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# Perinatal Outcome of Term Pregnancy with Meconium Stained Amniotic Fluid Versus Clear Amniotic Fluid

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## ABSTRACT

Background: The presence of meconium in amniotic fluid is considered an ominous sign of intra-uterine fetal compromise. Meconium Stained in Amniotic Fluid (MSAF) is thought to be a bad predictor of neonatal outcome associated with an increase in perinatal morbidity. This study comparing perinatal outcome in MSAF and clear amniotic fluid (CAF). Aims to develop plan of action for management of pregnancy with MSAF that provides greatest chance for appropriate safe delivery with least maternal, fetal and neonatal risk.

Methods: A total of 154 women were included in this study, 77 with MSAF was taken as exposed group and the other 77 women CAF was taken as unexposed group. The perinatal outcomes were studied. Data was collected using a proforma for each woman recruited for the study.

Results: The average age of the women was 27.19±4.35 years and 27.31±4.48 years in exposed and unexposed groups. Rate of intra partum FD [(27.3% vs. 2.6%; p=0.0005] and MAS [18.2% vs. 0% p=0.0005] was significantly high in exposed group as compared to unexposed group.

Conclusion: MSAF has short - long term adverse fetal outcomes concentrated especially in increased rates of neonatal resuscitation, respiratory distress, lower Apgar score, neonatal nursery admissions, MAS, neonatal sepsis and pulmonary disease. The perinatal morbidity and mortality related to MSAF hopefully, can be decreased if major risk factors are recognized right from the beginning of labour so that closely monitoring of the labor and cautious decisions for timing and mode of delivery can be planned beforehand

Keywords: *Amniotic fluid (AF), Meconium-stained AF(MSAF), Perinatal outcome*

## INTRODUCTION

Amniotic fluid (AF) or liquor is the liquid surrounding the fetus in utero, since early gestational, weeks helping protect fetus from trauma to the maternal abdomen, cushioning the umbilical cord from compression between the fetus and uterus, with antibacterial properties protects from infection, provides nutrients to the fetus finally provides the necessary fluid, space, and growth factors to permit normal development of the fetal lungs, musculoskeletal and gastrointestinal systems.[1]

As a matter of fact, AF is derived almost entirely from the fetus, the major inputs are fetal urine and fetal lung secretions. The major physiologic pathway for removal of AF from the amniotic cavity is fetal swallowing through the intramembranous flow.

Meconium is an odorless viscous, tar like sticky substance, color ranging from dark olive green, green, brown, or yellow. It constitutes of ingested materials such as intestinal epithelial cells, lanugos, mucus, bile, water and AF. After its formation between 12th to 20th week of gestation, it is normally retained in the bowel until after 24 hours birth when it is passed indicating normal maturation of the gastrointestinal tract. Elsewise, on the contrary, it is deemed pathologic, when passed in-utero at any period of gestation (POG) until labor or delivery caused by infection/stress (FD) leading to hypoxia. Meaning fresh MSAF is prognosticated as sign of hypoxic/distressed fetus. Whereas, it

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may be seen without FD in post-dated pregnancy. econium passed remote from labor may be homogeneously distributed throughout AF, whereas individual clumps of meconium appear if passed just before birth.

MSAF has incidence 7-22% arising suspicion of fetal compromise, adhering to increased predisposition to CS with poor perinatal outcome, MAS (MAS) and respiratory distress which mandates neonatal resuscitation or neonatal nursery admissions, imminent neonatal sepsis thereby pulmonary disease and neonatal death.[2]

MAS occurs in 5–10.5% of neonates with MSAF, attributing to 12% of neonatal mortality (as much as 40% case fatality rate) and around 2% of perinatal mortality.[3] This study may aid to plan action for management of pregnancy and labour with MSAF.

## METHODS

This cohort study with non-probability consecutive sampling, taking women with MSAF taken as exposed group and clear amniotic fluid (CAF) taken as unexposed group, was

conducted in The Department of Obstetrics and Gynecology, Phect- NEPAL/Kirtipur Hospital. The duration of the study was seven months from 11th January 2022 to 10th August 2022.

Inclusion criteria. Age 18-35 years, Gravida ≥1, singleton full term pregnancy (37-42 completed weeks of gestation assessed by last menstrual period (LMP)/dating scan with cephalic presentation and AF index (AFI)= 8-20 cm

Exclusion criteria. Preeclampsia and Eclampsia/ eclampsia(P/E), gestational diabetes mellitus (GDM), antepartum hemorrhage (APH), congenital malformation of fetus (CMF) anomalies and intrauterine Fetal Demise (IUFD)

Data was collected after approval from the Institutional Review Committee (IRC). Informed consent was taken after explaining about the purpose, risk and benefit of the study, to women meeting the inclusion criteria, who were recruited for the study. Women were enrolled from labor room (LR). Brief history was taken and estimated date of delivery (EDD) and GA (GA) wherever applicable was calculated from the last menstrual period (LMP)/ confirmed by USG whenever required.

Relevant examinations were done in entire women who were admitted for induction of labor (IOL), elective cesarean section (EL.CS) or spontaneous onset of labor (SOL). Any obstetric complication, prior to and at the time of admission or any intervention procedure was recorded during hospital stay.

In both the induced and spontaneous labor groups, progress of labor was monitored. To augment labor artificial rupture of membrane (ARM) was done invariably after active phase of labor. In all the cases with spontaneous and ARM, immediate per speculum and per vaginal examination was done to note the color of the AF and to rule out cord prolapse. Women with MSAF were more closely monitored with continuous CTG for type 2 decelerations, decreased variability and fetal persistent tachycardia. Whenever FD was noted, women were counseled and prepared for emergency (Em) CS or else vaginal delivery whatever was suited best, according to hospital protocol. In case of the El. CS membrane was ruptured artificially during the operation and the color of the AF was noted intra-operatively. Delivery was self-attended in majority of cases and in a few deliveries which could not be attended, the information was collected from the medical records. Mode of delivery whether spontaneous vaginal or CS was noted, noting also the indication of CS. Any obstetric complication, prior to and at the time of admission or any intervention was recorded during hospital stay.

The adverse perinatal outcomes that were studied were low Apgar score, admission to NICU, MAS, RDS, neonatal sepsis, birth asphyxia and perinatal mortality. Data was collected using a proforma for each woman recruited for the study. Post-delivery, proforma was also filled.

Results was considered statistically significant if p value is less than or equal to 0.05. Relative risk was calculated.

Sample size was calculated using the formula for comparing two proportions

$n = (Z\alpha/2+Z\beta)2 * (p1(1-p1) +p2(1-p2)) / (p1-p2)2$

where, level of confidence is 95%, margin of error is 5% and power is 80 %

Here the outcome variable is Apgar score <7 in 5 minute which was 21.6% in MSAF and 6.3% in clear amniotic fluid in a prior study. [4]

P1: proportion of Apgar score<7 in 5 minute, in MSAF=0.216

P2: proportion of Apgar score<7 in 5 minute, in clear Amniotic Fluid=0.063

And, the sample size is calculated to be 77 in each group.

## RESULTS

A total of 154 women were included in this study, half of them with MSAF, taken as exposed group and 77 women with CAF taken as unexposed group.

The average age of the women was 27 years in both groups.

Similarly mean GA (GA), weight, height, BMI and birth weight according to groups are represented in Table 1.

Labor onset and El CS (Table 2), in most of the women exposed to IOL had MSAF in comparison to CAF. Em. CS were more in overall CS rate of. 55.8%

Mode of delivery in SOL and induced labor in both groups are shown in Table 3. Em CS rate was more in exposed group rather than in unexposed group. Comparison of perinatal outcome in both groups is presented in Table 4. The rate of FD and MAS was significantly high in exposed group as compared to unexposed group. Rate of FD [27.3% vs. 2.6%; p=0.0005] and MAS [18.2% vs. 0% p=0.0005] was significantly high in exposed group as compared to unexposed group.

While rate of RDS, Apgar at 5 minutes, NICU admission, ARM, SROM, neonatal sepsis, perinatal asphyxia and transient tachypnea of newborn (TTN) were not statistically significant between exposed and unexposed groups. Neonatal mortality was observed in a woman in exposed group.

Stratification analysis was performed according to the gravida but effect of this confounder was not observed on outcome as reported in Table 4 and 5.

FD and MAS were significantly high in exposed group as compared to unexposed group even in primigravida /multigravida (Table 5.6).

The indications for undergoing Em CS in exposed group (n=32): made by FD in 17, non-progress of labor (NPOL) in 6, failed induction in 3, previous CS in labor or scar tenderness in 3, non-reactive cardiotocography (CTG) in 2 and maternal request (MR) for CSD (MRCSD) in 1. The indications for undergoing Em CS in unexposed group (26) is a sum of failed induction in 10, NPOL in 5, FD in 4, prev CS in labor 4 and one each in non-reactive CTG, breech in labor and secondary arrest of labor.

**Table 1:** Women characteristics according to exposed and unexposed groups

| Variables | Exposed n=77 | | Unexposed n=77 | |
|---|---|---|---|---|
| | Mean | Std. Deviation | Mean | Std. Deviation |
| Age (Years) | 27.19 | 4.35 | 27.31 | 4.48 |
| GA (Weeks) | 39.06 | 1.03 | 38.36 | 1.36 |
| Weight (Kg) | 62.32 | 6.50 | 63.16 | 7.82 |
| Height (cm) | 151.87 | 4.51 | 152.26 | 5.83 |
| BMI (kg/m$^2$) | 27.00 | 2.42 | 27.26 | 3.26 |
| Birth weight (g) | 3059.22 | 335.69 | 3087.79 | 469.88 |

**Table 2:** Labor /Delivery Details

| Variables | Exposed n=77 | Unexposed n=77 |
|---|---|---|
| Induced labor | 34 | 24 |
| Spontaneous labor | 32 | 35 |
| El.CS | 11 | 18 |
| Rupture of Membrane | | |
| ARM | 48 | 48 |
| SROM | 29 | 29 |

**Table 3:** Mode of Delivery in SOL and Induced Labor

| Group | Spontaneous labor | | | Induced labor | | |
|---|---|---|---|---|---|---|
| | ND | Vacuum | Em CS | ND | Vacuum | Em CS |
| Exposed | 23 | 1 | 8 | 9 | 1 | 24 |
| Un- Exposed | 26 | 0 | 9 | 7 | 0 | 17 |

**Table 4:** Comparisons of Perinatal Outcome between Exposed and Unexposed Groups

| Variables | | Groups | | P-Value | RR (95%CI) |
|---|---|---|---|---|---|
| | | Exposed n=77 | Un-Exposed n=77 | | |
| FD | Yes | 21(27.3%) | 2(2.6%) | 0.0005 | 10.5[2.55-43.25] |
| | No | 56(72.7%) | 75(97.4%) | | Ref |
| Respiratory distress | Yes | 3(3.9%) | 0 | 0.245 | NA |
| | No | 74(96.1%) | 77(100%) | | |
| MAS | Yes | 14(18.2%) | 0 | 0.0005 | NA |
| | No | 63(81.8%) | 77(100%) | | |
| Apgar at 5 minutes | <7 | 1(1.3%) | 0 | 0.999 | NA |
| | >=7 | 76(98.7%) | 77(100%) | | |
| NICU admission | Yes | 25(32.5%) | 15(19.5%) | 0.066 | 1.67[0.95-2.91] |
| | No | 52(67.5%) | 62(80.5%) | | Ref |
| ARM | Yes | 47(61%) | 48(62.3%) | 0.868 | 0.98[0.76-1.26] |
| | No | 30(39%) | 29(37.7%) | | Ref |
| SROM | Yes | 30(39%) | 29(37.7%) | 0.868 | 1.03[0.69-1.54] |
| | No | 47(61%) | 48(62.3%) | | Ref |
| Neonatal Sepsis | Yes | 4(5.2%) | 6(7.8%) | 0.513 | 0.66[0.19-2.27] |
| | No | 73(94.8%) | 71(92.2%) | | Ref |
| Perinatal Asphyxia | Yes | 3(3.9%) | 2(2.6%) | 0.649 | 1.50[0.26-8.72] |
| | No | 74(96.1%) | 75(97.4%) | | Ref |
| TTN | Yes | 2(2.6%) | 2(2.6%) | 0.999 | 1.00[0.14-6.91] |
| | No | 75(97.4%) | 75(97.4%) | | Ref |
| Perinatal mortality | Yes | 1(1.3%) | 0 | 0.999 | 3.00(0.12- 72.52) |
| | No | 0 | 0 | | Ref |

**Table 5:** Comparisons of Perinatal Outcome in both Groups Stratified by Primigravida

| Variables | | Groups | | P-Value | RR (95%CI) |
|---|---|---|---|---|---|
| | | Exposed n=39 | Un-Exposed n=29 | | |
| FD | Yes | 14(35.9%) | 2(6.9%) | 0.008 | 5.2[1.3-21.14] |
| | No | 25(64.1%) | 27(93.1%) | | Ref |
| Respiratory distress | Yes | 2(5.1%) | 0(0%) | 0.504 | NA |
| | No | 37(94.9%) | 29(100%) | | |
| MAS | Yes | 9(23.1%) | 0(0%) | 0.008 | NA |
| | No | 30(76.9%) | 29(100%) | | |
| Apgar at 5 minutes | <7 | 1(2.6%) | 0(0%) | 0.999 | NA |
| | >=7 | 38(97.4%) | 29(100%) | | |
| NICU admission | Yes | 15(38.5%) | 5(17.2%) | 0.066 | 2.23[0.91-5.42] |
| | No | 24(61.5%) | 24(82.8%) | | Ref |
| ARM | Yes | 26(66.7%) | 18(62.1%) | 0.799 | 1.07[0.47-1.54] |
| | No | 13(33.3%) | 11(37.9%) | | Ref |
| SROM | Yes | 13(33.3%) | 11(37.9%) | 0.695 | 0.87[0.46-1.67] |
| | No | 26(66.7%) | 18(62.1%) | | Ref |
| Neonatal Sepsis | Yes | 3(7.7%) | 2(6.9%) | 0.999 | 1.11[0.19-6.25] |
| | No | 36(92.3%) | 27(93.1%) | | Ref |
| Perinatal Asphyxia | Yes | 1(2.6%) | 1(3.4%) | 0.999 | 0.74[0.05-11.34] |
| | No | 38(97.4%) | 28(96.6%) | | Ref |
| TTN | Yes | 1(2.6%) | 1(3.4%) | 0.999 | 0.74[0.05-11.34]] |
| | No | 38(97.4%) | 28(96.6%) | | Ref |

**Table 6.** Comparisons of Perinatal Outcome in both Groups Stratified by Multigravida

| Variables | | Groups | | P-Value | RR (95%CI) |
|---|---|---|---|---|---|
| | | Exposed n=38 | Un-Exposed n=48 | | |
| FD | Yes | 7(18.4%) | 0(0%) | 0.002 | NA |
| | No | 31(81.6%) | 48(100%) | | |
| Respiratory distress | Yes | 1(2.6%) | 0(0%) | 0.258 | NA |
| | No | 37(97.4%) | 48(100%) | | |
| MAS | Yes | 5(13.2%) | 0(0%) | 0.014 | NA |
| | No | 33(86.8%) | 48(100%) | | |
| Apgar at 5 minutes | <7 | 0(0%) | 0(0%) | NA | NA |
| | >=7 | 38(100%) | 48(100%) | | |
| NICU admission | Yes | 10(26.3%) | 10(20.8%) | 0.612 | 1.26[0.58-2.71] |
| | No | 28(73.7%) | 38(79.2%) | | Ref |
| ARM | Yes | 21(55.3%) | 30(62.5%) | 0.516 | 0.88[0.62-1.26] |
| | No | 17(44.7%) | 18(37.5%) | | Ref |
| SROM | Yes | 17(44.7%) | 18(37.5%) | 0.516 | 1.19[0.72-1.98] |
| | No | 21(55.3%) | 30(62.5%) | | Ref |
| Neonatal Sepsis | Yes | 1(2.6%) | 4(8.3%) | 0.378 | 0.32[0.04-2.71] |
| | No | 37(97.4%) | 44(91.7%) | | Ref |
| Perinatal Asphyxia | Yes | 2(5.3%) | 1(2.1%) | 0.518 | 2.52[0.24-26.81] |
| | No | 36(94.7%) | 47(97.9%) | | Ref |
| TTN | Yes | 1(2.6%) | 1(2.1%) | 0.999 | 1.26[0.08-19.54] |
| | No | 37(97.4%) | 47(97.9%) | | Ref |

## DISCUSSION

The incidence of MSAF is projected as given as 11.15% (265 / 2376).[5]

In this study the average age of the women is 27.19±4.35 years and 27.31±4.48 years in exposed and unexposed groups, sharing same age pattern.[5] Hower age group is shown slightly than our.[6] A study has absorbed age range from 20 -35.[6]

Follow us to the main part of our study, MSAF responsible for the upsurge FD thereby escalating Em CS rate, birth asphyxia, MAS.

MSAF is invariably associated to FD percentage and answerable clue as indicated by increased CSD rate from 42.3% to above 50% in our study.[8,9]

Whatever be the rout of birth, MAS has been documented like us up to 17-18.5 %.

Thus, conclusive reason of neonatal morbidly. [6,10,11]

MSL corroborated to birth asphyxia (9-15%).[6,7] And displayed NICU admission portraying 22-42%.[6-8] Leading to neonatal intubation (6%)[5-6]

Neonatal death 2(0.8)-9%.[7,8] Likely contributed to some extent by early onset neonatal sepsis (EONS) 6%, neonatal sepsis (3.3%) – (5.6%).[6,7]

It is viewed that in addition, that MSAF has short - long term adverse fetal outcomes concentrated especially in increased rates of neonatal resuscitation, respiratory distress, lower Apgar score, neonatal nursery admissions, MAS, neonatal sepsis and pulmonary disease.

Summarizing, our study findings of the mean GA at delivery at a significantly greater level in MSAF group as compared to CAF group and that 19.7% of the neonates required NICU admission thus concludes MSAF during labor is associated with increased perinatal morbidity.

Thus, strongly suggesting careful watch or rigorous intra partum and postpartum monitoring supervision to ensure optimal management and reduction in the risks of complications.

The perinatal morbidity and mortality related to MSAF hopefully, can be decreased if major risk factors are recognized right from the beginning of labor so that closely monitoring of the labor and cautious decisions for timing and mode of delivery can be planned beforehand.

## CONCLUSION

MSAF has short-long term adverse fetal outcomes concentrated especially in increased rates of neonatal resuscitation, respiratory distress, lower Apgar score, neonatal nursery admissions, MAS, neonatal sepsis and pulmonary disease.

The perinatal morbidity and mortality related to MSAF hopefully, can be decreased if major risk factors are recognized right from the beginning of labour so that closely monitoring of the labor and cautious decisions for timing and mode of delivery can be planned beforehand

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