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Original Research Article

Estimation of the Prevalence of MSAF and Comparison of its Risk Factors among Newborn Delivered in a Tertiary Level of Health Care Center

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Abstract

Introduction: Meconium being the first intestinal secretion from the foetus starts as early as 10 weeks of gestation and tends to increase in its incidence with increasing period of gestation. Meconium stained amniotic fluid is a commonly observed phenomenon in routine Obstetric and Pediatric practice, which is considered as one of the signs of fetal distress in cases other than breech presentation. Factors such as placental insufficiency, maternal hypertension, pre-eclampsia, oligohydroamnios, etc. result in-utero passage of meconium.

Objective: To estimate the burden of MSAF and assessment of the associated risk factors among newborn delivered in a tertiary level of health care center.

Methodology: Prospective observational study was conducted with 1086 neonates born with MSAF in a tertiary level of health care center (M.P.) over a period of 1 year after clearance from institutional ethical committee. A written informed consent was obtained from the parents of the subjects. All newborn with MSAF and whose parents provide consent to participate in the study was included under study.

Results: The incidence of MSAF in this study is calculated as 12%. About 79% newborns need no active intervention at birth and shifted to mother side and 21% newborn need active intervention at births and admitted in NICU. Male contributes about 59% and female about 41% of total MSAF newborns (Sex ratio for MSAF newborns calculated 702/1000). Most of the MSAF newborn delivered by LSCS. Maternal risk factors like Anemia, pregnancy induced hypertension and preeclampsia/eclampsia had shown significant association.

Conclusion: This study found that among total numbers of delivery, about 12% newborn had suffered from MSAF. Risk factors like delivery mode, maternal age, gestational age, birth weight and others maternal risk factors like anemia, PIH and preeclampsia had a significant association between the two group of newborns with MSAF.

Keywords: MSAF, Incidence, Newborn.

Introduction

Meconium being the first intestinal secretion from the foetus starts as early as 10 weeks of gestation and tends to increase in its incidence with increasing period of gestation [1]. Meconium stained amniotic fluid (MSAF) is a commonly observed phenomenon in routine Obstetric and Pediatric practice, which is considered as one of the signs of fetal distress in cases other than breech presentation. However, there is controversy regarding its relative importance compared to other factors as an indicator of fetal distress such as - decrease in fetal scalp blood pH, variations in fetal heart rate (FHR) pattern, non-reactive cardiotocography (CTG) and loss of fetal movements or decreased fetal movements [2]. MSAF is usually considered as a response from the baby when there is a temporarily reduced oxygen supply at some point of time (usually during labour) or a slowly reducing level of oxygen over a period of time.

Factors such as placental insufficiency, maternal hypertension, pre-eclampsia, oligohydroamnios, chorioamnionitis, IUGR or maternal drug abuse (tobacco or cocaine) result in-utero passage of Meconium. The overall frequency of MSAF varies between 10% to 25% is common in full terms and especially in post-dated deliveries. Approximately 10% to 30% of the neonates born through MSAF develop meconium aspiration syndrome (MAS) and 30% to 50% of these infants require continuous positive airway pressure (CPAP) or mechanical ventilation. The mortality rate of meconium stained neonate is considerably higher than non-stained neonates [3].

Meconium passage is a developmentally programmed postnatal event because 98% of healthy newborns pass meconium in the first 24 to 48 hours after birth [4]. Treatment of MAS is a challenge to neonatologists. Appropriate use of positive end expiratory pressure, surfactant therapy, recent advances like high frequency ventilation and inhaled nitric oxide have led to reduced incidence of adverse outcome and improved survival rate of newborns with MAS. This study was undertaken to determine the maternal factors and incidents of meconium stained amniotic fluid among newborns.

Objectives

1. To estimate the burden of MSAF among newborn delivered in a tertiary level of health care center.
2. Assessment of the associated risk factors of MSAF among newborn delivered in a tertiary level of health care center.

Methodology

This prospective observational study was conducted with 1086 neonates born with MSAF in a tertiary level of health care center (M.P.). The study was conducted over a period of 1 year (October-2020 to-September 2021) after clearance from institutional ethical committee.

A written informed consent was obtained from the parents of the subjects included before enrolling in study. All newborn with MSAF and whose parents provide consent to participate in the study was included under study and whose parents did not provide consent to participate in the study was excluded. The data was collected by using pre designed semi structured questionnaire and entered into Microsoft excel 2010, analyzed by using Epi-info. Appropriate test of significance like chi-square test were applied wherever necessary.

Results

The results of our study is presenting below in forms of tables and figures.

There were total 9047 deliveries conducted in Past 12 Months (October-2020 to September 2021) in the selected study site of which 1086 (12%) newborns had problems of meconium stained amniotic fluid. Out of 1086 MSAF

deliveries , 861 (79.28%) newborns need no active intervention at birth and shifted to mother side and 225(20.72%) newborn need active intervention at births and admitted in NICU of the tertiary health care center Figure 1 representing the sex wise distribution of the newborn with MSAF required further intervention for their management.

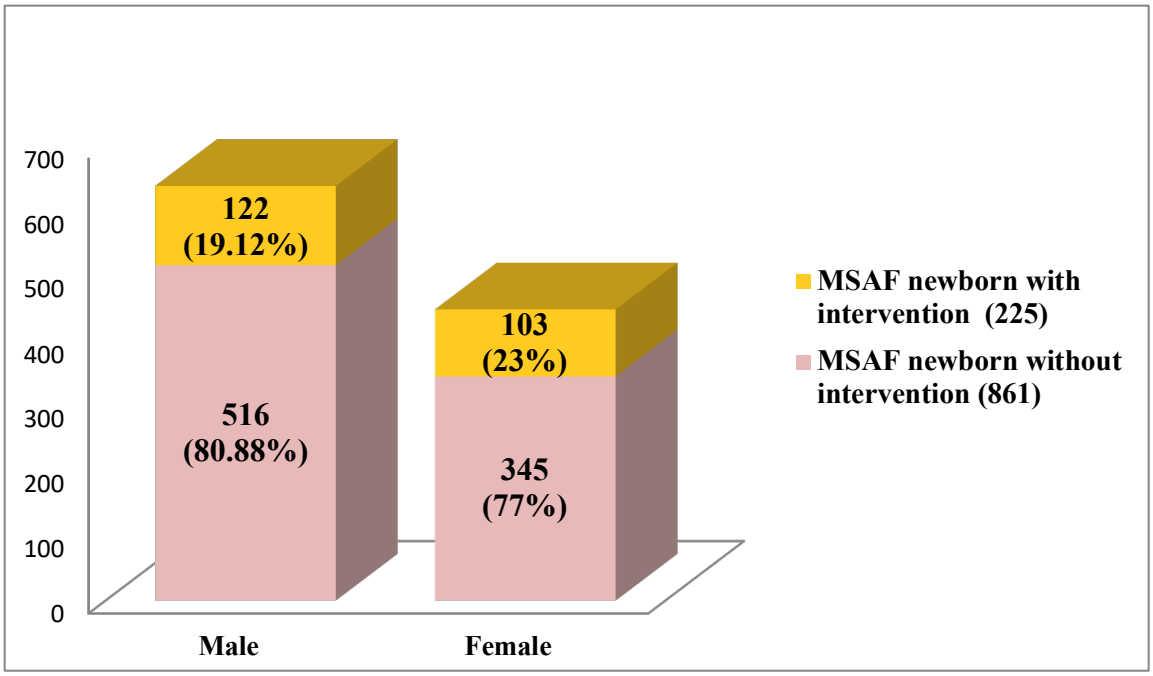

Figure 1: Sex wise distribution of Newborns with MSAF(1086)

(Sex ratio for MSAF newborns calculated 702/1000)

Table 1: Socio-demographic profile of the study participants (N=1086)

Socio-demographic Parameters	Socio-demographic Characteristics	MSAF newborn without intervention (861)	MSAF newborn with intervention (225)
Age of the mother	<30	691(80.25%)	179(79.56%)
	≥30	170(19.75%)	46(20.44%)
Religion	Hindu	612(71.08%)	157(69.78%)
	Muslim	238(27.64%)	62(27.56%)
	Others	11(1.28%)	6(2.66%)
Education	Illiterate	121(14.05%)	29(12.89%)
	Literate	740(85.95%)	196(87.11%)
Occupation	Housewife	413(47.97%)	116(51.55%)
	Job(Private/Government)	84(9.75%)	15(6.67%)
	Others(Farming & Laborers)	364(42.28%)	94(41.78%)
Residence	Rural	490(56.91%)	116(51.56%)
	Urban	371(43.09%)	109(48.44%)
Socio-economic-clas (Modified Kuppuswamy Scale)	Upper	34(3.95%)	11(4.98%)
	Upper-middle	197(22.89%)	39(17.34%)
	Lower-middle	269(31.24%)	59(26.22%)
	Upper-lower	204(23.69%)	61(27.11%)
	Lower	157(18.23%)	55(24.35%)

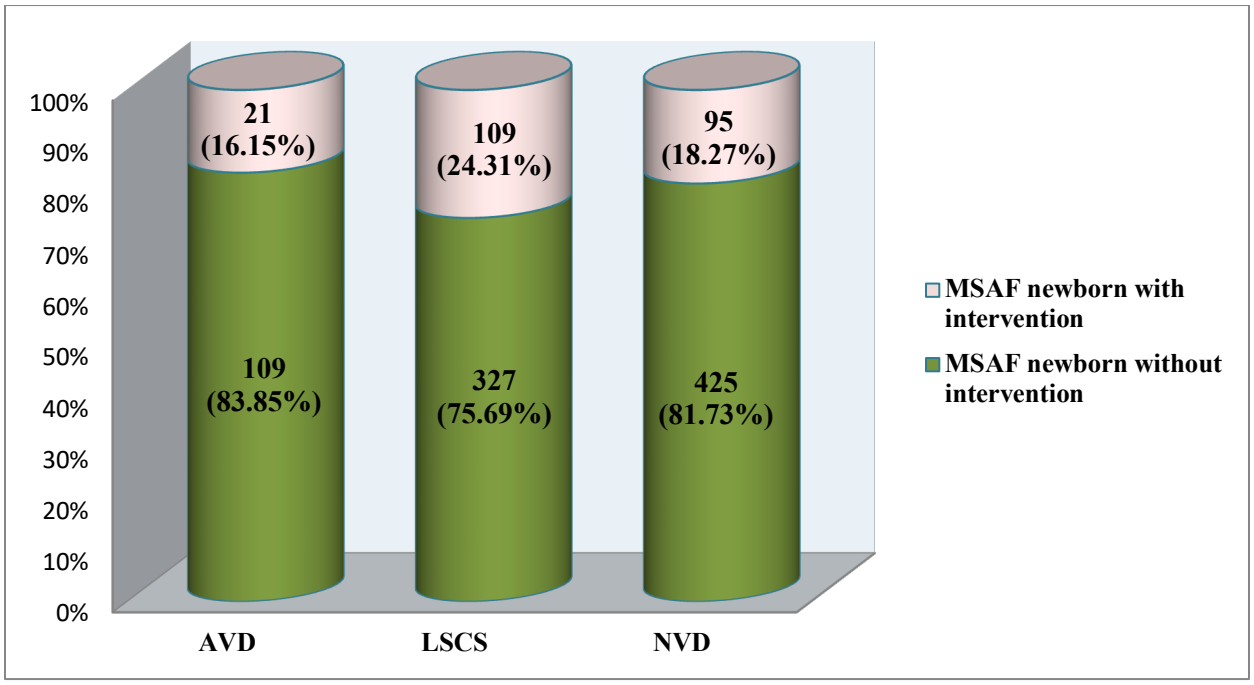

Figure 2: Mode of Delivery (N=1086)

Above figure depicted that MSAF newborn delivered by LSCS need intervention more as compared to the other modes of delivery.

Table 2: Relationship of Maternal Age Group with MSAF newborn (N=1086)

S. N.	Maternal age	MSAF newborn without intervention	MSAF newborn with intervention	
1.	18-24	423(49.12%)	117(52%)	Chi-square Statistic = 26.55 P Value = 0.00001 (<0.05)*
2.	25-32	216(25.09%)	82(36.44%)	
3.	33-39	193(22.41%)	19(8.44%)	
4.	40 and above	29(3.37%)	7(3.11%)	
Total		861(100%)	225(100%)	

MSAF newborn without intervention; Mean age of mothers = 26.48 & SD= 6.95 (95% CI)
MSAF newborn with intervention; Mean age of mothers = 25.19 & SD= 6.21(95% CI)

Table 3: Relation of Gestational age with MSAF Newborn (N=1086)

S. N.	Gestational Age	MSAF newborn without intervention	MSAF newborn with intervention	
1	Term (37-42 weeks)	543 (63.07%)	116 (51.55%)	Chi square statistic= 10.45 P value= 0.005*(< 0.05)
2	Pre-term (<37 weeks)	155 (18.00%)	49 (21.78%)	
3	Post-term (> 42 weeks)	163 (18.93%)	60 (26.67%)	
Total		861(100.00%)	225 (100.00%)	

MSAF newborn without intervention (Mean gestational age = 38.48 & SD= 2.74)
MSAF newborn with intervention (Mean gestational age = 39.15 & SD= 2.45)

Table 4: Relationship of other Maternal Risk Factor's with MSAF (N=1086)

Maternal Risk Factor	MSAF newborn without intervention (861)	MSAF newborn with intervention (225)	Chi-square Statistic (X^2) and P –Value
Anemia	357 (41.46%)	115 (51.1%)	X^2= 6.75, P =0.0093*
Gestational DM	25 (2.9%)	10 (4.4%)	X^2= 1.357, P= 0.24
PIH	72 (8.36%)	31 (13.8%)	X^2= 6.09, P = 0.013*
Pre-eclampsia/ Eclampsia	76 (8.83%)	37 (16.4%)	X^2= 11.10, P = 0.0008*
Foul smelling liquor	36 (4.18%)	14 (6.2%)	X^2= 1.69, P = 0.193
PROM	179 (20.79%)	55 (24.4%)	X^2= 1.409, P = 0.24
Oligohydroamnios	78 (9.06%)	25 (11.1%)	X^2= 0.874, P = 0.35
Polyhydroamnios	28 (3.25%)	10 (4.4%)	X^2= 0.75, P = 0.39
Primi-para	334(38.7%)	101 (44.9%)	X^2= 2.76, P = 0.09
Multi-para	527(61.2%)	124(55.1%)	

Table 5: Comparison of APGAR Score at 1 and 5 min in MSAF newborns (N=1086)

APGAR Score	Interpretation of APGAR Score	MSAF newborn without intervention	MSAF newborn with intervention
At 1 minute	Normal (7-10)	861	0
	Moderately depressed (4-6)	0	142(63.1%)
	Severely depressed (0-3)	0	83(36.9%)
Total		861	225
At 5 minute	Normal (7-10)	861	0
	Moderately depressed (4-6)	0	142(63.1%)
	Severely depressed (0-3)	0	83(36.9%)
Total		861	225

Table 6: Relation of birth weight with MSAF Newborns (N=1086)

S. No.	Birth weight (Kg)	MSAF newborn without intervention	MSAF newborn with intervention	
1	<2.5	176 (20.44%)	89 (39.55%)	Chi square statistic= 108.09 P value= 0.00001* (< 0.05)
2	2.5 – 3	543 (63.07%)	55(24.45%)	
3	>3	142(16.49%)	81(36.00%)	
Total		861(100.00%)	225 (100.00%)	

Mean = 2.634 & SD = 0.486

Discussion

In our study, total 9047 deliveries conducted in Past 12 Months (October-2020 to September 2021) of which 1086 neonates were Meconium Stained (MSAF) and thus the incidence calculated was 12%. These results were closed to the results of Kamala G *et al*, Goud & Krishna *et al* and Hari kumar *et al* where the incidence of MSAF calculated was 9.37%, 9.80% and 11.20% respectively [5-7].

In our study, (Figure 2) significant association had been observed between the mode of delivery of the newborn and the MSAF outcome in them(X^2= 8.414, P value= 0.014). Similarly in study of Rafia R *et al* and Sundaram R *et al* where presence of MSAF was significantly high in the mode of delivery by LSCS as compared to Normal vaginal delivery [8,9]. Similarly Erum *et al* and Chaudhary *et al* also found significant

association of MSAF with the LSCS as a mode of delivery [10,11].

In our study (Table 2), maternal age had a significant association with the intervention required or not among the MSAF newborn. Similarly Naveen *et al* and Sankhyan *et al* also found the significance association with the maternal age and thick MSAF [12,13]. while Rafia R *et al* and Sundaram R *et al* in their study found this relation as non significant [8,9]. In our study, there was significant association was found between the incidence of MSAF and the gestational age (Table 3). Similar finding was observed in the study of Greenwood *et al* where incidence of meconium passage was increases with the gestational age [14]. Rafia R *et al*, Naveen *et al* ,Becker *et al* , Mundra *et al*, and Desai *et al* also found the significant association between the MSAF and Gestational age [8,12,15-17].

In our study, (Table 4), maternal risk factors like Anemia, pregnancy induced hypertension and preeclampsia/eclampsia had shown significant association with the intervention required among MSAF newborn. While the other risk factors like Gestational diabetes, foul smelling liquor, premature rapture of membrane, oligo/polyhydramnios etc. although contributes as risk factors but effect was found non-significant in this study.

Mundra *et al* and Khatun *et al* also revealed pregnancy induced hypertension as contributing risk factors for MSAF in their studies [16,18]. Similarly in case-control study of Sundaram R *et al*, PIH and preeclampsia was found significant risk factors and Anemia, premature rapture of membrane, oligohydramnios was found non-significant risk factors for the presence of MSAF [9].

In our study, incidence of MSAF with intervention was observed more in the neonates with primipara as compared to multipara however finding was not stabilized significantly. In study of Sundaram R *et al* also MSAF was found more in cases as compared to controls in primipara [9]. Similar results was also observed in the study done by Kamala Ghokroo *et al* where more number of cases seen in primigravida [5].

In present study,(Table 5), among the MSAF newborn (N=225) those required further intervention for their management about 63% had APGAR score of (4-6) i.e. Moderately depressed and 37% had (0-3) i.e. Severely depressed as calculated at 1 minute and at 5 minutes. Sundaram R *et al* in their study had found significant difference among cases and controls for the APGAR score calculated at 1 minute and at 5 minutes [9].

In our study, (Table 6), birth-weight of newborn shown significant association between these two groups of newborn had incident of MSAF and no MSAF. Mean & SD calculated was 2.634 and 0.486 in Newborn with MSAF and 2.71 and 0.361 in Newborn without MSAF at 95% CI respectively. Similarly in study of Rafia R *et al*, Mean & SD of birth weight with meconium was calculated as 2.649 and 0.353 respectively [8]. In another study, Sedaghatian *et al* revealed that birth weight over 4 kg significantly increased the chance of MSAF [19].

Conclusion

This study found that among total numbers of delivery conducted in a tertiary level of health care center, about 12 % newborn had suffered from MSAF. Risk factors like mode by which the delivery of newborn had been conducted, maternal age, gestational age, birth weight and others maternal risk factors like anemia, PIH and preeclampsia had a significant association between the two group of newborns with MSAF.

While other maternal risk factors like parity level, amniotic fluid level, gestational DM and PROM were although present in newborn with MSAF but association was not found significantly among two groups.

Recommendations

In developing countries like INDIA, where most peripheral centres lack facilities for

managing high risk deliveries and giving essential newborn care, the role of anticipation and timely referral have great importance. Therefore identification of maternal factors may help to anticipate the need for neonatal resuscitation in delivery room which eventually helps to improve the perinatal outcome and reduce perinatal mortality and morbidity associated with MSAF.

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Ethical approval: Taken from the institutional ethical committee

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