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Risk Factors and Outcomes of Meconium Stained Liquor Babies in Tertiary Care Neonatal Unit

Nida Sarwar, Khurram Fayyaz, Imrana Ata, Sehar Aslam, Hajra Begum, Khubaib Ahmad

Abstract

Objective: The purpose of this research was to examine the variables affecting the mother and the baby when amniotic fluid is tainted with meconium during pregnancy.

Study design and setting: This cross-sectional study was conducted at PNS Shifa Hospital, Karachi, from July 15th, 2023, to December 30th, 2023.

Methodology: It involved non-probability consecutive sampling of patients with a gestational age over 37 weeks who presented with meconium-stained liquor during labor. Newborns with congenital defects were excluded, resulting in a study sample size where basic demographic and clinical data were collected. Data analysis was performed using SPSS 26, with continuous variables expressed as mean ± SD and categorical variables in frequency and percentages.

Results: Meconium stained amniotic fluid (MASF) was seen in 60 (4.8%) of the 1232 births that occurred during the research period. Meconium aspiration syndrome affected 22 of 60 (36 %) newborns with MSAF. There was a substantial correlation between thick meconium stained liquor and a low Apgar score, an unsettling CTG, MAS, or the need for an emergency C-section. A total of 41 newborns (68% of the total) were diagnosed with thin meconium, although only 85% of those infants showed no symptoms. Important risk variables for MAS were PIH, anemia and GDM (P 0.002, 0.002, <0.0001 respectively), and parity was related in a significant manner

Conclusion: Low Apgar scores, higher rates of emergency caesarean sections, and meconium aspiration syndrome were all linked to meconium-stained amniotic fluid. Risk factors for MAS included maternal anemia, hypertension, and gestational diabetes.

KEYWORDS: Meconium, Liquor Babies, Tertiary Care Neonatal Unit

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Nida Sarwar *(Corresponding Author)*
PG Trainee Department of Pediatrics
PNS Shifa Hospital, Karachi
Email: nida106584@gmail.com

Khurram Fayyaz
Assistant Professor, Department of Pediatrics
PNS Shifa Hospital, Karachi
Email: Kfc113@hotmail.com

Imrana Ata
Consultant, Department of Pediatrics
PNS Shifa Hospital, Karachi
Email: Imranaata.dr@gmail.com

Sehar Aslam
PG Trainee, Department of Pediatrics
PNS Shifa Hospital, Karachi
Email: seharaslam126@gmail.com

Hajra Begum
PG Trainee, Department of Pediatrics
PNS Shifa Hospital, Karachi
Email: hajrakhan70@gmail.com

Khubaib Ahmad
House Officer
PNS Shifa Hospital, Karachi
Email: khubaibahmadsiddiqui@gmail.com

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INTRODUCTION:

Amniotic fluid surrounds the fetus in the uterus, creating a safe and easygoing environment for the developing infant. Amniotic membranes, fetal skin, and fetal urine all contribute to the production of amniotic fluid. Newborn babies routinely pass meconium, a dark green liquid that includes mucus, bile, and epithelial cells. Meconium is released into the amniotic fluid when the fetus is under pressure. Fetal compromise is indicated by its existence, and it is linked to higher perinatal morbidity and death.[1] A greater incidence of instrumental delivery, caesarean section, low birth weight, fetal distress, admission to the neonatal intensive care unit (NICU), and newborn mortality is linked to meconium-stained amniotic fluid (MSAF).[2,3] One-fifth to one-sixteenth of all births[3] are impacted by MSAF. Aspiration of meconium results in meconium aspiration syndrome (MAS), which affects 2–10% of infants with MSAF.[4] Infants born with MAS have a mortality rate of around 12%.[5] It's possible that having MSAF indicates that your digestive system is developing normally. Fetal distress may occur in response to either acute or chronic hypoxia.[4-6] Meconium leaks from the fetus into the amniotic fluid if there is an acute or chronic hypoxic event affecting the fetus. Maternal drug usage,

postdated pregnancy, hypertension, preeclampsia, and oligohydramnios are all risk factors for the delivery of MSAF.[7] It is clear that MSAF is linked to worse perinatal outcomes, hence a well-designed research is necessary to learn more about this connection. Several needless caesarean sections are performed because of the lack of understanding on how to handle labour in MSAF. While there have been several research on the topic in various areas of India, there have been surprisingly few well-designed comparative studies in the country's northeast. In Shillong, researchers Mundhra and Agarwal did one such study.[3] Perinatal mortality and morbidity are reduced and perinatal outcomes are improved when maternal variables that predict the need for newborn resuscitation in the delivery room are identified. The purpose of this research was to examine the variables affecting the mother and the baby when amniotic fluid is tainted with meconium during pregnancy.

The scope of this study is to meticulously analyze the multifaceted consequences of meconium-stained amniotic fluid (MSAF) on perinatal outcomes, focusing particularly on the maternal and fetal factors that influence the prevalence and severity of this condition. By delving into the impacts of MSAF in a region with sparse comprehensive data, this research seeks to fill a critical gap in understanding that could inform better clinical practices across diverse healthcare settings. The rationale behind the study stems from the observed need to reduce unnecessary medical interventions, such as caesarean sections, by enhancing the understanding of MSAF's pathophysiology and its direct effects on neonatal health outcomes. By identifying specific risk factors and outcomes associated with MSAF, this research aims to provide evidence-based guidelines for managing labor and delivery in cases complicated by meconium presence, ultimately improving survival rates and health outcomes for newborns.

METHODOLOGY:

After the ethical approval from institutional review board, this crossectional study was conducted at PNS Shifa hospital Karachi from 15th July 2023 to 30th December 2023. Through non-probability consecutive sampling, patients having a gestational age >37 weeks, who presented with meconium stained liquor after spontaneous or artificial rupture of membranes during labour and a cephalic presentation were included in the present study, and their records were examined; newborns with congenital defects were excluded. Basic demographic information such as gestational age, gender of baby, birth weight, maternal clinical characteristics, obstetric and medical complications during pregnancy, premature membrane rupture (PROM), meconium grades, mode of delivery, and neonatal outcome were collected from clinical notes and entered into a pre-designed proforma (APGAR score, type of resuscitation, meconium aspiration syndrome and need for admission in nursery). Preterm birth is defined as a delivery date that occurs before 37 weeks of gestation and term birth as a delivery date that occurs at or beyond 37 weeks of gestation. Standardized equipment was used for regular anthropometric measurements of newborns by the attending nurse in the delivery room or operating theatre. A standard weighing scale in kilograms was used to test body mass index (BMI) with the subject naked. To prevent errors, the scale's calibration was checked before each measurement, the baby was placed on the scale so that its entire body was on the scale, and the weight was adjusted until the balance beam was in the centre. The reading was then recorded and plotted on specific WHO growth charts (Fenton growth chart), and the percentiles were noted. Babies with birth weights of less than 2.5 kilograms were classified as having low birth weight (LBW). Maternal age, parity, and the prevalence of obstetric problems including hypertension, anemia, and gestational diabetes, as well as information on antenatal care (ANC) services, were collected. Meconium was divided into two groups based on its consistency: thin and thick. Thin meconium was characterized as a little greenish staining of amniotic fluid, whereas thick meconium was classified as a dark greenish staining of amniotic fluid including particle materials. Nine analyses compared meconium grades in an effort to find a link between the severity of meconium and adverse newborn outcomes. CTG was also recoded, with categories created for reassuring and non-reassuring results, as was the method of birth (caesarean section C/S, vaginal delivery with and without instrumental delivery). Birth weight, time until nursery admission, symptoms, and the onset of meconium aspiration

Table: 1 Neonatal and maternal demographic Characteristics

Parameters	Statistics
Gestational age (week)	38.22±1.24
Birth weight (kg)	3.3±0.49
Maternal Age (year)	26.9±3.9
Gender	
Male	20 (33%)
Female	40 (66%)
Parity	
Primipara	39 (65%)
Multipara	21 (35%)
Pregnancy induced hypertension (PIH)	11 (18%)
Gestational Diabetes	25 (41%)
Anemia in pregnancy	38 (63%)
Grades of MSAF	
Thin	41 (68%)
Thick	19 (31%)
IUGR	10 (16%)
PROM	25 (41%)
Rupture of membrane	
Spontaneous	25 (41%)
Artificial	35 (58%)
Non-reassuring CTG	33 (55%)

syndrome (MAS) were all measured as indicators of neonatal outcome. When symptoms of meconium aspiration syndrome developed after delivery, it was determined that the baby had meconium aspiration syndrome (i.e. dyspnea, tachypnea, retraction, grunting or cyanosis). Data was analyzed by SPSS 26. Results for continuous variables were expressed as mean ± SD. Frequency and percentage was calculated for categorical variables. The t-test was applied between grades of meconium and neonatal outcome and the p-value =0.05 was considered to be statistically significant.

RESULTS:

Meconium stained amniotic fluid (MASF) was seen in 60 (4.8%) of the 1232 births that occurred during the research period. Meconium aspiration syndrome affected 22 of 60 (36 %) newborns with MSAF. Table 1 shows the clinical parameters of mother and their neonates. Mean± S. D of gestational age of the study participants was 38.22±1.24 weeks. Mean± S. D of neonate's birth weight of the study participants was 3.3±0.49 Kg. Mean± S. D of mother's age of the study participants was 26.9±3.9 years. Table 2 displays the correlation between the severity of meconium and the neonatal outcome and delivery method. There was a substantial correlation between thick meconium stained liquor and a low Apgar score, an unsettling CTG, MAS, or the need for an emergency C-section. A total of 41 newborns (68% of the total) were diagnosed with thin meconium, although only 85% of those infants showed no symptoms. Important risk variables for MAS were PIH, anemia and GDM (P 0.002, 0.002, <0.0001 respectively), and parity was related in a significant manner. Maternal risk factors for MSAF are shown in Table 3 in comparison to the MAS group.

Table: 2 Neonatal outcome and mode of delivery in relation to grades of meconium

Neonatal outcomes	Thin (n=41)	Thick (n=19)	P value
Remained Asymptomatic	35 (85%)	12 (63%)	0.005
Low APGAR<7	3 (7%)	10 (52%)	0.005
LBW	15 (36%)	4 (21%)	<0.0001
IUGR	9 (22%)	2 (10%)	0.005
Non-Reassuring CTG	30 (73%)	10 (52%)	0.001
Immediate resuscitation	13 (32%)	4 (21%)	0.001
endotracheal suctioning	8 (19%)	3 (16%)	0.021
Nursery admission	20 (49%)	10 (52%)	0.001
MAS	15 (36%)	7 (37%)	0.002

Table 3: Maternal factors associated with meconium stained amniotic fluid and meconium aspiration syndrome.

Maternal factor	MSAF (n=60)	MAS (n=22)	p-value
Antenatal care			
Booked	35 (58%)	3 (13%)	<0.0001
Un-booked	25 (42%)	19 (86%)	0.002
Parity			
Primipara	39 (65%)	14 (63%)	<0.0001
Multipara	21 (35%)	8 (36%)	0.005
Anemia in pregnancy	38 (63%)	15 (68%)	0.002
PIH	11 (18%)	3 (13%)	0.002
GDM	25 (41%)	8 (36%)	<0.0001
PROM	25 (41%)	6 (27%)	<0.0001
MOD			
SVD	20 (33%)	3 (13%)	0.56
C-Section	40 (66%)	19 (86%)	0.83

DISCUSSION:

A problem for both obstetricians and pediatricians, meconium-stained amniotic fluid (MSAF) is linked to increased rates of caesarean delivery, perinatal morbidity, and death. Amniotic fluid stains with meconium range from 12% to 20%.[8] It tends to be greater in less developed nations. The prevalence of MSAF was 4.8% in our sample. This research provides clear evidence that the prevalence of MSAF rises along with maternal age at delivery. Similar results were shown in the research by Desai et al., in which all of the instances occurred after 37 weeks of pregnancy.[9] Thin meconium stained fluid was identified in 68% of instances, whereas thick meconium was found in 31%; these results are in line with those of Hanoudi's[10] research, but differ with those of Khazardoost et al., who showed that 10.6% of patients had thin meconium and 89.4% had thick meconium.[11] We discovered that 45% of patients with MSAF had reassuring CTG and the remaining 55% had non-reassuring CTG, which was mostly linked with thick meconium (p-value 0.001), while Desai et al did not identify any connection between CTG pattern and thick meconium.[9] More women with thin meconium than thick meconium received caesarean section (83% vs 63%, p-value 0.005), suggesting that obstetricians are more active when treating labour in women with MSAF, resulting in a higher caesarean section rate. Consistent with these results, Kumar S et al.[12] found that thin meconium was associated with a greater rate of caesarean birth (72% vs 21%). Thick meconium may develop later in the second stage, which might explain the phenomenon. Desai's research also found that compared to the control group, infants with thick meconium were more likely to be admitted to a nursery.[9] There was a statistically significant difference between the groups since the vast majority of newborns in both groups (thin and thick) needed resuscitation. In situations of thick meconium, endotracheal suction was required (p-value 0.021). In our analysis, MAS was detected in 1.7 percent of all births and 36 percent of MSAF cases, and it was more often seen in instances with thick meconium than thin meconium, both of which are recognized complications of MSAF.[13,16,17] Strategies to avoid MAS should be feasible, safe, effective, and based on risk assessment since it increases newborn intensive care unit hospitalizations and long-term morbidity and death. A higher prevalence of MAS among infants delivered to un-booked moms (p 0.002) highlights the need for prenatal care.

Although none of the moms in this research developed preeclampsia, anemia in pregnancy, gestational diabetes, PIH, and early rupture of membranes were all substantially linked with MAS. High rates of MAS were shown to be connected to maternal anemia and hypertension (p=0.002). Maternal anemia and PIH were reported to be prenatal risk factors for MAS by Ashtekar in India[14]. In contrast to the findings of Aviram A et al. and Kashikar et al., we found a statistically significant connection between gestational diabetes and MAS (p <0.0001) .[15,17]

The significance of this study lies in its potential to inform and improve clinical practices and decision-making processes in managing pregnancies complicated by MSAF. By establishing clear correlations between the nature of MSAF and perinatal outcomes, the study provides evidence that could lead to more targeted interventions. Additionally, the study highlights the importance of prenatal care, as evidenced by the correlation between un-booked mothers and a higher prevalence of MAS, suggesting that timely and adequate prenatal monitoring could mitigate some of the risks associated with MSAF. Ultimately, the findings advocate for refined strategies to prevent MAS, which is crucial for reducing intensive care admissions and long-term negative outcomes for newborns. This research, therefore, has significant implications for both clinical practice and public health policies aimed at improving maternal and neonatal care. The foremost limitation is the small sample size and is limited to a single center. The educational and economic status of the mother was not studied, which forms an important basis for the prevalence of MAS and eventually MSAF. We have not compared the MSAF group with the clear liquor group. Additionally, the consistency of the meconium-stained liquor was not classified, which might have provided more insight into the varying outcomes. Future research should aim to include larger sample sizes and multi-center studies to enhance the generalizability of the findings. It is also crucial to investigate the impact of maternal educational and economic status on MSAF and MAS outcomes. Comparative studies between MSAF and clear amniotic fluid groups could provide a clearer understanding of the risk factors and outcomes. Additionally, classifying the consistency of meconium-stained liquor could offer more detailed insights into the associated risks and management strategies. Recent advancements in prenatal care and fetal monitoring, including the use of advanced imaging techniques and biomarkers, have the potential to improve the early detection and management of MSAF.[18,19,20] The development of more precise and non-invasive methods for assessing fetal well-being could lead to better outcomes. Additionally, ongoing research into the molecular mechanisms underlying meconium passage and aspiration could provide new therapeutic targets for preventing and treating MAS.[21] Implementing comprehensive prenatal education programs and improving access to quality healthcare for all pregnant women are also critical steps toward reducing the incidence and impact of MSAF and MAS.[22,23,24] The study highlights the significant challenges and risks associated with meconium-stained amniotic fluid (MSAF), including increased caesarean deliveries and a higher incidence of meconium aspiration syndrome (MAS), particularly linked with thicker meconium. It underscores the critical importance of prenatal care to mitigate these risks and suggests that managing maternal health conditions like anemia and hypertension could reduce MAS occurrences. The findings advocate for refined clinical guidelines to improve perinatal outcomes in cases of MSAF.

CONCLUSION:

The study highlights the significant challenges and risks associated with meconium-stained amniotic fluid (MSAF), including increased caesarean deliveries and a higher incidence of meconium aspiration syndrome (MAS), particularly linked with thicker meconium. It underscores the critical importance of prenatal care to mitigate these risks and suggests that managing maternal health conditions like anemia and hypertension could reduce MAS occurrences. The findings advocate for refined clinical guidelines to improve perinatal outcomes in cases of MSAF.

Authors Contribution:
Nida Sarwar: Conception of Study, Data Collection, Drafting
Khurram Fayyaz: Design of Study, Supervision of work
Imrana Ata: Data Collection, Drafting, Analysis of results
Sehar Aslam: Data Collection, Drafting
Hajra Begum: Data Collection, Drafting
Khubaib Ahmad: Data Collection, Drafting

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