RISK FACTORS LEADING TO MECONIUM ASPIRATION SYNDROME IN MECONIUM-STAINED AMNIOTIC FLUID

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ABSTRACT

OBJECTIVES

This study aimed to find out the risk factors leading to meconium aspiration syndrome in patients having meconium-stained amniotic fluid.

METHODOLOGY

This comparative study was conducted in the department of Obstetrics and Gynaecology at Hayatabad Medical Complex from January 2022- June 2022. All patients admitted to the labour ward with the diagnosis of meconium-stained liquor (MSL) were included in the study through a convenient sampling technique. Patients were divided into two groups, group 1 having only meconium-stained amniotic fluid (MSAF) without meconium aspiration syndrome while group 2 having babies with the diagnosis of meconium aspiration syndrome (MAS). Both groups were compared for different risk factors for the development of MAS. Differences in the risk factors between the two groups were analyzed using Pearson's correlation with a p-value of <0.05 considered significant. SPSS vs 20 was used for statistical analysis.

RESULTS

84 patients were included in the study, i.e., 61 in group 1 and 23 in group 2. The mean age of the patients was 25± 3.45. The frequency of meconium-stained amniotic fluid was 3.83%. Meconium aspiration syndrome developed in 23 babies out of 84 MSAF deliveries (27.38%). Low APGAR score (< 0.00), patients handled outside the hospital (<0.001) and prolonged second stage (0.003) were significant risk factors for the development of MAS.

CONCLUSION

In the prolonged second stage, patients handled outside the hospital by unauthorized personnel and low APGAR score at birth were statistically significant risk factors for developing meconium aspiration syndrome.

KEYWORDS: *Meconium-Stained Amniotic Fluid, MeconiumAspiration Syndrome, Birth Asphyxia.*

INTRODUCTION

Meconium is a Greek word meaning "Opium" due to its tarry consistency, and they believe it induces sleep in the baby.[1] Meconium is sterile, particulate matter composed of intestinal epithelial cells, lanugo mucus, amniotic fluid, bile and water.[2] It appears in the fetal gut around 10-16 weeks.[3] Usually, the parasympathetic system is inactive/quiescent in utero. In post-term pregnancies and utero hypoxic insults, the parasympathetic system gets activated, leading to intestinal stimulation and anal sphincter relaxation leading to the passage of meconium. Meconium passage could also follow vagal stimulation from common but transient umbilical cord entrapment.[4] The presence of meconium-stained amniotic fluid (MSAF) has long been considered an indicator of poor fetal outcomes, such as meconium aspiration syndrome and birth asphyxia, which leads to perinatal morbidity and mortality. MSAF can predict adverse perinatal outcomes even in low-risk patients, so it should be treated as an independent risk factor for the development of MAS.[5,6] MSAF occurs in 10-15% of term pregnancies. In the post-term, the incidence is around 30%. Only 2-3% of babies develop MAS.[3,7] MAS is defined as respiratory distress occurring soon after birth in an infant born from a meconium-stained milieu with compatible radiological findings which cannot be otherwise explained.[8] MAS has multifactorial pathophysiology, which includes mechanical airway obstruction, inactivation of the surfactant, and activation of the inflammatory cascade. Although in the literature, different risk factors have been documented that lead to MAS in MSAF, e.g., post, term pregnancies oligohydramnios maternal medical disorders, intrauterine growth retardation, induced labour, prolonged labour, instrumental labour delivery.[9,10] However, still, it is not clear why some babies develop MAS. Different studies have documented that thick meconium, low APGAR score, non-reassuring CTG, oligohydramnios and male gender are associated with

meconium aspiration syndrome in MSAF.[11] Although the meconium-stained amniotic fluid and the risk factors for the development of MAS were well studied in developed countries, there is a paucity of locally generated evidence to design appropriate prevention strategies in the study area. Therefore, we have selected this topic to search for these risk factors in our local setup to design appropriate prevention strategies to improve the perinatal outcome.

METHODOLOGY

This comparative study was conducted in the department of Obstetrics and Gynaecology at Hayatabad Medical Complex from January 2022- June 2022 after approval from the local ethical committee (607/HEC/B nPSC/2022). All patients diagnosed with meconium-stained liquor (MSL) either at the time of admission or after the artificial rupture of membranes were included in the study through a convenient sampling technique. While patients having no MSL or those having intra-uterine death /congenitally abnormal babies were excluded from the study. All these patients were then managed per the labour suite's protocol. After delivery, patients were divided into two groups, group 1 having only meconium-stained amniotic fluid (MSAF) without meconium aspiration syndrome while group 2 having babies with the diagnosis of meconium aspiration syndrome (MAS). MAS was defined as respiratory distress occurring soon after birth in an infant born from a meconium-stained milieu with compatible radiological findings which cannot be otherwise explained.[1] Both groups were compared for different risk factors for the development of MAS. Risk factors were divided into antenatal, intra natal and postnatal. Antenatal risk factors included a period of gestation (POG), maternal medical disorders, intrauterine growth retardation (IUGR), and decreased amniotic fluid index. Intranatal risk factors included grade of MSL (Grade 1= light green in colour, Grade 2= reasonable amount of liquor with heavy suspension of meconium, Grade 3= thick meconium with scanty liquor), induced/spontaneous labour, patients already handled (mismanaged by nonprofessional personnel) outside the hospital, duration of labour, augmentation with oxytocin, mode of delivery. Postnatal risk factors include low APGAR (appearance, pulse, grimace, activity, respiration) score and birth weight. Data was collected on a predesigned proforma. Differences in the risk factors between the two groups were analyzed using Pearson's correlation with a p-value of <0.05 considered significant. SPSS vs 20 was used for statistical analysis.

RESULT

The mean age of the patients was 25±3.45. Most of the patients in both groups were primigravida. During the study period, 2190 term babies were delivered. Eighty-four babies were born with meconium-stained liquor, which constitutes 3.83% of all births. Meconium aspiration syndrome developed in 23 babies out of 84 MSAF deliveries. So, MAS frequency was 27.38% in all newborn babies born through MSAF. In the prolonged second stage, patients handled outside the hospital by unauthorized personnel and low APGAR score at birth were statistically significant risk factors for the development of meconium aspiration syndrome.

Table 1: Demographic Details (N=84)

		Frequencies (%ages)	
		Group 1(61)	Group 2(23)
Age(Years)	≤20 >20- 30 > 30	09 (14.75%) 34 (55.73%) 18 (29.50%)	01 (4.34%) 20 (86.95%) 02 (8.69%)
Gravidity	Primigravida Multigravida Grand Multigravida	33 (54.09%) 18 (29.50%) 10 (16.39%)	10 (43.47%) 08 (34.78%) 05 (21.73%)

Table 2: Risk Factors For the Development of Meconium Aspiration Syndrome (N=84)

Risk factors	Group 1 (61)	Group 2 (23)	P-Value
Instrumental Mode of Delivery: C/S NVD	 07 29 25	 05 09 09	0.47
Induction of Labour	05	02	0.941
Grade 1 MSL Grade 2 Grade 3	 07 21 33	0 05 18	0.78
Low APGAR Score	09	17	0.000
Augmentation of Labour	32	15	0.294
Handled case	02	06	0.001
≥37-40 weeks POG >40 weeks	39 22	16 07	0.628
<2.5kg Weight of Baby ≥2.5-3kg >3kg	0 28 33	01 14 08	0.098
Medical disorders	09	07	0.190
Prolonged Latent Phase	20	08	0.863
AFI ≤5cm	10	02	0.369
Prolonged Second Stage	14	13	0.003
IUGR	01	01	0.468

DISCUSSION

The present study has shown that patients having prolonged second stage, those who were handled outside the hospital and babies delivered with low APGAR scores, were significant risk factors for developing meconium aspiration syndrome in patients with MSAF. In our study low, APGAR score was the most critical risk factor for the development of MAS (0.000). Similar results were shown by Rovas L et al. in their study.[12] Other studies have also shown that babies born through MSAF with low APGAR scores were at high risk of developing MAS. Therefore, these babies should be carefully inspected after delivery.[13,14] Fischer et al. have also observed a significant correlation between low APGAR scores and the development of MAS ($p<0.0001$).[8] Mehta et al. documented that patients with MAS had a 9.656 times higher risk for perinatal asphyxia.[15] Another important risk factor for developing MAS was patients handled outside a hospital by injudicious use of prostaglandins or oxytocin for labour induction or augmentation. In a study conducted by Shah S et al., it has been documented that significant severe birth asphyxia ($p <0.001$) and prolonged labour occurred in patients who were handled by nonprofessional personnel by unregulated medications for labour induction.[16] Birth-related events play an essential role in the appearance of MAS. In our study, the prolonged second stage was a significant risk factor for MAS. Rovas et al. have demonstrated a significant relationship between the prolonged second stage and the occurrence of MAS ($p= 0.00$).[12] Benny PS et al. also show a significant association between MAS and prolonged second stage.[17] Interestingly Woneui C et al. reported that severe MAS was associated with the shorter second stage of labour.[18] We have not determined any statistically significant difference between the two groups regarding other risk factors, i.e., medical disorders, period of gestation, intrauterine growth retardation, grade of MSL, mode of delivery, birth weight, prolonged latent phase, amniotic fluid index and augmentation with oxytocin. However, studies have shown that different pregnancy-associated conditions, such as urogenital tract infections, maternal anaemia and respiratory tract infections, are associated with MAS.[17,19,20] Fischer et al. have shown that oligohydramnios (0.62), intrauterine growth retardation (IUGR), hypertensive disorders (0.28), gestational diabetes (0.16), induction of labour (0.83) and birth weight (0.33) were not a significant risk factor for the development of meconium aspiration syndrome.[8] Some studies suggested that prevention of post-term pregnancy prevents severe MAS.[21,22] The earlier induction of labour (e.g., by 41 weeks) may prove beneficial for the prevention of MAS, as shown by Ross.[23] However, the incidence of MAS in neonates born through MSAF does not vary significantly with GA in our study. Most cases of MAS are not directly caused by aspiration of meconium but are related to different pathological processes leading to chronic asphyxia in utero.[19] Rovas L et al. have shown that hypertensive disorders were not a significant risk factor for the development of MAS.[12] Although other studies have documented that pregnancy-induced hypertension was related to an increased risk of MAS.[24] In our study, the consistency of meconium was not a significant risk factor for the development of MAS. Other studies have also documented that the thickness of meconium is not an independent risk factor for the development of MAS. It is significant if associated with other risk factors, e.g., non, reassuring CTG, low APGAR score at birth.[12,24] Although Fischer et al. has documented that the thickness of meconium is a significant risk factor for MAS.[8] The study has shown that the risk of pathological fetal heart rate patterns, operative vaginal and cesarean section, need for neonatal resuscitation, low Apgar scores and higher neonatal mortality increased as the consistency of the amniotic fluid thickened.[25]

LIMITATIONS

This study was conducted in a single centre on limited patients. We need to conduct large-scale studies to find the significance.

CONCLUSION

Present study has shown that although there are different risk factors for developing MAS in patients with MSAF. However, only prolonged second stage, patients handled outside the hospital by unauthorized personnel and low APGAR score at birth were statistically significant for the development of MAS.

CONFLICT OF INTEREST: None

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REFERENCES

1. Gebretsadik W, Degefa N, Getahun D, Kassie N. Determinants of Meconium-Stained Amniotic Fluid at Hadiya Zone Hospitals, Southern Ethiopia; Unmatched Case-Control Study. International Journal of Women's Health. 2022 Sep 16;14:1351-60.
2. Shrestha A, Singh SD, Tamrakar D. Associated factors and outcome of babies born through meconium stained amniotic fluid. Kathmandu Univ Med J. 2018 Jan 1;61(1):65-8.
3. Monfredini C, Cavallin F, Villani PE, Paterlini G, Allais B,

Trevisanuto D. Meconium aspiration syndrome: A narrative review. Children. 2021 Mar 17;8(3):230.
4. Lemma K, Misker D, Kassa M, Abdulkadir H, Otayto K. Determinants of birth asphyxia among newborn live births in public hospitals of Gamo and Gofa zones, Southern Ethiopia. BMC pediatrics. 2022 Dec;22(1):1-3.
5. Goel A, Nangia S. Meconium aspiration syndrome: challenges and solutions. Res Rep Neonatol. 2017 Aug 16;7(1):19-28.
6. Tolu LB, Birara M, Teshome T, Feyissa GT. Perinatal outcome of meconium stained amniotic fluid among labouring mothers at teaching referral hospital in urban Ethiopia. PloS one. 2020 Nov 13;15(11):e0242025.
7. Addisu D, Asres A, Gedefaw G, Asmer S. Prevalence of meconium stained amniotic fluid and its associated factors among women who gave birth at term in Felege Hiwot comprehensive specialized referral hospital, North West Ethiopia: a facility based cross-sectional study. BMC pregnancy and childbirth. 2018 Dec;18(1):1-7.
8. Fischer C, Rybakowski C, Ferdynus C, Sagot P, Gouyon JB. A population-based study of meconium aspiration syndrome in neonates born between 37 and 43 weeks of gestation. International journal of pediatrics. 2012 Jan 1;2012.
9. Parween S, Prasad D, Poonam P, Ahmar R, Sinha A, Ranjana R. Impact of Meconium-Stained Amniotic Fluid on Neonatal Outcome in a Tertiary Hospital. Cureus. 2022 Apr 25;14(4).Kaoje AU, Labaran S, Magashi AG, Ango JT. Improving maternal and child health: a situational analysis of primary health care centres of Sokoto state, Nigeria. Int J Community Med Public Health. 2018;5:11.
10. Chand S, Salman A, Abbassi RM, Siyal AR, Ahmed F, Leghari AL, Kabani AS, Ali S. Factors leading to meconium aspiration syndrome in term-and post-term neonates. Cureus. 2019 Sep 5;11(9).
11. Rovas L, Razbadauskas A, Boguziene E. Risk factors that can lead to development of meconium aspiration syndrome. Obstet Gynecol Int J. 2018;9(3):208-12.
12. Joseph K, UdayKiran G, Reddy DR, Jain CS. Incidence of meconium aspiration syndrome and associated risk factors in babies born to mothers with meconium stained amniotic fluid. Int J Contemp Med Res. 2017;4(7):1457-61.
13. Buzdar N. Factors leading to meconium aspiration syndrome in neonates. Journal of Rawalpindi Medical College. 2017 Dec 30;21(4):371-5.
14. Mehta V, Adarsh E, Spoorthi Spoorthi, Archana Archana, Hassan M. Meconium-stained amniotic fluid as a risk factor for perinatal asphyxia. Int J Contemp Pediatr. 2019;6:325–328.
15. Shah S, Van den Bergh R, Prinsloo JR, Rehman G, Bibi A, Shaeen N, Auat R, Daudi SM, Njenga JW, Khilji TB, Maïkéré J. Unregulated usage of labour-inducing medication in a region of Pakistan with poor drug regulatory control: characteristics and risk patterns. International health. 2016 Mar 1;8(2):89-95.
16. Benny PS, Malani S, Hoby MA, Hutton JD. Meconium aspiration – role of obstetric factors and suction. Australian and New Zealand Journal of Obstetrics and Gynaecology. 1987 Feb;27(1):36-9.
17. Choi W, Jeong H, Choi SJ, Oh SY, Kim JS, Roh CR, Kim JH. Risk factors differentiating mild/moderate from severe meconium aspiration syndrome in meconium-stained neonates. Obstetrics & gynecology science. 2015 Jan 16;58(1):24-31.
18. Mohammad N, Jamal T, Sohaila A, Ali SR. Meconium stained liquor and its neonatal outcome. Pakistan journal of medical sciences. 2018 Nov;34(6):1392.
19. Bhutani VK. Developing a systems approach to prevent meconium aspiration syndrome: lessons learned from multinational studies. Journal of Perinatology. 2008 Dec;28(3):S30-5.
20. Yoder BA, Kirsch EA, Barth WH, et al. Changing obstetric practices associated with decreasing incidence of meconium aspiration syndrome. Obstet Gynecol. 2002;99(5 Pt 1):731–9.
21. Dargaville PA, Copnell B. Australian and New Zealand Neonatal Network. The epidemiology of meconium aspiration syndrome: incidence, risk factors, therapies, and outcome. Pediatrics. 2006 May;117(5):1712-21.
22. Ross MG. Meconium aspiration syndrome more than intrapartum meconium. New England Journal of Medicine. 2005 Sep 1;353(9):946-8.
23. Paz Y, Solt I, Zimmer EZ. Variables associated with meconium aspiration syndrome in labors with thick meconium. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2001 Jan 1;94(1): 27-30.
24. Fernández VR, y Cajal CN, Ortiz EM, Naveira EC. Intrapartum and perinatal results associated with different degrees of staining of meconium stained amniotic fluid. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2018 Sep 1;228:65-70.

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