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Risk factors for meconium stained amniotic fluid

Abstract

Background: The presence of meconium in amniotic fluid is considered as one of the foetal distress sign even though it can be a normal physiological phenomenon. The objective of the study was to determine maternal risk factors for meconium stained amniotic fluid.

Methods: This was a prospective observational study from October 2022 to November 2023.Women admitted in labour room and fulfilling eligibility criteria were included in the study.These were then classified into those with clear liquor or meconium stained Details regarding maternal risk factors were evaluated.

Results: Out of 250 women, 50 women had meconium stained liquor (MSL). Maternal risk factor- GDM, and obstetric factors- gravidity, cord around neck and intrauterine growth retardation had significant association with MSL.

Conclusion: Early identification of the women with risk factors in the antepartum and intrapartum period and close monitoring of these women during labour may help to reduce and early diagnose MSL.This may improve the perinatal outcome.

Keywords: amniotic fluid, foeto-placental risk factors, maternal risk factors, meconium stained

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Introduction

Meconium is germ - free black-green, odourless, rather sticky, and viscous material that starts to collect in foetal intestine after 12 weeks of gestation and released in liquor when peristalsis movements occur as a result of physiological phenomenon or foeto-maternal distress.[1] Meconium stained amniotic fluid (MSAF) can serve as an indicator of foetal bowel maturation and can also represent a secondary foetal distress sign due to hypoxia.[2] It is made of desquamated cells from alimentary track, skin, lanugo hairs, various gastrointestinal secretions, swallowed vernix caseosa.[3] Hyoxia occurrs due to interference in oxygen transport through placenta. The etiological factors are usually maternal. Maternal risk factors may be obstetric factors or medical conditions.[4] Meconium is a major cause of maternal and neonatal morbidity and mortality.

The incidence of meconium stained amniotic fluid has never been evaluated in settings which caters to population of rural Rajasthan. These women are from poor socio-economic group, of lower literacy status ans usually delay seeking healthcare. Hence this study was undertaken. Early identification of high risk cases can reduce incidence of MSAF and immediate delivery with better neonatal resuscitation services can improve neonatal and perinatal outcomes decreasing perinatal morbidity and mortality. The study aimed to evaluate the maternal risk factors for MSAF.

Method

This was a hospital based observational prospective descriptive study conducted in Department of Obstetrics and Gynaecology, SMS Medical College, Jaipur. It was conducted from October 2022 to November 2023. Institutional review board and ethics committee approval was taken prior to study. Women with single, cephalic, live pregnancy, more than 28 weeks in spontaneous labour, who were willing to participate and gave written informed consent and not included in any other study were included. Women with breech presentation and congenital anomalies were excluded. After applying inclusion and exclusion criteria pregnant women included in the study formed the study population.

Sample size was calculated at 95% confidence interval assuming 17.5% of meconium stained liquor in pregnancy as found in article of Addis, et al.[5] At the absolute allowable error of 5%, minimum 225 pregnancies calculated as sample size that were further enhanced to 250 pregnancies as final sample size expecting 10%dropout/ loss to follow up.

Written informed consent taken and all eligible women were monitored. When they passed meconium in amniotic fluid, they were selected as case and those who had a clear liquor were included in the control group. All eligible women were admitted in labour room. Complete history was taken, physical, systemic and per vaginal examination done. Labour was monitored closely for foetal heart rate at regular intervals, progress of labour, duration of labour. Outcome of labour was also noted. Obstetrics management done as per protocol. Details and Management after detection of MSL also noted. All data were recorded in a prestructured Performa, analysis was done and conclusions were drawn. Recommendation were made. Statistical analysis was done by using Medcalc 16.4 version software.

Results

Total 250 women were included in the study and kept under observation during labour. They were closely monitored. Women who passed meconium were categorized as meconium stained liquor (MSL) group and other group was of women with clear liquor. Of the 200 women with clear liquor, 52% were multigravida and 48% primigravida. In MSL group 66% cases were primigravida and 34% were multigravida. There was statistically significant association between gravidity and MSL ($p < 0.05$). The primigravida women were at a higher risk of having MSL compared to multigravida women (Table 1). Women with hypertensive disease in pregnancy (HDP) had 2.340 times higher odds of developing MSL compared to women without HDP. Women with gestational diabetes mellitus (GDM) had 4.04 times higher odds of developing MSL compared to women without GDM and this association was statistically significant ($p<0.05$) (Table 2).

Table 1 Association of gravidity with MSL

Gravida	Clear liquor (n = 200)		MSL (n = 50)		Odd's ratio	Test of significance
	No.	%	No.	%		
Primigravida	96	48	33	66	1	x^2=5.189 Df=1 p=0.023
Multigravida	104	52	17	34	0.476(0.249-0.909)	

Table 2 Association of maternal risk factors with MSL

Maternal risk factors	Clear liquor (n=200)		MSL (n=50)		Odd's ratio	X^2	p-value
	No.	%	No.	%			
HDP	15	7.5	8	16	2.349(0.935-5.902)	3.46	0.063
Anaemia	46	23	11	22	0.944(0.448-1.991)	0.023	0.88
GDM	9	4.5	8	16	4.042(1.473-11.090)	8.347	0.004
Hypothyroidism	-	-	3	6	-	12.146	<0.001

Women with cord around neck and intrauterine growth retardation (IUGR) had 2.429 and 4.042 times respectively higher odds of developing MSL compared to women without these and both these association was statistically significant($p<0.05$). Women having preterm birth had 1.362times higher odds of developing MSL, women with postdatism had 2.190times higher odds of developing MSL (Table 3).

Table 3 Association of obstetrics risk factors with MSL

Obstetrics risk factors	Clear liquor (n=200)		MSL (n=50)		Odd's ratio	x^2	P value
	No.	%	No.	%			
Cord around neck	35	17.5	17	34	2.429(1.219-4.839)	6.611	0.010
IUGR	9	4.5	8	16	4.042(1.473-11.090)	8.347	0.004
Preterm	12	6	4	8	1.362(0.420-4.419)	0.267	0.605
Oligohydramnios	5	2.5	1	2	0.796(0.091-6.969)	0.043	0.836
Polyhydramnios	1	0.5	-	-	-	0.251	0.616
Postdatism	16	8	8	16	2.190(0.880-5.455)	2.95	0.086

Women with premature rupture of membrane (PROM), prolonged labour and preterm premature rupture of membrane (PPROM) had 2.550, 2.358 and 1.362 times higher odds compared to those without same risk factors respectively. ($p>0.05$) (Table 4).

Table 4 Association of Labour Associated Risk Factors with MSL

Obstetrics risk factors (during labour)	Clear liquor (n=200)		MSL (n=50)		Odd's ratio	x^2	p-value
	No.	%	No.	%			
PROM	12	6	7	14	2.550(0.948-6.859)	3.645	0.056
PPROM	12	6	4	8	1.362(0.420-4.419)	0.267	0.605
Prolonged labour	9	4.5	5	10	2.358(0.754-7.376)	2.289	0.13

Discussion

In present study 66% MSAF cases were primigravida.There was significant association between primigravida and MSAF with p-value 0.023. Similar results observed in various studies like Niranjan K, et al., who also observed that majority of the women with meconium stained amniotic fluid were primigravida (55 %), Gokhroo K, et al., Harikumar, et al., and Chaudhary R, et al., all reported that primigravida have increased risk for MSL.[6–9] Primigravidae take longer time for cervical dilatation and descent of head. Cervical dystocia risk is also higher in primigravida as compared to multigravida, hence primigravida have higher risk of MSL.

In present study, 22% MSAF cases were anaemic Women with GDM had 4.04 times higher odds of developing MSL compared to women without GDM and this association was statistically significant ($p<0.05$). Women with HDP had 2.39 times higher risk than non-HDP women. Similar results found in various studies also like Chand et al. reported that women with MSL had higher incidence of diabetes mellitus and HDP 7% and 17% respectively.[10] Hanoudi, et al.[11] in study from Iraq observed that of the women with MSL 5.2% had DM and 12.2% had hypertension.[11] In a study Addis et al. found that HDP had a significantly association with development of MSL.[5] In another study by Pendse V, et al. 26.5% women with hypertension had MSL.[12]

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In a similar study done by Chaudhary R, et al. also found that HDP, GDM and anaemia were risk factors for MSL.[9] Similar risk factors are also mentioned in studies by Dohbit, et al.,[13] Avula TR, et al.,[14] Gurubacharya.[15] In another study, Bhinder OS, et al. also concluded that HDP (13.6%), GDM (12.8%) anaemia (26.4%) etc. were risk factors for MSL and had poor neonatal outcome.[16] Diabetes, HDP, anaemia have effect on the placental circulation and on foetal growth. These foetus are more prone to develop asphyxia leading to passage of meconium.

In present study, in women with cord around neck 34% had MSAF whereas those with IUGR had MSAF in 16%. Women with IUGR had 4.042 times higher odds, cord around neck had 2.42 times higher odd for MSAF. Similar results seen in studies by Sankhayan et al. reported 13.2%, IUGR and 10.1% cord problems in women who had MSL.[17] In a study, Bhinder OS et al. observed that mothers with cord around neck and true knots (15.2%), IUGR (9.6%) were risk factors for MSL.[16] In study by Chhetri UD, et al. IUGR, oligohydramnios, antepartum haemorrhage were associated risk factors for MSL.[18] Sharma U et al. reported that IUGR was noted in 11% cases of MSL.[19]

Women with PROM had MSAF in 14% cases. In study done by Niranjan KS, et al., they found that prolonged labour (16.5%) and postmaturity (12.5%) were associated with meconium stained amniotic fluid.[6] In another study, Chhetri UD, et al., concluded that postdated pregnancy and PROM were risk factors for MSL.[18] In a similar study, Bhinder OS et al. observed that postmaturity and PROM were risk factors for MSL (10.4% and 9.6% respectively).[16] In study done by Sankhayan, et al., they found that prolonged duration of labour was associated with meconium stained amniotic fluid with statistical significance (p value < 0.005). They found 12.67% had PROM and 2.5% had prolonged labour.[17]

Women with these risk factors, have greater incidence of foetal hypoxia. This activates foetal physiological mechanism (Peristalsis movement of foetal intestine increases and anal sphincters relaxes) which leads to release of meconium in liquor.

Conclusion

Women with GDM, HDP, obstetric factors- primigravida, cord around neck or IUGR, premature rupture of membrane, prolonged labour and preterm premature rupture of membrane had significant association with meconium stained liquor. Early identification of the women with risk factors in the antepartum and intrapartum period and close monitoring of these women during labour may help to reduce the incidence of meconium stained liquor and may improve perinatal outcome.

Limitation of study

Long term follow up of the neonates was not done due to limitation of time. The study was performed in a single centre which is a tertiary referral center. This may not exactly represent all the population of the dry arid area, hence more field studies need to be done.

Ethical approval: The study was approved by the Institutional Ethics Committee

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Conflict of interest

None declared.

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