

Study of women in labour with Meconium stained liquor, Maternal Risk Factors, Perinatal Outcome and Management

Kundanur Suseela¹, Ponguru Lakshmi Priya²

¹Assistant Professor, Department of Obstetrics And Gynecology, Acsr Government Medical College , Nellore

²Assistant Professor, Department of Obstetrics And Gynecology, Acsr Government Medical College , Nellore

Received: 05-11-2021 / Revised: 23-11-2021 / Accepted: 22-12-2021

Corresponding author: Dr. Ponguru Lakshmi Priya

Conflict of interest: Nil

Abstract

Background: Meconium-stained amniotic fluid (MSAF) is a common intrapartum finding, particularly in term and post-term pregnancies, and is often considered a marker of fetal compromise. Although not all cases of MSAF are associated with adverse outcomes, thick meconium is frequently linked with fetal distress, operative delivery, meconium aspiration syndrome (MAS), and increased perinatal morbidity and mortality. Early identification of maternal risk factors, close intrapartum surveillance, and appropriate management strategies are crucial in improving neonatal outcomes.

Aim: To study the maternal risk factors, perinatal outcomes, and management strategies in women in labour with meconium-stained liquor.

Methodology: This hospital-based prospective observational study was conducted at Tertiary Care Center, from Jan 2021 to December 2021. A total of 200 term pregnant women (≥ 37 weeks) with singleton cephalic presentation and meconium-stained amniotic fluid were included. Women with antepartum hemorrhage, malpresentations, congenital anomalies, and intrauterine fetal death were excluded. MSAF was clinically graded as thin or thick. Maternal demographic details, antenatal and intrapartum risk factors, cardiotocography (CTG) findings, mode of delivery, use of amnioinfusion, and neonatal outcomes including APGAR scores, NICU admission, and neonatal morbidity and mortality were recorded. Statistical analysis was performed using SPSS version 21.0, with significance set at $p < 0.05$.

Results: Thin meconium was observed in 71.5% cases and thick meconium in 28.5%. Thick MSAF was significantly associated with unbooked status, prolonged pregnancy, preeclampsia, oligohydramnios, IUGR, prolonged labour, and non-reactive CTG patterns ($p < 0.001$). Caesarean section rates were significantly higher in thick meconium (68.3%) compared to thin meconium ($p < 0.001$). Amnioinfusion significantly reduced the rate of caesarean delivery and operative interventions ($p < 0.001$). Neonates born with thick MSAF had significantly lower APGAR scores, higher incidence of birth asphyxia and meconium aspiration syndrome, increased NICU admissions, longer NICU stay, and higher perinatal mortality ($p < 0.01$).

Conclusion: Meconium-stained amniotic fluid, particularly thick meconium, is strongly associated with adverse maternal and neonatal outcomes. Early recognition of maternal risk factors, vigilant fetal monitoring, and timely interventions such as amnioinfusion and appropriate mode of delivery can significantly reduce perinatal morbidity and mortality. Coordinated obstetric and neonatal care remains essential to optimize outcomes in labour complicated by MSAF.

Keywords: Meconium-stained amniotic fluid, Fetal distress, Amnioinfusion, Perinatal outcome, Meconium aspiration syndrome.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Meconium is a Greek word derived from the term "mekoni", meaning poppy juice opium. It commenced with Aristotle's observation of the association between meconium staining of the amniotic fluid and a sleepy state or neonatal depression. [1]

It is one of the manifestations of intrauterine fetal hypoxia; hence quick delivery is the rule. So many of them underwent operative vaginal deliveries or LSCS, with associated increased morbidity and mortality. According to neonatal studies, most babies have transient respiratory distress, but only around 5% developed the meconium aspiration syndrome. It is associated with the poor perinatal outcome, including low APGAR scores, higher rates of chorioamnionitis, increased incidence of NICU admission and an increased incidence of perinatal death. Meconium passage is rare before 34 weeks of gestation, and after 37 weeks its incidence increases steadily with increasing gestational age about 10% at 36 weeks, 30% at 40 weeks and 50% at 42 weeks. [2,3,4]

Pathogenesis: Under normal circumstances, the passage of meconium is prevented by lack of intestinal peristalsis because of low motilin levels, tonic contraction of the anal sphincter and terminal cap of viscous meconium.

Meconium passes from the fetal GIT due to hypoxia, vasoconstriction of mesentery causing gut hyperperistalsis, falling umbilical venous saturation, vagal stimulation and normal physiological function of a mature fetus. Term and post-term neonates are more likely to pass meconium than preterm neonates. The passage of meconium into amniotic fluid may increase the risk of intra-amniotic infection. The following holds true

for MSL: Clear amniotic fluid is reassuring, thick meconium is at high risk, Presence of the abnormal fetal heart rate pattern in the presence of MSAF indicates fetal compromise. [5,6]

Various authors have described the passage of meconium in utero by different mechanisms. Three theories for meconium passage by fetus have been proposed : The pathological explanation suggests that fetuses pass meconium in response to fetal hypoxia; In utero passage of meconium represents normal gastrointestinal tract maturation, which is under neural control; Commonly, meconium passage occurs following the relaxation of sphincter and increased peristalsis due to vagal stimulation; The gastrointestinal functions were developed to absorb much water from it by the end of the sixteenth week of gestation. [7,8]

It propels the unabsorbed matter as far as the lower colon. During intrauterine life, the fetus does typically not pass meconium as the peristaltic movements of fetal intestine remain quiescent. But if fetal hypoxia occurs, intestinal peristalsis increases to some extent that causes unabsorbed matter to be excreted per anum. These fetal excreta is called meconium. But in quite a good number of cases, could find no definite cause; probably these are the cases where physiological expulsion of meconium took place. [9]

The primary goal of obstetric care is to prevent maternal and fetal morbidity and mortality. To reduce fetal morbidity and mortality, early identification of markers of fetal distress is essential. The classical signs of fetal hypoxia markers are loss of fetal movements or decreased fetal movements, variations in fetal

heart rate pattern, presence of meconium in amniotic fluid, fetal moulding and decrease in fetal scalp blood PH.

Management strategies of women in labour with MSL include left lateral position, oxygen inhalation, intravenous fluid administration, continuous fetal heart rate monitoring and Amnioinfusion. Amnioinfusion is the instillation of ringer lactate or normal saline into amniotic cavity either transabdominally or transcervically. Transcervical Amnioinfusion is the instillation of fluids through cervix once membranes rupture. Meconium aspiration syndrome is known to occur in 5-10% of the infants born through MSAF and 10-40% of newborns with meconium below the vocal cords. It is a life-threatening emergency in term babies. [10]

Amnioinfusion is the instillation of normal saline into the uterine cavity during labour. It has been proposed as a method. To reduce the meconium concentration by diluting the meconium on the trachea, thereby decreasing the potential to develop airway obstruction and development of meconium aspiration syndrome. It reduces cord compression in cases of oligohydramnios with thick meconium and prevents fetal gasping and in-utero aspiration. [11]

Meconium staining of amniotic fluid during labour must be managed by a team of obstetrician and paediatrician well versed in neonatal resuscitation to: prevent intrauterine hypoxia; prevent intrauterine meconium aspiration; avoid meconium aspiration at birth. [12]

The present study "Study of maternal risk factors, perinatal outcomes and management strategies of women in labour with meconium-stained liquor" will help to know about maternal risk factors associated with meconium-stained amniotic fluid. Since all fetuses with meconium passage in labour do not have associated maternal risk factors and do not have an adverse outcome, it is essential to promptly distinguish those destined to

develop fetal distress promptly and intervene accordingly to prevent meconium aspiration syndrome and sequel. This study is an effort to ascertain whether meconium staining of amniotic fluid correlates with high-risk factors predisposing to fetal distress in labour and assess the fetal condition and outcome in all cases of MSAF with the help of data obtained in the present series. This study also takes into consideration management strategies like intrapartum Amnioinfusion during labour in women with MSAF.

Aims and Objectives: This study includes a sample size of 200 pregnant women ≥ 37 weeks of gestational age from Narayana medical college and hospital, Nellore. It is a hospital-based prospective study. To study the maternal risk factors responsible for meconium-stained amniotic fluid. To studying the mode of delivery in labour complicated by meconium-stained amniotic fluid. To correlate between meconium-stained liquor and fetal heart rate variability/NST. Study of perinatal outcome in meconium-stained amniotic fluid. Study of management strategies of women in labour with MSAF.

Patients and methods: This was a Hospital based prospective study done in 200 pregnant women admitted in hospital after 37 weeks of pregnancy in labour who presented with meconium-stained liquor after spontaneous or artificial rupture of membranes or incidental finding during caesarean section in the Department of Obstetrics & Gynaecology, conducted at Tertiary Care Center, from Jan 2021 to December 2021.

Inclusion Criteria: Term labour (>37 completed weeks), Cephalic presentation with Live singleton pregnancy.

Exclusion Criteria: Antepartum haemorrhage, Malpresentations, Pregnancy with congenital malformations and Intrauterine death.

Mothers in labour were studied when meconium was found at the time of rupture of membranes or when clear AF turned

meconium-stained during delivery or incidental finding during caesarean section. A total number of 200 cases were studied in each group as a prospective study. According to the obstetrical findings, associated maternal risk factors and the babies delivered vaginally/forceps delivery or ventouse/CS were followed up and taken into consideration in analyzing the perinatal outcome.

Procedure: Following the selection of cases a detailed history regarding age, gravida and parity, past obstetrical history, menstrual history, socioeconomic status, history of present pregnancy, history of medical and surgical disorders, and the patients' antenatal records and recorded in a printed proforma. During labour, the mother's general examination was done noting anaemia, BP, pulse, oedema, Icterus, dehydration, temperature, and systemic examination of the cardiovascular and respiratory system. Abnormal findings if any, are noted. Obstetrical Examination was done noting the presentation, position, height of fundus, amount of AF, fetal heart rate, uterine contraction and pelvic assessment. Use of any medication like Oxytocin, sedatives, analgesics or any transfusion was also noted. When MSAF appeared along with rupture of membranes, it was collected for clinical gradation before the vaginal examination. A thorough and quick vaginal examination was then done to assess the state of cervix and station of the fetal head and exclude cord prolapse and note the colour and consistency of AF. In cases where there has been rupture of membranes with clear AF, but subsequently, during labour, the AF has been stained with Meconium, Meconium was collected for gradation. MSAF was collected by introducing Sim 's speculum under aseptic precaution and material are taken into a clear test tube for clinical gradation according to the colour and consistency. When AF was greenish-yellow in colour; it was graded as thin meconium stained). When AF was dark green or tarry black or muddy in colour and thick

consistency, it was considered thick stained (thick meconium-stained). Clinical foetal monitoring, i.e. foetal heart rate, was also noted at the time of collecting the MSAF.

Investigation: Intrapartum cardiocographic tracing was taken for assessing foetal hypoxia during labour. In the present study, bradycardia was considered when foetal heart rate below 100 beats /minute and tachycardia when foetal heart rate above 160 beats/minute. The assessment of uterine contractions was made clinically, and the number of contractions for 10 minutes and the duration of each contraction was noted. The degree of relaxation in between contractions was also recorded. Immediately after the birth of the head, the mouth, nostrils were cleaned by mucous sucker, a cord around the neck noted for. APGAR score of the newborn was assessed at one minute and five minutes.

A baby is considered non-asphyxiated and in good condition when the APGAR score was seven or more. Babies were considered moderately asphyxiated when the score was 4 to 6 and was considered grossly asphyxiated when the score was below 4. Along with APGAR score weight of the baby and sex were noted as usual. Resuscitation was done according to the APGAR scoring.

Follow-up of the newborn: All the babies delivered were kept in observation for 24hours. Babies who were normal, and did not develop any complications within 24hrs after birth were placed with the mother. Babies who developed any sign of complications within 24hrs were kept in NICU. Babies who were placed with the mother if developed any complication also were transferred to NICU. Babies were followed-up up to 7th day, and their clinical condition was assessed, and any abnormalities were recorded. Death and its cause during hospital stay within the first week of neonatal life were also recorded.

Statistical Analysis: Regarding data analysis, data were coded, checked and entered into SPSS Version 21.0. Descriptive and inferential

statistical analysis has been carried out in the present study.

The characteristics of the study patients were expressed as numbers and percentages for categorical variables and as means \pm Standard deviation for continuous variables.

Significance is assessed at 5% level of significance.

Chi-square/Fischer exact test has been used to find the significance of study.

Results

Table 1: Distribution of pregnant women with MSL according to Various Parameters

Age	Number	Percentage
<20 years	58	29.0
21 – 25 years	117	58.5
26 – 30 years	21	10.5
>30 years	4	2.0
SE status	Number	Percentage
Lower class	174	87.0
Middle Class	26	13.0
Grade of MSL	No. of Cases	Percentage
Grade – I (Thin)	143	71.5
Grade – II (Thick)	57	28.5

Table 2: correlation of Parameters with meconium staining.

ANC	Meconium Consistency					
	Thick		Thin		Total	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
Booked	14	24.6	97	67.8	111	55.5
Un-booked	43	75.4	46	32.2	89	44.5
Total	57	100	143	100	200	100.0
Chi-square χ^2 : 30.897**; df= 1; p=0.000; Sig. At 0.01 level **(P<0.001)						
Gravidity						
Primi	20	35.1	64	44.8	84	42.0
Multi	37	64.9	79	55.2	116	58.0
Total	57	100.0	143	100.0	200	100.0
Chi- square χ^2 : 1.564@; df= 1; p=0.211; Not Sig. P>0.05						

Table 3: Correlation of Gestational AgeAntenatal and intrapartum risk factors with MSL

Gestational age group in weeks	No. of Patients	%
37 weeks	48	24.0
38 – 39 weeks	48	24.0
40 – 42 weeks	104	52.0
Risk Factors		
Anaemia	13	6.5
GDM	14	7.0
IUGR	22	11.0
Oligohydramnios	20	10.0
Prolonged pregnancy	34	17.0
Preeclampsia	15	7.5

Prolonged Labour	17	8.5
Prom > 24 Hours	10	5.0
Severe Preeclampsia	29	14.5
Severe Oligos	4	2.0
Severe IUGR	4	2.0
No. RF	18	9.0

Table 4: Correlation of CTG with meconium staining.

CTG	Meconium Consistency					
	Thick		Thin		Total	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
Reactive	3	5.3	133	93.0	136	68.0
Non Reactive	54	94.7	10	7.0	64	32.0
Total	57	100.0	143	100.0	200	100.0

Chi-square χ^2 : 144.197; df= 1; p=0.000; Sig. At 0.01 level **(P<0.001)**

Table 5: Amino infusion and mode of delivery

MOD	Amnioinfusion					
	Yes		No		Total	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
NVD	51	76.1	79	59.4	130	65.0
Vacuum	9	13.4	1	0.8	10	5.0
LSCS	7	10.4	53	39.8	60	30.0
Total	67	100.0	133	100.0	200	100.0

Chi-square χ^2 : 29.085; df= 2; p=0.000; Sig. At 0.01 level;**p<0.001**

Table 6: Mode of delivery Vs meconium consistency

Meconium Consistency	Total No. of Patients	Mode of Delivery					
		NVD		Vacuum		LSCS	
		No. of Patients	%	No. of Patients	%	No. of Patients	%
Thick	57	8	6.2	8	80.0	41	68.3
Thin	143	122	93.8	2	20.0	19	31.7
Total	200	130	100.0	10	100.0	60	100.0

Chi-square χ^2 : 91.591; df= 2; p=0.000; Sig. at 0.01 level **(P<0.001)**

Table 7: Correlation between birth weight and meconium-stained babies.

Birth Weight	No. of Patient	%
< 2.5 kgs	26	13.0
2.5 – 2.9 kgs	50	25.0
3.0 – 3.4 Kgs	118	59.0
> 3.5	6	3.0
Total	200	100.0
Mean Birth Weight in kgs	2.88 ± 0.348	

Table 8: Correlation of APGAR score in different groups of meconium-stained babies.

Meconium Consistency	APGAR score at 1minute				APGAR score at 5minute			
	1 - 3	4 - 6	7 - 10	Total	1 - 3	4 - 6	7 - 10	Total
Thick	7	30	20	57	7	15	35	57
Thin	0	73	70	143	0	0	143	143
Total	7	103	90	200	7	15	178	200
Chi-square	$\chi^2 : 19.322^{**}$; df= 2; p=0.000; Sig. at 0.01 level $^{**}p<0.001$				$\chi^2 : 62.015^{**}$; df= 2; p=0.000; Sig. at 0.01 level			

Table 9: Different causes of neonatal morbidity in meconium- stained liquor.

Causes	N1 = 57		N2 = 143		Total	
	Thick		Thin			
	No. of Patients	%	No. of Patients	%	No. of Patients	%
MAS	16	44.4	0	0.0	16	40.0
Asphyxia	20	55.6	2	50.0	22	55.0
Pneumonia	0	0.0	2	50.0	2	5.0
Total	36	100.0	4	100.0	40	100.0
Chi- Square	$\chi^2 : 19.798^{**}$; df= 2; p=0.000; Sig. At 0.01 level;					

Table 10: Frequency of NICU care needed by neonates and their stay

NICU Stay in days	Meconium Consistency					
	Thick N1 = 57		Thin N2 = 143		Total	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
1 - 2 Days	14	26.4	31	55.4	45	41.3
3 - 4 Days	35	66.0	25	44.6	60	55.0
> 5 Days	4	7.5	0	.0	4	3.7
Total	53	100.0	56	100.0	109	100.0
Chi square	$\chi^2 : 12.015^{**}$; df= 2; p=0.002; Sig. At 0.01 level $^{**}P<0.001$					

Table 11: Fetal outcome in meconium-stained liquor

Meconium Consistency	N	Fetal Outcome					
		Alive		Expired		Stillborn	
		No. of Patients	%	No. of Patients	%	No. of Patients	%
Thick	57	52	26.7	3	100.0	2	100.0
Thin	143	143	73.3	0	.0	0	.0
Total	200	195	100.0	3	100.0	2	100.0
Chi- Square: $\chi^2 : 12.87^{**}$; df= 2; p=0.002; Sig. at 0.01 level $^{**}P<0.001$							

Discussion

Meconium stained amniotic fluid (MSAF), is a commonly observed phenomenon in women during labour. MSAF has been implicated as a factor influencing the fetal well being during the intrapartum and postpartum periods.

Presence of meconium in AF in the cephalic presentation was of great concern even to the midwives and obstetricians of old age (Mittler and Mittler 1947). Passage of meconium by the foetus once thought to be a sure sign of fetal death in utero (Schultz 1925), but later it was realized to be a sign of fetal hypoxia, not fetal

death (James Walker, 1954). Even the modern obstetricians are fully aware of this fact, and they cannot be indifferent at the light of meconium in AF during labour which calls for close vigilance of the fetal well being.

This study was done to evaluate the significance of MSAF, maternal risk factors associated with it, fetal outcome and management strategies of women in labour with MSAF admitted to Narayana medical college and hospital, Nellore from November 2018 to March 2020. During this period, 200 pregnant women with meconium-stained amniotic fluid were studied which fulfilled the inclusion criteria. 143 out of the 200 cases had thin meconium and, 57 pregnant women were with thick MSAF, which was noted at the time of spontaneous /artificial rupture of membranes or incidental finding during caesarean section.

Incidence of MSAF in different age groups :

Sandu et al [13] noted 80% of cases with MSAF belonged to the age group of 21- 25 years similar to the present study. In the present study, 58.5% of cases with MSAF belong to the same age group, i.e. 21 — 25 years. In a similar study conducted by Ramya Sundaram et al [14], the incidence of MSAF was more in maternal age of 18 - 30 years which was 84% and 16% in women of >30 years of age. In the present study, maternal age >30 years was found in 2% of women because most women with MSAF were in the age group between 21 — 25 years. In a similar study done by Siva Saranappa et al. [15] incidence of MSAF is more with maternal age of 20 — 24 years which was 50%.

Incidence of MSAF concerning socioeconomic status :

In the present study, pregnant women with low socioeconomic status had a higher incidence of MSAF, i.e. 87%.

Incidence of Gradation of MSAF and comparison with other studies :

In the present study women with thin meconium-stained amniotic fluid were 71.5% and women with

thick MSAF were 28.5%. This was compared with the study done by Erum Majid Shaikh [16] in which more patients are with thin MSAF. In a similar study done by K.Subbarao et al. [17], the incidence of thin MSAF was 45%, and thick MSAF was 55%. Satendra Singh Rajput et al. [18] done a study in which 65% had thin MSAF, and 35% had thick MSAF similar to the current study. Siva Saranappa et al. [15] conducted a similar study in which the incidence of thin MSAF is 65%, and thick MSAF is 35%. This is similar to the current study.

Comparison of incidence of MSAF with regard to booking status:

In the present study, out of 200 cases, 111 cases were booked, and 89 cases were un-booked. Among booked cases, 24.6% were with thick MSL, and 67.8% were with thin MSL. Among un-booked cases, 43% were with thick MSL, and 32.2% were with thin MSL. Incidence of thick MSL is more in un-booked cases compared to booked cases. This is in comparison to a study done by Siva Saranappa et al. [15], in which incidence of MSAF was more in un-booked cases, i.e. 65% compared to booked cases, i.e. 35% similar to the current study.

Comparison of incidences of MSAF with parity of mothers:

In the present study, a higher incidence of MSAF was seen in multigravida, that is 58% compared to primigravida, that is 42%. This is in comparison to the study done by Ramya Sundaram et al. [14] in which the incidence of MSAF is more in primigravida, which is 60% than multigravida which is 40%. In a similar study did by K. Subbarao et al. [17] incidence of MSAF is higher in primigravida, which constitutes 61% than multigravida, which is about 39%. In primigravida, of 61%, 23% were with thin MSAF, and 32% were with thick MSAF. In multigravida, of 39%, 22% were with thin MSAF, and 17% were with thick MSAF. Siva Saranappa et al. [15] did a study in which the incidence of MSAF is higher among primigravida. Of which 44% were of thin meconium-stained, and 26% were

thick meconium stained. Among the second gravida, 11% were thin meconium- stained, and 9% were thick meconium stained. Among the third gravida, 6% were thin meconium- stained, and 0.5% were thick meconium stained. Fourth and above gravidity accounted for 3.5% of MSAF.

Comparison of Gestational age : James¹² mentions incidence of MSAF increases with gestational age and reaches approximately 30% at 40 weeks and 50% at 42 weeks. Hiremath P B¹ [10] and others did a similar study in which the gestational age from 40-42 weeks was up to 36%, and they had a large number of cases (40%) > 42 weeks. K.Subba Rao et al. [37] did a similar study in which incidence of MSAF is more in women with gestational age >40 weeks. A large group of women belong to gestational age between 40 — 42 weeks with a mean GA of 41 weeks. In the present study, a large group of cases belong to gestational age 40 - 42 weeks, that is 52%.

Comparison of Antepartum and Intrapartum risk factors : In the present study following were the associated antepartum and intrapartum risk factors – preeclampsia, prolonged pregnancy, Oligohydramnios, IUGR, Anaemia and prolonged labour. Cases with preeclampsia had increased incidence of MSAF accounting for 22% followed by prolonged pregnancy accounting for 17%. In the study conducted by Hiremath P B¹⁹, 42% of MSAF cases had hypertension similar to our study. Preeclampsia was found in 22% of the patients with meconium-stained amniotic fluid in the present study. This was a significant risk factor for the presence of meconium- stained amniotic fluid in the study.

Ramya Sundaram et al. [14] conducted a study in which incidence of MSAF was more in women with preeclampsia which is 32% similar to current study followed by anaemia (32%), IUGR(12%) and prolonged labour (20%). In a study conducted by Satendra Singh Rajput et al. [18], the incidence of MSAF was

more in women with prolonged pregnancy which constitutes 33%. Of which thin MSAF was about 75.75%, and thick MSAF was about 24.25%, followed by oligohydramnios (30%), preeclampsia (26%) and anaemia (19%). Siva Saranappa et al [15] done a similar study in which incidence of MSAF is higher among women with preeclampsia which accounts for 28% followed by prolonged pregnancy (21%) and anaemia (12%).

Comparison of NST study by other authors:

NST: In the current study, non-reactive NST occurred in 32% of women. Non-reactive NST was more in thick group 94.7% compared to thin group 7%. This is similar to the study done by Rosario [20] in which Non-reactive NST was more in thick group 54% compared to the thin group 4%. Early detection of foetal distress through non-reactive NST helped in reducing the neonatal morbidity and mortality.

Incidence of Amnioinfusion and mode of delivery:

Amnioinfusion significantly reduced the incidence of caesarean section rate. Majority of the women delivered by labour natural. In the present study out of 200 cases, 65% delivered by NVD, 5% delivered by vacuum-assisted delivery and 30% delivered by LSCS. Among the amnioinfusion group, 76.1% of women underwent NVD, 13.4% underwent vacuum-assisted delivery and 10.4% underwent LSCS. This coincides with the studies by Pierce et al. [21], who showed a lower incidence of caesarean section in the amnioinfusion group (19.7% vs 24.3%) and his instrumental delivery was 18%.

Similar observations of the lower incidence of operative deliveries have been made by several authors Das et al. [22] (18% of Amnioinfusion vs 30% of control) and Sahu et al. [23] also reported a similar decrease in caesarean section. Wenstroms²⁴ (6/36 of Amnioinfusion vs 15/44 of control), Ilagan NB et al. (6/38 of Amnioinfusion vs 19/40 of control) reported significant decreased caesarean section rate and decreased assisted

delivery (2/38 vs 7/40). Sood et al. [25] also reported (12% of Amnioinfusion vs 42% of control) decreased caesarean section rate. Demeenus et al. [26] reported decreased assisted delivery. (15.5% of amnioinfusion vs 25.35% of control) and decreased caesarean delivery Kosha et al. also reported a significant decrease in section rate (4% of Amnioinfusion vs 28% of control).

Incidence of Mode of delivery Vs meconium consistency Recorded by other authors:

In comparison to the thin group incidence of caesarean section was near about double in the thick group. There was an increased incidence of operative delivery in meconium-stained group cases in the current study. In the present study, the incidence of CS was highest in thick meconium group, that was 68.3% and out of 200 MSAF cases 60 cases delivered by caesarean section. This is in comparison to the study done by Goud [27] and Bhide SS et al. [28] In a study done by Siva Saranappa et al. [15] the incidence of LSCS was higher among MSAF group which accounts for 56% compared to NVD that is 20% followed by forceps and vacuum-assisted delivery which accounts for 18% and 6% respectively. This is similar to the current study.

Mean birth weight observed by different authors compared to the present study in MSAF: Fujikura (1975) [29] observed that the incidence of meconium staining was significantly more with increased birth weight more than 3 kg similar to the present study. In the present study, mean birth weight was 2.88 Kg which coincides with other studies. This is in comparison to studies done by Miller [30] (3.4kg), Pravin goud [27] (2.7kg), Satendra Singh Rajput et al. [18] done a similar study in which incidence of MSAF was 53% in babies weighing 2.5 — 3.5kg and 40% in babies weighing 1.5 — 2.5kg. Thick MSAF was found predominantly among very low birth weight babies.

MSAF and APGAR score: Majority of the authors observed that the incidence of birth asphyxia among the babies born with MSAF was more compared to the control cases with clear AF. Workers like James Walker [8] (1954), Desmond [9] (1957) concluded that this high rate of depressed babies in the stained group was the result of intrauterine hypoxia.

Comparison of APGAR score at 1 minute in the present study between thin and thick MSAF: In the present study, one minute APGAR score was good in thin meconium-stained amniotic fluid compared to thick MAF. In the present study out of 200 cases, 103 babies have an APGAR score between 4 — 6 at 1 minute. Of these, 73 were thin meconium-stained, and 30 were thick meconium stained. 1minute APGAR score was between 7 — 10 in 90 babies of which all are thin meconium stained.

Comparison of APGAR score at 5minutes in the present study between thin and thick MSAF: In the present study, out of 200 cases, 178 babies have 5minute APGAR score between 7 — 10. Of these 143 babies were thin meconium-stained and 35 were thick meconium stained.

Comparison of APGAR at 1minute by different authors: In a study done by Miller et al. [13] 14.10% babies have 1minute APGAR score between 0 - 3, 11.30% babies have 1minute APGAR score between 4 — 6 and 74 % babies have APGAR score between 7 — 10. Ramya Sundaram et al. [14] done a similar study in which 1minute APGAR score was less than 7 in 36% babies with MSAF. Siva Saranappa et al. [15] done a similar study in which APGAR score at 1minute was more than 7 in 71% of babies and less than 7 in 29% of babies but later APGAR improved after 5minutes of resuscitation.

Comparison of APGAR at 5minutes by different authors: In Miller et al. [30] study 5minute APGAR scores are between 7 — 10 in 88.7% babies, 4 - 6 in 10.4% babies, 0 — 3 in 0.9% babies. 18% of the babies with

meconium-stained amniotic fluid had an Apgar of less than seven at 5 minutes in a study done by Ramya Sundaram et al. [14]. In a study by Rosario [20] 5minute APGAR score was between 7 — 10 in 74%babies and 4-6 in 2% babies. Ramya Sundaram et al. [14] did a study in which 5minutes APGAR score was less than 7 in 18% of babies similar to the current study. K. Subba Rao et al. [17] done a similar study in which 1 minute APGAR score was less than 7 in 69% of babies with MSAF, of which thick MSAF constitutes 47%, and thin MSAF constitutes 22%. APGAR score at 5minutes was more than 7 in 69% of babies with MSAF in a study conducted by K. Subba Rao et al. [17]. There was an improvement in the APGAR score at 5 minutes. Low APGAR score at 5 minutes indicated poor neonatal outcome, were seen more in thick meconium-stained cases.

Comparison of incidence of birth asphyxia by different authors: It is evident from the above list that Miller and Meis recorded nearly triple incidence of birth asphyxia in the stained group compared to the control group. In the present series incidence of birth asphyxia in MSG was 55%. Percentage of asphyxiated babies was different in different groups of MSAF. In our study, it was 50% in thin group and 55.6% in the thick group. It is shown that birth asphyxia is more common in the thick group compared to the thin group. Meconium aspiration syndrome(MAS) contributes to major morbidity in neonates with MSL. In the present study, out of 200 cases, the incidence of MAS was 40%. Of these, 44.4% were with thick MSL. Ramya Sundaram et al. [14] did a similar study in which 26% of neonates were with MAS followed by birth asphyxia which constitutes 18%. In a study done by Satendra Singh Rajput et al. [18] 65% of the babies were with birth asphyxia similar to present study and 35% were with MAS specifically more among the thick meconium-stained group. In a study done by K. Subbarao et al. [17] meconium-stained liquor significantly increased the neonatal morbidity. Total

neonatal morbidity in meconium-stained cases was 33% which is highest among thick meconium-stained cases which are about 22%. Of 33%, birth asphyxia occurred in 21% of MSAF cases, and MAS accounts for 12% of MSAF cases similar to the current study.

Comparison of NICU care in the present study to other studies: In the present study, out of 200 cases, 109 neonates required NICU stay accounting for 54.5%. Of these 53 neonates were thick meconium-stained and 56 neonates were thin meconium stained. More than 5days NICU stay was required in the thick meconium-stained group that is 7.5%. This is similar to another study by Pravin Goud. [27] in which 54% of MSG babies required NICU care.

Observation of Neonatal death in MSAF case by different workers: In present study Neonatal mortality was 2.5%, among which two were stillborn, and three were expired after birth, of which two were due to MAS, and one was due to asphyxia. In the series of other authors, perinatal mortality ranged from 3% to 7.7%.

They had similar observation as compared to the present study. Debdas (1981) in his study found that in the group with thin meconium the babies are not generally depressed at birth and do not have any higher perinatal mortality rate in comparison to those with the clear group. Another worker Arun (1991) observed 3.42% neonatal death. K. Subbarao et al. [17] done a similar study in which 3 cases had neonatal death, and one case had stillborn, which occurred due to MAS. This is similar to the current study.

Conclusion

The incidence of meconium-stained amniotic fluid greatly varies with maternal antenatal and intrapartum risk factors. Increased incidence was seen in cases with prolonged pregnancy. Preeclampsia, IUGR, oligohydramnios and prolonged labour prevailed more compared to

other factors and had a significant association with meconium- stained liquor, $P < 0.05$.

As per the mode of delivery concerned, increased incidence of cesarean section was seen and was significantly associated with the consistency of meconium.

Amnioinfusion significantly reduced the incidence of caesarean section rate. Majority of women delivered by labour natural. There was a significant reduction in intrapartum operative interventions for fetal distress and reduced incidence of FHR abnormalities in the amnioinfusion group.

Meconium stained amniotic fluid is significantly associated with abnormal oetal heart rate ($P < 0.05$), should be taken as a potential danger sign for the baby and the need for early intervention is required.

Neonates with thick meconium, as compared to those with thin meconium appeared to have significantly greater rates of acidemia, low APGAR scores at 1 minute and 5 minutes ($P < 0.05$), more need for resuscitation and increased rate of NICU admission.

Infants with severe meconium aspiration syndrome and birth asphyxia are to be managed in NICU where they can be closely monitored and vigorously treated. Prompt and efficient labour monitoring and delivery can minimize the sequel of meconium aspiration syndrome.

If neonatal complications are to be avoided, full cooperation and coordination of the Obstetrician and Pediatrician are required. Since all foetuses with meconium passage in labour do not have associated maternal risk factor and do not have an adverse outcome; it is important to distinguish those who are destined to develop foetal distress promptly and intervene accordingly to prevent meconium aspiration syndrome and sequel.

References

1. Ahanya SN, Lakshmanan J, Morgan BL, Ross MG. Meconium passage in utero: mechanisms, consequences and management. *Obstet Gynecol Surv.* 2005;60:45-56.
2. Abramovici H, Brandes JM, Fuchs K, Timor-Tritsch I. Meconium during deliver: A sign of compensated fetal distress. *Am. J. Obstet. Gynecol.* 1974; 118:251-255.
3. Walker J. Fetal distress. *Am. J. Obstet. Gynecol.* 1959; 77: 94-107.
4. Abramovich DR, Gray ES. Physiologic fetal defecation in midpregnancy. *Obstet Gynecol* 1982; 60: 294. Ramon Y, Cajal CL, Martinez RO.
5. Ramon Y, Cajal CL, Martinez RO. Defecation in utero: a physiologic fetal function. *Am J Obstet Gynecol* 2003; 188: 153.
6. Cleary GM, Wiswell TE. Meconium-stained amniotic fluid and the meconium aspiration syndrome: an update. *Pediatr Clin North Am* 1998; 45: 511-529.
7. Dargaville PA, Copnell B. The epidemiology of meconium aspiration syndrome: incidence, risk factors, therapies, and outcome. *Pediatrics* 2006; 117: 1712.
8. Walker J. Foetal anoxia. *J. Obstet Gynecol* 1954; 61: 162-80.
9. Desmond MM, Moore J, Lindley JE. Meconium staining of the amniotic fluid – A marker of fetal hypoxia. *Obstet Gynecol* 1957; 9:91-103. 12.
10. Katz VL, Bowes WA; Meconium aspiration syndrome; reflection on a murky subject *Am J Obstet Gynecol.* 1992; 166-171.
11. Ramin KD, Leveno KJ, Kelly MS, Carmody TJ; Amniotic fluid meconium; A fetal environmental hazard. *Obstet Gynecol.* 1996; 87:181-184.
12. James D.K, Steer C.P, Weiner B. *Gonic. High risk pregnancy.* 1994 1st ed. 1135-1142
13. Ziadeh SM and Sunna E. Obstetrics and Perinatal outcome of pregnancies with — term labour and meconium stained amniotic fluid. *Archives of Gynaecology*

- and Obstetrics 2000; 264(2): 84-87.
14. Sundaram R, Murugesan A. Risk factors for meconium stained amniotic fluid and its implications. *Int J Reprod Contracept Obstet Gynecol* 2016;5:2503-6.
 15. Rokade J, Mule V, Solanke G. To study the perinatal outcome in meconium- stained amniotic fluid. *Int J Sci Res Pub.* 2016 Jul;6(7):41-3.
 16. Erum Majid Shaikh, Sadaf Mehmood, Majid Ahmed Shaikh. Neonatal outcome in meconium stained amniotic fluid-one year experience. *JPMA* 60:711; 2010
 17. K. Subba Rao¹, Sravanthi Pathapati², Cheedi Vansipriya³ Risk factors for meconium stained liquor and outcome of neonate in meconium stained amniotic fluid *Indian Journal of Obstetrics and Gynecology Research* 2017;4(1):1-5
 18. Satendra Singh Rajput¹, Yogendra Singh Verma², Deepika Yadav³ Study of Risk Factors and Outcome in Neonates Born with Meconium Stained Liquor Satendra Singh Rajput et al., *Sch. J. App. Med. Sci.*, Sep 2016; 4(9E):3548-3552
 19. Hiremath PB, Bahubali Gane, Meenal C, Nidhi Bansal, Ragaramya. The Management Practices and outcome of meconium stained amniotic fluid. *Int J Biol Med Res.* 2012; 3(3): 2204-2207.
 20. Rosario MC, Seshadri L. Meconium staining of amniotic fluid in low risk parturients. *Journal of Obstetrics and Gynaecology of India* 1996; 46: 642-646
 21. Pierce J, Gaudier FL, Sanchez- Ramos L. Intrapartum amnioinfusion for meconium stained fluid: meta-analysis of prospective clinical trials. *Obstet Gynecol* 2000; 95: 1051-1056.
 22. Das AK, Jana N, Dasgupta S, et al. Intrapartum transcervical amnioinfusion for meconium-stained amniotic fluid. *Int J Gynaecol Obstet* 2007 Mar 16
 23. Sahu IM intrapartum amnioinfusion in meconium stained amniotic fluid *J obst & gyne India* 2003 53 : 345-7.
 24. Wenstroms KD, Parsons MT. The prevention of meconium aspiration in labour using amnioinfusion. *Obstet Gynecol* 1989; 73: 647.
 25. Sood M, Charulata, Dimple, et al. Amnioinfusion in thick meconium. *Indian J Pediatr* 2004 Aug; 71(8):677-81.
 26. De Meeus JB, D'Halluin G, Magnin G et al. Prophylactic intrapartum amnioinfusion: a controlled retrospective study of 135 cases. *Eur J Obstet Gynecol Reprod Biol* 1997;72:141-8.
 27. Goud P and Krishna U. Significance of meconium staining of amniotic fluid in labour. *Journal of Obstetrics and Gynaecology of India* 1989; 39:523-526.
 28. Hellman LM, Schiffer MA, Kohl SG and Tolles WE. Studies in fetal well being: Variations in fetal heart rate. *Am. J. Obstet. Gynecol.* 1958; 76: 998-1012.
 29. Fujikura T, Klionsky B. The significance of meconium staining. *Am. J. Obstet. Gynecol.* 1975; 121:45-49.
 30. Miller FC, Sacks DA, Yeh SY, Paul RH, Schifrin BS, Martin CB, Hon EH. Significance of meconium during labor. *Am. J. Obstet. Gynecol.* 1975; 122: 573-580.