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A Study of Maternal Risk Factors and the Perinatal Outcome in Meconium Stained Amniotic Fluid at Tertiary Care Centre

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Abstract
Background*:Meconium is the first substance secreted from fetal intestines and consist of intestinal epithelial cells, lanugo, mucus, amniotic fluid, bile and water.* ***Objective:****A study of maternal risk factors and the perinatal outcome in meconium stained amniotic fluid.* ***Methods****:This Prospective observational study was conducted among 100 cases of meconium stained AF admitted in Department of Obstetrics and Gynecology of a tertiary care centre during study period from January 2021 to December 2022 according to exclusion and inclusion criteria.* ***Results:****Majority of cases found with moderate thick MSAF. Most common maternal risk factor was post maturity. Majority of cases detected in Active stage of labour. Majority of cases found with Meconium severity Grade 2. Most of cases required resuscitation. Perinatal Mortality was 2%. There is statistically not significant association between age and Meconium aspiration syndrome. There is statistically significant association between birth weight with perinatal mortality*
Conclusions: *Majority of cases found with moderate thick MSAF. Most common maternal risk factor was post maturity.*
Keywords*: Maternal Risk Factors, Perinatal Outcome, Meconium Stained Amniotic Fluid,*

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I. Introduction

Meconium aspiration syndrome is one of the dreadful complications of prolonged labor, fetal hypoxia due to any cause and prematurity. Once the meconium is aspirated by fetus it may cause severe meconiumpneumonitis, respiratory distress, acidosis and ultimately respiratory failure.[1] Extensive neonatal care, surfactant therapy and ventilatory management is required for babies developing respiratory distress secondary to meconium aspiration and despite extensive medical care MAS may prove fatal in many cases.[2]

The various hypothesis put forward as the triggering event for in-utero passage of meconium include fetal hypoxia, vagal stimulation causing increased peristalsis and relaxation of anal sphincter and passage of meconium as a consequence of normal gastrointestinal tract maturation as the gestational age advances.[3]

Fetal hypoxia causing increased peristalsis and passage of meconium appears to be plausible as there is increased incidence of passage of meconium in many cases where fetal distress is diagnosed on the basis of fetal bradycardia or abnormal doppler parameters.[4] On the contrary no definite cause is found in many cases where there is meconium staining of amniotic fluid first noted during rupture of membranes.

Irrespective of the cause of passage of meconium in utero it is important to prevent its aspiration as it will invariably cause pneumonitis, emphysema due to ball valve mechanism, acidosis and in severe cases respiratory failure and neonatal death.[5] For this pregnancy with post maturity, fetal compromise or fetal distress should be identified in time.[6] Umbilical artery doppler showing absence or reversal of diastolic flow, decrease or loss of fetal movements, fetal bradycardia and fetal scalp blood pH indicative of acidosis are some of the important features which may suggest fetal hypoxia.

In all such cases appropriate measures must be taken to prevent fetal morbidity and mortality.[7] Meconium stained amniotic fluid may be a normal phenomenon in post-maturity and has little significance unless it is associated with variations in fetal heart rate and other signs of fetal hypoxia. Nonetheless there are always chances that the fetus may make gasping in-utero more hazardous in presence of meconium stained amniotic fluid.[8]

Unless proper resuscitative measures are taken immediately after the delivery aspiration of meconium may take place which is usually followed by major pathological consequences that include airway obstruction,

surfactant dysfunction, chemical pneumonitis and pulmonary hypertension. The consequences of pathological processes may cause secondary complications such as persistent pulmonary hypertension in newborn (PPHN), right to left shunts due to pulmonary hypertension, diffuse pneumonitis due to enzymes, bile salts and free fatty acids present in meconium.

Surfactant dysfunction may result in diffuse atelectasis and airway obstruction may result in hyperinflation, pneumothorax and pneumomediastinum.[8] Maternal risk factors associated with meconium stained amniotic fluid and consequently meconium aspiration syndrome include maternal pathologies such as preeclampsia and eclampsia, anemia, oligohydramnios, prolonged labor, maternal infections such as chorioamnionitis, maternal substance abuse such as tobacco or cocaine and placental insufficiency of any cause.[9]

Though meconium aspiration can occur in any gestation complicated or uncomplicated, treating obstetrician must be aware of presence of maternal risk factors so that appropriate preventive and therapeutic measures can be taken in time.[10]

Hence this studywas conductedto find out the prevalence of meconium stained, study of maternal risk factors and the perinatal outcome in meconium stained amniotic fluid and to study the various maternal risk factors responsible for meconium stained amniotic fluid.

II. Materials and Methods:

This Prospective observational study was conducted among 100 cases of meconium stained AF admitted in Department of Obstetrics and Gynecology of a tertiary care centre duringstudy period from January 2021 to June 2022 according to exclusion and inclusion criteria.

Inclusion criteria:

1. Term labour (>37 completed weeks)
2. Cephalic presentation.
3. Live singleton pregnancy

Exclusion criteria:

1. Antepartumhaemorrhage
2. Malpresentations
3. Pregnancy with congenital malformations.
4. Intrauterine death
5. Not willing to participate

Approval for the study:

Written approval from Institutional Ethics committee was obtained beforehand. Written approval of OBGY and other related department was obtained. After obtaining informed verbal consent from all patients coming to our institute during study period according to exclusion and inclusion criteria admitted to OBGY ward of tertiary care centre such cases were included in the study.

Sample size = 100

Sampling technique: Convenient sampling technique used for data collection.

Methods of Data Collection

Predesigned and pretested questionnaire was used to record the necessary information. Questionnaires included general information, such as age, sex, Medical history- chief complain, past history, general examination, systemic examination.

Menstrual history: LMP, EDD, Obstetrics history-marriage duration, parity, Mode of delivery, maternal complications, Type of meconium , No ANC visits, Gestational age at the time of admission, Mode of delivery, Maternal Outcome, Maternal complications, perinatal outcome, perinatal complication.

A detailed history was taken with a special emphasis on associated maternal risk factors like pre-eclampsia, gestational diabetes, history of fever and substance abuse. Ultrasound reports were studied and any abnormality like oligohydramnios or polyhydramnios was noted down. Method of delivery like vaginally, forceps delivery or LSCS was noted. General and systemic examination was done.

Obstetrical examination was done noting the presentation, position, height of fundus, amount of amniotic fluid, fetal heart rate, uterine contraction, pelvic status. When MSAF appeared along with rupture of membrane it was collected and clinically graded thorough and quick vaginal examination was done to assess the state of cervix, station of fetal head, and exclusion of cord prolapse and to note the colour and consistency of AF.

MSAF was collected by introducing Sim's speculum under aseptic precaution and material taken into a clear test tube for clinical gradation according to the colour and consistency.

When AF was thinly stained with greenish yellow in colour, it was graded as thin meconium stained. When AF was dark green or tarry black or muddy in colour and of thick consistency it was considered as thick meconium stained.

Study cases were grouped into thin and thick meconium stained amniotic fluid group on the basis of consistency of meconium. APGAR scores at 1 and 5 minutes, Weight and gender of the newborns was noted. All the babies delivered were kept under observation for 24hours. Babies who were normal and did not develop any complications within 24hours after birth were placed mother-side.

Babies who developed any sign of respiratory distress within 24hours were shifted to NICU. Babies who initially were shifted to mother and developed signs of respiratory distress were also transferred to NICU. Babies were followed-up up to 7 day and their clinical condition was assessed and any abnormalities were recorded. Death and its cause during hospital stay within first week of neonatal life were also recorded

Complete investigation done,Usg, Complete haemogram, Blood electrolyte, Blood biochemistry, Blood culture, Blood gas analysis, Chest X-ray.All the procedures and investigations conducted under direct guidance and supervision of pg guide. Proforma of meconium stained notes maintained.

Data entry and analysis: The data were entered in Microsoft Excel and data analysis was done by using SPSS demo version no 21 for windows. The analysis was performed by using percentages in frequency tables and correlation of Meconiumstained with various risk factors and maternal and perinatal outcome. $p<0.05$ was considered as level of significance using the Chi-square test.

III. Results:

Majority of study participants were from 26-30 years age group e.g. 40 followed by 21-25,18-20,31-35 and >35 found 30,16,10 and 4 respectively

Majority of subjects were educated upto primary education (1^{st} -5^{th})contributing 80 (80%) followed by 14 (14%) upto secondary level (6^{th}-10^{th}) std and 6 cases (6%) were educated above 10^{th} std respectively.

Majority of subjects were house wife contributing 38 (38%) followed by Labourer 22 (22%), Farmer 18 (18%), Shop keeper 08(8%), Sales woman 08(8%) and employed 06(6%) respectively.

Most of study subjects are from lower socioeconomic class (III,IV,V) contributing 85 (85%) followed by 15 (15%) in higher classes (I,II).

Most of the study subjects were Primigravida contributing 60 (60%) and 40 (40%) wereMultipara

Majority of study participants were from > 40 weeks of gestational age contributing 60 (60%) followed by 38-40 weeks 30 (30%) and 37-38 weeks 10 (10%) respectively.

Most of study participants received inadequate ANC care as 57 (57%), cases with 5-10 visits 36 cases and 7 cases reported more than 10 ANC visits.

Majority of cases found with moderate thick MSAF 57 (57%) followed by thin MSAF 27 (27%) and thick MSAF found in 21 cases (21%). Table 1

Table 1: Distribution of cases as per type of meconium stained amniotic fluid (N=100)

MSAF	Frequency	Percentage
Thin	27	27%
Moderate thick	52	52%
Thick	21	21%
Total	100	100%

Majority of cases presented with post maturity 42 (42%) followed by oligohydramnios 18 (18%), prolonged labour 15 (15%), pregnancy induced hypertension 10(10%) ,IUGR 10 (10%) and 05 cases found with anemia. Table 2

Table 2: Maternal risk factors with meconium stained amniotic fluid (N=100)

Maternal risk factors	Frequency	Percentage
Post maturity	42	42%
Pregnancy induced hypertension	10	10%
Anemia	05	05%
IUGR	10	10%
Oligohydramnios	18	18%
Prolonged labour	15	15%

Majority of cases detected in active stage of labour 58 (58%) followed by 2^{nd} stage 32 (32%) and 10cases detected during latent stage

Majority of cases found with Grade 2 e.g. 49 (49%) followed by Grade 3 with 34 cases (34%) and Grade 1 with 17 cases (17%). Table 3

Table 3: Meconium severity grading (N=100)

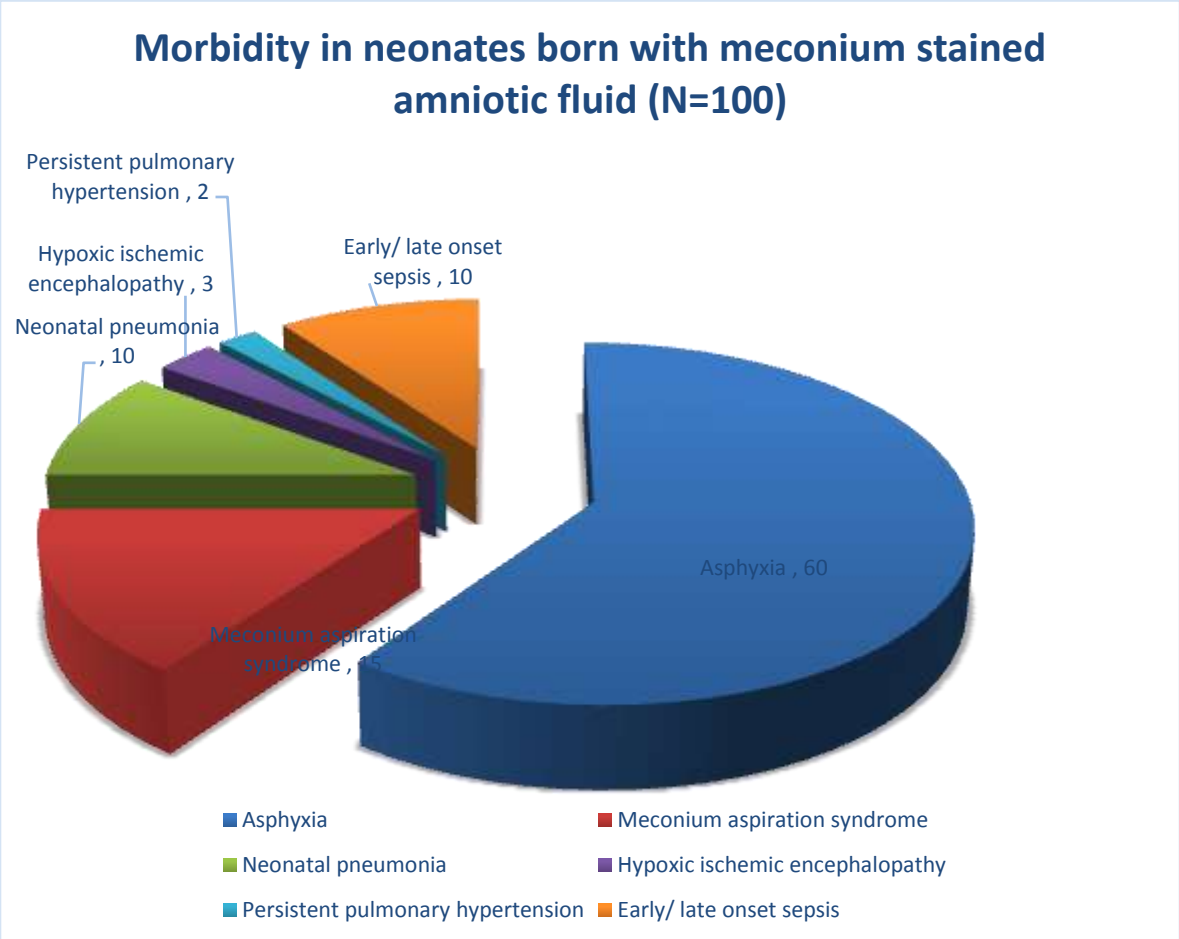
Meconium severity grading	Frequency	Percentage
Grade 1	17	17%
Grade 2	49	49%
Grade 3	34	34%
Total	100	100%

Majority of cases delivered through LSCS 60 followed by NVD 31 and Assisted delivery 09%
Majority of cases delivered through LSCS 60followed by NVD 31 and Assisted delivery 09.
LSCS thin meconium 15 cases and 45 cases with thick meconium, NVD 20 cases with thin meconium and 11 cases with thick meconium, AD 3 cases with thin meconium and 06 cases found with thick meconium.
Majority of cases with normal birth weight 80 (80%) 20 cases with low birth weight.
Majority of cases APGAR score at 1 minute was ≥ 6 found in 60 cases and 40 cases found with <6. APGAR score at 5 minute in 79 cases score was ≥ 6 and 21 cases found with <6.
Majority of cases required resuscitation 60 and 40 cases not required resuscitation.

Table 4: Distribution of cases as per Need for resuscitation (N=100)

Need for resuscitation	Frequency	Percentage
Resuscitation required	60	60%
Resuscitation not required	40	40%
Total	100	100%

The majority of cases found Asphyxia 60 followed by meconium aspiration syndrome 15, neonatal pneumonia 10, Early/late onset sepsis 10, Hypoxic ischemic encephalopathy 03 and persistent pulmonary hypertension found in 02 cases. Fig 1



Majority of cases discharged 91 followed by 7 cases DAMA and 2 cases death during treatment.

Table 5: Outcome in neonates born with meconium stained amniotic fluid (N=100)

Outcome	Frequency	Percentage
Discharged	91	91%
DAMA	7	7%
Death	2	2%
Total	100	100%

Table 6: Association of MAS with age

Age in years	Meconium aspiration syndrome				
	Present	Percentage	Absent	Percentage	Total
18-20	1	12.5%	8	87.5%	9
21-25	2	10.53%	17	89.47%	19
26-30	3	10.71%	25	89.29%	28
31-35	7	17.5%	33	82.5%	40
>35	2	50%	2	50%	4
Total	15	15%	85	85%	100 (100%)

Chi square-2.4079, p-value-0.120727, (Row 1,2vs Row 3, 4 and 5 Merged)The result is not significant at $p < .05$.Inference: There is statistically not significant association between age and Meconium aspiration syndrome.

Table 7: Association of Birth weight with perinatal mortality

Birth weight	Perinatal Mortality				
	Present	Percentage	Absent	Percentage	Total
Low birth weight	2	11.11%	18	88.88%	20
Normal birth weight	0	0%	80	100%	80
Total	2	2%	98	98%	100

The Fisher exact test statistic value-0.0384, The result is significant at $p < .05$.
Inference: There is statistically significant association between birth weight with perinatal mortality

IV. Discussion:

Majority of study participants were from 26-30 years age group e.g. 40 followed by 21-25,18-20,31-35 and >35 found 30,16,10 and 4 respectively. Similar result found in the study of **Thirukumar M (2020)[11]** He found that the Majority of the study participants represented the 18 to 30 years age group (N=119:79.3%).

Majority of subjects were educated upto primary (1^{st} -5^{th}) std contributing 80 (80%) followed by 14 (14%) upto secondary level (6^{th}-10^{th}) std and 6 cases (6%) above 10^{th} std. respectively. Similar result reported by **Mohan M et al (2018)[12]**

Most of study subjects are from lower socioeconomic class (III,IV,V) contributing 85 (85%) followed by 15 (15%) in higher classes (I,II).Similar result reported by **Mohan M et al (2018)[12]** He found that the majority of cases with low socioeconomic class.

Most of the study subjects were Primigravida contributing 60 (60%) and 40 (40%) were Multipara.Similar results were reported by the authors such as Harikumar et al[13] who reported that 69% of the women found to have meconium stained amniotic fluid were primigravida.Gokhru K et al [14] found that MSAF was more common in primigravida and multigravida.

Majority of study participants were from > 40 weeks of gestational age contributing 60 (60%) followed by 38-40 weeks 30 (30%) and 37-38 weeks 10 (10%) respectively.Other studies such as those conducted by **Sori DA et al [15]** found that the meconium stained amniotic fluid was more common in between the gestational age of 40-42 weeks.

Most of study participants received inadequate ANC care as 57 (57%), cases with 5-10 visits 36 cases and 7 cases reported more than 10 ANC visits. Similar result observed in the study conducted by **Sori DA et al [15]** found that the majority of cases received inadequate ANC care as 47%.

Majority of cases found with moderate thick MSAF 57 (57%) followed by thin MSAF 27 (27%) and thick MSAF found in 21 cases (21%).Similar observation in the study of **K. SubbaRao et al [16]** He found that the Out of the 100 cases delivered, 45% were with thin meconium stained amniotic fluid and 55% cases were with thick meconium stained amniotic fluid.

Majority of cases presented with post maturity 42 (42%) followed by oligohydramnios 18 (18%), prolonged labour 15 (15%),pregnancy induced hypertension 10 (10%), IUGR 10 (10%) and 05 cases found with anemia 05 (05%).Similar result observed in the study of **Niranjan KS et al (2019)[17]**Reported that 45 (22.5%) women had no risk factors.

Majority of cases detected in active phase of labour 58 (58%) followed by 2^{nd} stage 32 (32%) and 10 cases detected during 2^{nd} latent phase. Similar result observed in the study of **Niranjan KS et al (2019)**

[17]Reportedthatmeconium stained amniotic fluid was detected most commonly in active phase of labour (49.00%) followed by latent phase (36.00%) and 2nd stage of labour (15.00%).

Majority of cases found with Grade 2 e.g. 49 (49%) followed by Grade 3 with 34 cases (34%) and Grade 1 with 17 cases (17%). Similar result found in the study conducted by **Sheiner E et al (2002)[18]** he reported that the most of cases found with Grade 2 (55%).

Majority of cases delivered through LSCS 60 followed by NVD 31 and AD 09 cases.Similar result found in the study conducted by **Sheiner E et al (2002)[18]** he reported that the most of cases delivered though LSCS (45%).

Most of cases delivered through LSCS 60 followed by NVD 31 and Assisted delivery 09. LSCS thin meconium 15 cases and 45 cases with thick meconium, NVD 24 cases with thin meconium and 4 cases with thick meconium, AD 9 cases with thin meconium and 07 cases found with thick meconium. Similar result found in the study of **Niranjan KS et al (2019)[17]**reported patients with thick meconium stained liquor 80.70% patients were delivered by lower segment cesarean section while 38.37% patients with thin meconium stained liquor were delivered by LSCS.

Majority of cases APGAR score at 1 minute was ≥ 6 found in 60 cases and 40 cases found with <6. APGAR score at 5 minute in 79 cases score was ≥ 6 and 21 cases found with <6.Similar observation found in the study of **Niranjan KS et al (2019)[17]**reported meconium staining was significantly associated with low APGAR score at one minute.

Majority of cases required resuscitation 60 and 40 cases not required resuscitation. Similar finding observed in the study conducted by **Niranjan KS et al (2019)[17]** found that the 40 Neonates born through thick meconium stained amniotic fluid needed some form of resuscitative measures including endotracheal intubation and IPPV (10%), intubation and suctioning (5.00%), bag and mask ventilation (3%) . Only Oxygen inhalation was needed in 4 (2%) neonates. In babies born through thin meconium stained amniotic fluid 30 neonates required either oxygen inhalation or some form of resuscitation.

Similar result found in the study by **Niranjan KS et al (2019)[17]** he reported that the Morbidities associated with meconium stained amniotic fluid included birth asphyxia (19.50%) followed by meconium aspiration syndrome (14%), Hypoxic ischemic encephalopathy (12.00%) and sepsis (07.50%). In control group Asphyxia (10%), sepsis (8.50%) and neonatal pneumonia (3.50%) were commonly seen morbidities.

Majority of cases discharged 91 followed by 7 cases DAMA and 2 cases death during treatment.**Debdas et al [19]** have reported similar perinatal mortality figures (3%) while **Narang et al [20]**have found a slightly higher perinatal mortality in neonates born through meconium stained amniotic fluid (7.7%).

There is statistically not significant association between age and Meconium aspiration syndrome.Similar result found in the study conducted by**Ziadehet al [21]** he reported that thenot significant association between age and Meconium aspiration syndrome.

There is statistically significant association between birth weight with perinatal mortality. Similar result found in the study conducted by**Ziadehet al [21]** he reported that the statistically significant association between birth weight with perinatal mortality

V. Conclusion:

Majority of cases found with moderate thick MSAF. Most common maternal risk factor was post maturity**.** Majority of cases detected in Active stage of labour. Majority of cases found with Meconium severity Grade 2**.** Most common perinatal morbidity was Asphyxia**.** Perinatal Mortality was 2%**.** There is statistically not significant association between age and Meconium aspiration syndrome**.** There is statistically significant association between birth weight with perinatal mortality

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