical disorders such as gestational diabetes, hypertension and hypothyroidism, although there was no statistical significance. Majority of study group pregnancies had adequate amniotic fluid that is 444/500 (88.8%). Oligohydramnios was found in 2.9% cases in primary MSL group and 4% in secondary MSL group. Polyhydramnios was seen in 7.4% cases in primary MSL group and 9.3% in secondary MSL group, both entities were not statistically significant.

Association of secondary MSL was found to be more with Induced labor whereas occurrence of primary MSL was more seen in spontaneous labor and this finding was statistically significant. Type of rupture of membranes was not seen exclusively associated with occurrence of primary or secondary MSL. Uptake of epidural was seen to be more in secondary MSL and this data was statistically significant. Non-reassuring foetal heart traces were found to be more in secondary MSL group and were statistically significant. There was not much significant difference between rates of vaginal delivery and LSCS in both groups but a higher percentage of women were observed to have an LSCS in Non reassuring FHR traces.

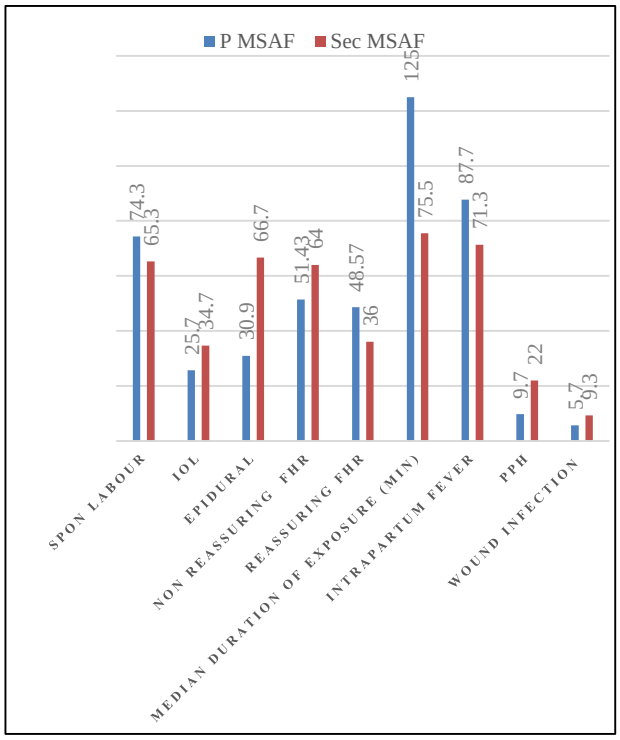

Figure 1: Comparison of selected pregnancy outcomes between primary MSL and secondary MSL.

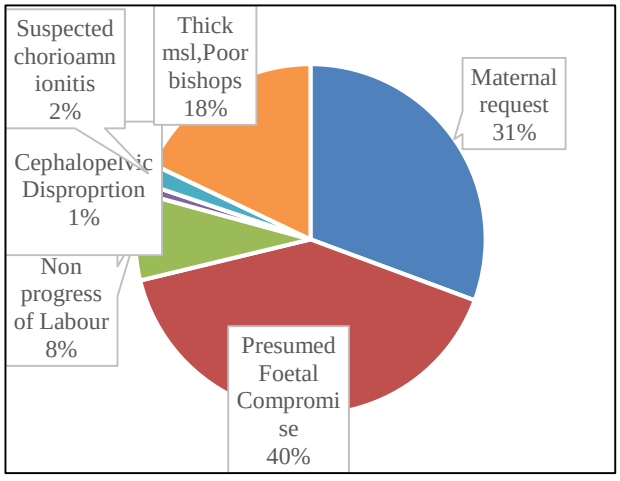

Figure 2: Indications of caesarean section in the primary MSAF population.

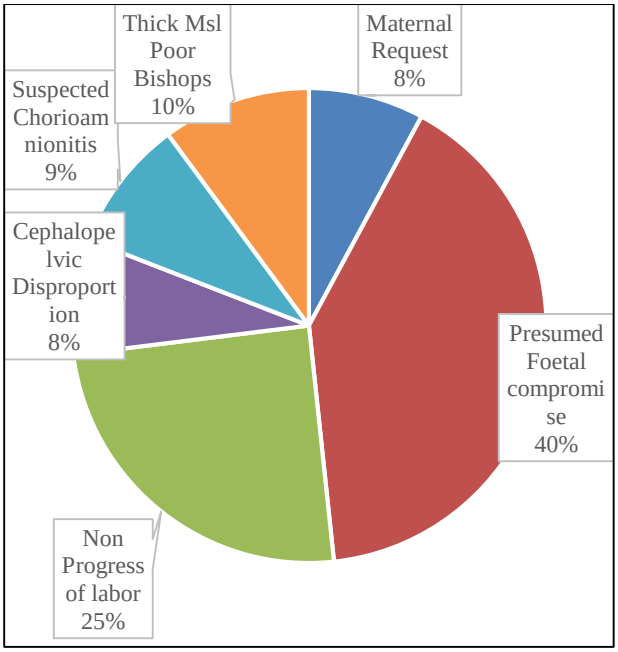

Figure 3: Indications of caesarean section in the secondary MSAF population.

Median duration of exposure to MSL was understandably found to be more and statistically significant in primary MSL. Chorioamnionitis/Intrapartum fever was also found to be at higher incidence in the primary MSL group and it was statistically significant. Rates of PPH and also wound infection rates were found to be higher in secondary MSL group and was statistically significant ($p<0.001$). Non-reactive NST was found to be more seen in secondary MSL group which was statistically significant and could have been the major reason for delivery of fetus and not continuing further trial of labour.

Predominant mode of delivery in both groups was LSCS with about 60% in both groups but this data was not statistically significant. As there was a greater percentage of women who had LSCS as the mode of delivery, sub group analysis was done to determine the indications of LSCS in both groups. The pie charts above discuss indications of LSCS in both primary and secondary MSL groups. Non reassuring fetal heart tracings was a major factor for decision for delivery of the foetus. The study revealed that maternal request caesarean section with the backdrop of fear of adverse neonatal outcomes was more in the Primary MSL Group and it was found statistically significant. In both the groups presumed fetal compromise was the predominant reason for the Caesarean section amounting to almost 40% cases but it was not statistically significant. There is a statistically significant increased occurrence of chorioamnionitis, cephalo-pelvic disproportion and non-progress of labor in the secondary MSL group. Thick MSL with poor Bishop's score contributed to 17.9% in primary MSL cases ending up in caesarean section. The median gestational age at delivery in both the groups was 39 weeks which was statistically significant. The birth weight was on average 3.08-3.12 kg in the study period.

Low APGARs were found to be more statistically significant in secondary MSL group. Birth weight of delivered babies was plotted on the GROW chart using software and weights were classified into SGA, AGA and LGA. There were more SGA babies in the secondary msl group but was not significant statically.

Comparison of primary neonatal outcomes

8.7% of babies had an umbilical cord pH of less than 7.1 in secondary MSL and this data was found to be statistically significant. Secondary MSL has been shown to have a higher percentage of babies who had low Apgar scores and required resuscitation at birth. There were no babies affected with Necrotising enterocolitis in this study group. Around 20-25% of babies in both groups required NICU admission for observation and treatment on our cohort. The rate of admission when compared amongst the two groups was not statistically significant. Incidence of MAS was more in the secondary MSL group, 7.3% which was a significant finding. There was one neonatal death in the primary MSL group and none in secondary MSL group.

None of the above neonatal composite outcomes were found to be statically significant when compared with the duration of exposure of meconium in less than or greater than 180 min in the secondary MSL Group, Hence, in the cohort of secondary MSL, there was no statistically significant relation found between severity of morbidities and time to which baby is exposed to meconium. Hence, we could not find any relation or conclusion between Meconium aspiration syndrome and duration of exposure to meconium.

In general, the outcomes were worse overall in secondary MSL group. As non-reassuring fetal heart tracing was a factor in the decision to deliver, a comparison of mode of delivery and MAS according to CTG changes was done for the entire group of secondary MSL. Concurrence of CTG changes was more found in those who got diagnosed with MAS but it was not found to be statistically significant 10.4% of babies with Non reassuring CTG changes and 1.9% with Normal CTG which was not significant, therefore we conclude that Meconium aspiration syndrome can still happen without preceding CTG changes.

MAS was found to be around 7-7.5% in both groups and did not show any correlation with duration if exposure in our cohort and was statistically insignificant. Authors further explored the impact of CTG changes in the Mode of delivery in secondary MSL group. The incidence of LSCS in secondary MSL group were higher with Nonreactive NST and trial of vaginal birth continued more so till the CTGs were normal. Similarly we could not conclusively find any statistically significant correlation of the occurrence of MSL with NRNSTs.

Table 1: Comparison of maternal demographic details between primary MSL and secondary MSL.

Parameter	Primary MSL (n=350)	Secondary MSL (n=150)	P value
Gravida			
Primigravida	212 (60.6%)	105 (70%)	0.045
Multigravida	138 (39.4%)	45 (30%)	
Parity			
Nulliparous	272 (77.7%)	130 (86.7%)	0.021
Parous	78 (22.3%)	20 (13.3%)	
Age, Mean±SD	28.3+3.7	27.8+3.9	0.255
Age>35	19 (5.4%)	8 (5.3%)	1.000
BMI at booking, Mean±SD	26.04±4.33	26.07±4.31	0.937
Weight gain in pregnancy, Mean±SD	11.31±5.25	12.27±4.48	0.053
Hypothyroid	88 (25.1%)	39 (26%)	0.929
Pre-GDM	4 (1.1%)	0 (0%)	0.443
GDM	72 (20.6%)	35 (23.3%)	0.568
Chronic hypertensive	2 (0.6%)	1 (0.7%)	1
Gestational hypertension	40 (11.4%)	19 (12.7%)	0.809
Thrombocytopenia	16 (4.6%)	5 (3.3%)	0.697
Anemia	96 (27.4%)	34 (22.7%)	0.317
IHCP	9 (2.6%)	1 (0.7%)	0.296
Oligohydramnios	10 (2.9%)	6 (4%)	0.506
Polyhydramnios	26 (7.4%)	14 (9.3%)	0.636

Table 2: Comparison of selected pregnancy outcomes between primary MSL and secondary MSL.

Parameter	Primary MSL	Secondary MSL	P value
Labor			
Spontaneous labor	260 (74.3%)	98 (65.3%)	0.042
Induction of labor	90 (25.7%)	52 (34.7%)	
ARM	149 (42.6%)	68 (43.4%)	0.568
PROM / SROM	201 (57.4%)	82 (54.7%)	
Epidural	108 (30.9%)	100 (66.7%)	<0.001
FHR			
Reassuring FHR	170 (48.57%)	54 (36%)	0.010
Non reassuring FHR	180 (51.43%)	96 (64%)	
Mode of delivery			
Vaginal birth	138 (39.43%)	61 (40.67%)	0.795
LSCS	212 (60.57%)	89 (59.33%)	
Duration of exposure to MSL, Median (IQR)	125 (68, 300)	75.5 (48, 143)	<0.001
Intrapartum Fever/Chorioamnionitis	43 (87.7%)	43 (71.3%)	<0.001
PPH	34 (9.7%)	33 (22%)	<0.001
Wound infection	20 (5.7%)	14 (9.3%)	0.141

Table 3: Indications of Caesarean section in the study populations.

	Primary MSL (n=212)	Secondary MSL (n=89)	P value
Maternal request	65 (30.66%)	7 (7.86%)	<0.001
Presumed fetal compromise	86 (40.56%)	36 (40.44%)	0.985
Non progress of labor	17 (8.01%)	22 (24.71%)	<0.001
Cephalopelvic disproportion	2 (0.94%)	7 (7.86%)	0.004
Suspected chorioamnionitis	4 (1.88%)	8 (8.89%)	0.011
Thick MSL poor Bishop score	38 (17.92%)	9 (10.11%)	0.088

Table 4: Comparison of neonatal outcomes between primary MSL and secondary MSL.

Parameter	Primary MSL	Secondary MSL	P value
Gestational age at delivery, Median (IQR)	39.3 (38.5, 40.1)	39.5 (39, 40.2)	0.016
Birth weight, Mean±SD	3.08±0.35	3.12±0.38	0.165
Growth centile			
SGA	17 (4.9%)	11 (7.3%)	0.270
AGA	300 (85.7%)	123 (82%)	0.292
LGA	33 (9.4%)	16 (10.7%)	0.670
Umbilical PH <7.1	12 (3.4%)	13 (8.7%)	0.014
Cord ABG	7.24±0.07	7.23±0.08	0.492
Low Apgar at 1 min	11 (3.14%)	13 (8.67%)	0.008
Low Apgar at 5 min	6 (1.71%)	0 (0%)	1
Resuscitation at birth	6 (1.7%)	13 (8.7%)	<0.001
NICU admission	73 (20.9%)	39 (26%)	0.206
MAS	11 (3.1%)	11 (7.3%)	0.036
Necrotizing Enterocolitis	0	0	-
Neonatal sepsis	13 (3.7%)	10 (7.3%)	0.083
NICU supports required	48 (13.7%)	26 (17.3%)	0.296
Respiratory distress syndrome	42 (12%)	25 (16.7%)	0.16
Mechanical ventilation	5 (1.4%)	6 (4%)	0.072
Neonatal death	1 (0.3%)	0 (0%)	0.512

Table 5: Comparison of neonatal outcomes in the secondary MSAF group stratified according to the time of transition from clear to MSAF.

Parameter	<180 mins (n=124)	> 180 mins (n=26)	P value
Low APGAR scores	11 (8.87%)	2 (7.69%)	1.000
Resuscitation at birth	9 (7.25%)	4 (15.38%)	0.339
NICU admissions	34 (27.41%)	5 (19.23%)	0.387
MAS	9 (7.25%)	2 (7.69%)	1.000
NICU supports required	23 (18.54%)	3 (11.56%)	0.566
Necrotising enterocolitis	0	0	-
Neonatal sepsis	9 (7.25%)	1 (3.84%)	0.840
Neonatal death	0	0	-

Table 6: Comparison of mode of delivery and MAS according to CTG changes in secondary MSL group.

Variables	CTG	changes	P value
	Non reassuring (96)	**Reassuring (54)**	
Mode of delivery			
Vaginal birth	34 (35.4%)	27 (50%)	0.081
Cesarean section	62 (64.6%)	27 (50%)	
M. A. S	10 (10.4%)	1 (1.9%)	0.108

DISCUSSION

A total of 6618 deliveries occurred at our institution during the study period and 500 pregnancies were studied (7.55%) after applying exclusion criteria.

Maternal demographic details

Patients in the secondary MSAF group were more likely to be nulliparous compared with patients in the primary MSAF group. This finding was similar to the study conducted by Tairy et al in 2019.[4] In the present study the incidence of Primary meconium-stained amniotic fluid (right from the rupture of membranes) was found to be 60.6% in primigravida and 39.4% in multigravida which was similar to the findings in the study conducted by Jha et al in 2021 where primigravida constituted 63% out of 230 cases studied with MSL.[5] Authors further went on to compare the Incidence of primary MSAF and secondary MSAF in particular to find any specific association in

medical disorders in pregnancy like anemia, diabetes (both pregestational and gestational), hypertension, hypothyroidism, thrombocytopenia and IHCP which did not show any statistical significant difference. This was reflected similarly in the study by Tolu et al in 2020, wherein they mentioned only hypertensive disorder and diabetes not having any corroboration.[6]

In the cohort study, amongst all the coexisting medical disorders, anemia, gestational diabetes and gestational hypertension had higher concurrence of finding of MSAF. This was found similar in association as quoted by Gupta et al in 2015.[7] Abnormalities in liquor in antenatal scans including both Polyhydramnious and oligohydramnios were not found to be statistically significant in both primary and secondary MSAF group whereas Tairy et al in 2019 found a greater incidence of polyhydramnios in pregnancies of Primary MSL which was statistically significant.[4]

Delivery details

The median IQR for duration of exposure to MSL was found to be about 125 (68,300) minutes for primary MSL and 75.5 (48,143) minutes in secondary MSAF and was statistically significant (p<0.001).

There was a higher rate of inductions of labor in the secondary MSAF group compared with the primary MSAF group and was statistically significant (p=0.042). Uptake of epidural was seen to be more in secondary MSL in our study and this data was statistically significant (p<0.001) however in the study conducted by Tairy et al, in 2019 the uptake of epidural was seen equally in both the groups, though induction of labour were higher like ours in secondary MSAF group.[4] The possible reason for the difference in our study group could be that pain relief allowed for a longer trial of vaginal delivery and thereby greater occurrence of secondary MSL.

The study conducted by Fernández et al in 2018 found a higher proportion of intrapartum fevers in Meconium labours.[8] The study found the Occurrence of Intrapartum fever leading to suspicion of chorioamnionitis to be more in primary MSL than secondary MSL which was statistically significant (p<0.001), although the duration of ruptured membranes was more logically in secondary MSL group (Primary MSAF (231 min) versus Secondary MSAF (344 min). In the study of Tairy et al in 2019 it was found to be more in the secondary group but it was not statistically significant.[4]

The cardiotocography trace was found to be reassuring in majority of the primary MSAF group whereas, there was a higher percentage of Non reassuring FHR in the secondary MSL group in our study (p<0.010). In literature, studies by Fernández et al in 2018, Adnan et al in 2022 and de Souza et al in 2017 found FHR abnormalities were more frequent in case of MSL, which resulted in a higher rate of CS in their study due to Non reassuring FHR.[8,10,11]

The study by Fernández et al in 2018 and Tolu et al in 2020 and Shai et al, in 2022 found MSAF to be associated with increased rates of caesarean section and operative delivery.[6,8,12] In our study there was not much significant difference between rates of vaginal delivery and LSCS in both groups.

Rates of postpartum hemorrhage were found to be more in secondary MSL than primary MSL in our study which was statistically significant (p<0.001), similar finding was seen in the study by Tairy et al in 2019 although it was not statistically significant.[4] This could be explained and expected as the duration of labour is more in secondary MSAF group. Fang et al in 2020 described MSAF as a significant risk factor for minor and Major PPH.[13]

The study found wound infection post-delivery to be more in the secondary MSL group but this was not statistically significant.

Neonatal outcome details

Gestational age at delivery in both the groups was around 39 weeks in our study which was statistically significant (p=0.016) and this was similar to the findings in Tairy et al's study in 2019 and Jha et al in 2021.[4,5]

Umbilical pH <7.1 was seen more in the secondary MSL group (8.7%) when compared to primary MSAF (3.4%) in our study and was statistically significant (p=0.014) as well as in the study done by Tairy et al in 2019.[4] Low Arterial cord blood PH and severe foetal academia in meconium labours seen to be endorsed in the various studies conducted by Shai D et al, in 2022 and Nathan L et al, in 1994.[12,14]

Low Apgar scores at 1 minute were seen more in babies born in secondary MSL group and this was a significant finding (p-0.008) in the study. Similar findings of low APGAR were seen in the study by Fernández et al, in 2018, Shai et al in 2022 and Locatelli et al in 2005.[8,12,15]

The study by Tolu et a in 2020 found MSAF to be associated with increased frequency of NICU admissions.[6] In the study NICU admissions were more seen in the secondary MSL group (26%) versus primary MSAF (21%) but were statistically insignificant. In the study we found that a greater percentage of babies required resuscitation at birth in the secondary MSL group which was statistically significant (p<0.001). The study by Fernández et al in 2018 and Adnan et al in 2022 found the need for advanced neonatal resuscitation.[8,10]

Occurrence of Meconium aspiration syndrome

Was found to be occur more in secondary MSL group (7.3%) as compared to Primary MSL (3.1%) which was statistically significant (p-0.036) in our study which was similar to Tairy et al's study in 2019.[4]

The study by Tolu et al in 2020 found MSAF to be associated with increased frequency of Neonatal sepsis.[6] Our study found Neonatal sepsis was found to be more in the secondary MSL group (7.3%) versus 3.7% in primary MSAF group, but this was not found to be statistically significant.

Occurrence of respiratory distress was 16.7% in the secondary MSL group and 12% in primary MSAF group which was not found to be significant statistically. In the study by Tairy et al's study in 2019 the percentage was more in Primary MSAF group although was similarly found statistically insignificant as ours.[4] Ziadeh et al, in 2000 studied and reported incidence of MAS and respiratory distress were significantly increased in those with MSAF.[16]

Need for mechanical ventilation

4% neonates born in secondary MSAF group required Mechanical ventilation as compared to 1.4% babies of the primary MSAF group although it was not statistically significant. This finding was similar to the study by Tairy et al's study in 2019.[4] Unfortunately we had one neonatal mortality in primary MSAF group in the whole study which was because of multiorgan dysfunction and E. coli septicemia and refractory shock.

The comparison of neonatal outcomes in secondary MSAF Group stratified according to th time of transition from clear to MSAF were found to be statically insignificant when compared with the duration of exposure of meconium in less than or greater than 180 min. Hence authors could not find any statistically significant corelation or conclusion between Meconium aspiration syndrome and duration of exposure to meconium. In the study by Tairy et al they showed that neonates with poorer outcome were those in which transition to MSAF occurred <3 hours before delivery.[4] They went to say further that the direct correlation between secondary MSAF during labor and adverse neonatal outcomes emphasizes the concept of MSAF (and specifically a transition to MSAF during labor) as a strong marker for inadequate fetal wellbeing.

It was a prospective study done in a single tertiary center, with robust data collection and adherence to protocol in management of cases along with availability of resources like electronic fetal monitoring, NICU, anaesthetists, paediatricians and obstetricians round the clock. Authors specifically studied the concept of secondary MSAF (specifically a transition from clear to MSAF during labor) and whether it was a marked as a higher risk for foetal distress and inadequate wellbeing. We could observe that Meconium aspiration syndrome can happen irrespective of duration of exposure of MSAF and not necessarily preceded by NST changes.

The current study was conducted for a short period of time and sample size was limited due to time constraints. Long term outcomes could not be assessed in neonates. Few women who satisfied the inclusion criteria did not consent for the study thereby overall success rate for our center is not reflected in the study. These limitations can be overcome by another long-term study with a greater sample size for analysis.

CONCLUSION

The finding of MSAF was even found at 39 w in our cohort contrary to the belief that meconium is more common in post-dated pregnancies. Primary MSAF was seen more in spontaneous labours and had increased maternal request Caesarean section rate with the backdrop of fear of adverse neonatal outcomes. Chorioamnionitis/ Intrapartum fever was also found to be at higher incidence whereas secondary MSAF was found more in nulliparous and induced labours. Severity of composite neonatal outcomes like NICU Admissions, Low Apgars, Metabolic Acidosis and Meconium aspiration syndrome were higher. Also, non-reassuring CTGS were found more associated in secondary MSAF. Significant Caeserean section rate was because of non-progress of Labour and Cephalo-pelvic disproportion. The rates of PPH and postnatal wound infection rates were found to be higher. The above points would help us being more vigilant intrapartum and tighten up the surveillance and counsel couples in MSAF labours.

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