ORIGINAL ARTICLE

Meconium stained amniotic fluid (MSAF) and Neonatal Morbidity and Mortality: A Case-Control Study

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ABSTRACT

Objectives: To assess the neonatal outcomes associated with the incidence of meconium-stained amniotic fluid (MSAF) in mothers who delivered at term.

Study Design: A case-control study design

Study Setting and Duration: The study was conducted at Obstetrics and gynecology Department, unit-2Kausar hospital Mother & Child Health Care Center Khairpur, Khairpur Medical College Khairpur Mirs for a duration of Eight months from Jan, 2020 to August, 2020.

Methodology: During the study period, a total of 73 cases with meconium stained amniotic fluid were recruited and 73 healthy subjects with clear amniotic fluid acted as control. Women with singleton pregnancies presented to the obstetrical department for delivery between 37 weeks to 42 weeks were included in the study. Women with breech presentation, congenital abnormality, twin births, stillbirth or preterm or late-term cases were excluded from the study. Participants with MSAF were labelled as group A and those with clear amniotic fluid were labelled as group B. A predefined questionnaire was used to recruit information on socio-demographic, obstetrical characteristics of mothers and neonatal outcomes. Data was analyzed using SPSS version 26.

Results: Prolonged labour of greater than 12 hours was more frequently observed in the MSAF group compared to the control healthy subjects with clear amniotic fluid. The rate of birth asphyxia in MSAF was 6.85% in the MSAF group compared to the 1.37% in the control group. One neonate in the MSAF group developed hypoxicischemic encephalopathy. Meconium aspiration syndrome - a lethal complication was more frequent in cases with MSAF during delivery. Other complications such as neonatal sepsis, transient tachypnea of the newborn (TTN) and respiratory distress syndrome were all more frequent in the MSAF group compared to the control group.

Conclusion: The current study highlights the association of meconium-stained amniotic fluid with poor neonatal outcomes including meconium aspiration syndrome, hypoxia-induced encephalopathy, neonatal sepsis, and respiratory distress. Prompt diagnosis and management can improve the perinatal outcomes.

Keywords: Aspiration, cesarean section, neonatal mortality, meconium-stained amniotic fluid, obstetrician

INTRODUCTION

Meconium stained amniotic fluid (MSAF) is a condition characterized by in-utero exposure of a fetus to meconium which is a green pasty-fluid developed via intestines by the 12th week of gestation [1]. The presence of meconium stained amniotic fluid (MSAF) is a serious sign of fetal compromise, associated with an increased risk of prenatal morbidity and mortality [2, 3].

The incidence of meconium-stained amniotic fluid (MSAF) is a common phenomenon occurring at a rate of 10% to 24% [4, 5]. Normally the excretion of meconium in the newborn infants should occur within the first three days of life however, the intrauterine passage of meconium may occur in some pregnancies [6]. The etiology behind the premature passage of meconium is not clearly understood. However, some factors have been attributed to the phenomenon. The risk of MSAF is increased with the gestational age. Meconium-stained amniotic fluid is uncommon before 37 weeks of gestation [7]. Apart from fetal gut maturation, it has been observed that MSAF may occur in case of hypoxia or chorioamnionitis.

Meconium-stained amniotic fluid is associated with poor neonatal outcomes. Rao et al., reported that the incidence of admissions to newborn intensive care units, the risk of respiratory distress, meconium aspiration syndrome, and neonatal sepsis were significantly more frequent in cases of MSAF than the control group with clear amniotic fluid [8]. Meconium aspiration syndrome is a lifethreatening condition whereby a fetus aspirates on the meconium in utero. It can prove to be fatal to the fetus.

MSAF is a serious condition associated with a high number of neonatal morbidity and mortality. The occurrence of MSAF in any pregnancy should be of concern to the obstetrician [9]. Studies have shown that infants born to mothers with MSAF, are at risk of developing cerebral palsy [10]. Pakistan has the third highest rate of neonatal mortality worldwide. Poor antenatal care, ineffective referral system, lack of awareness, inaccessible healthcare, and many other factors lead to neonatal mortality. Since we do not have local literature on the neonatal outcome of MSAF, the current study was undertaken. The objective of the present study was to evaluate the neonatal short-term outcomes in cases with MSAF. The study signifies the burden of MSAF and its association with perinatal complications.

METHODS AND MATERIALS

A case-control study was conducted at Obstetrics and Gynecology Department, unit-2 Kausar hospital Mother & Child Health Care Center Khairpur, Khairpur Medical

College Khairpur Mirs for a duration of Eight months from Jan, 2020 to August, 2020. The study was started after ethical approval. A non-probability obtaining the convenience sampling technique was applied to conduct participants to the study. Women with singleton pregnancies presented to the obstetrical department for delivery between 37 weeks to 42 weeks were included in the study. Women with breech presentation, congenital abnormality, twin births, stillbirth or preterm or late-term cases were excluded from the study. Those with risk factors such as hypertension, preeclampsia, eclampsia, gestational diabetes, and previous stillbirth or cesarean section were also excluded from the study. Participants with MSAF were labelled as group A and those with clear amniotic fluid were labelled as group B.

A predefined questionnaire was used to recruit information on socio-demographic, obstetrical characteristics of mothers and neonatal outcomes. Age, weight, body mass index, parity, gestational age at delivery, mode of delivery, neonatal outcome, APGAR Scores at 1 minute and 5 minutes were recorded. Fetal and maternal heart rate were regularly monitored for both groups.

Data was analyzed using SPSS version 26. The continuous data was presented as mean and standard deviation, while the non-numerical data was presented as frequency or percentages. The two groups were compared for neonatal outcomes associated with the occurrence of MSAF. Independent t-test and Chi square tests were applied where applicable. A p-value of < 0.05 was set as statistical significance.

RESULTS

There were 16 women with Grade I MSAF, 40 women with Grade II, and 17 women with Grade III MSAF. Prolonged labour of greater than 12 hours was more frequently observed in the MSAF group compared to the control healthy subjects with clear amniotic fluid. See table 1.

Table 1	Grading	of Med	conium	-stained	amniotic	fluid
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Grade of MSAF	n (%)
Grade I	16 (21.92%)
Grade II	40 (54.79%)
Grade III	17 (23.29%)

On comparing mean APGAR score at one and five minutes in both groups, it was found that significantly lower Apgar scores were seen in subjects with MSAF as compared to the clear AF group. The 1 min Apgar score was low (5±0.5) in subjects in the MSAF (group I) as compared to subjects with clear liquor, where the Apgar score was 6 ± 0.9 . The 5 minute APGAR was 7.6±0.8, in group I and 8.5 ± 0.7 in group II. See table 2.

Table 2. APGAR score and its association with	MSAF
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Variable	MSAF Group	Control Group	p-value
APGAR of 1 minute	4.9 ± 0.4	6.2 ± 0.8	< 0.0001
APGAR of 5 minutes	7.5 ± 0.9	8.4 ± 0.7	

The rate of birth asphyxia in MSAF was 6.85% in the MSAF group compared to the 1.37% in the control group. One neonate in the MSAF group developed hypoxicischemic encephalopathy. Meconium aspiration syndrome - a lethal complication was more frequent in cases with MSAF during delivery. Other complications such as neonatal sepsis, transient tachypnea of the newborn (TTN) and respiratory distress syndrome were all more frequent in the MSAF group compared to the control group. See table 3.

Table 3. Perinatal complication	ns and	neonatal	outcomes	of	MSAF
and the control group					

Variables	MSAF Group	Control Group
Birth Asphyxia	5 (6.85%)	1 (1.37%)
Hypoxic-ischemic encephalopathy (HIE)	1 (1.37%)	0 (0.00%)
Meconium aspiration syndrome (MAS)	8 (10.96%)	0 (0.00%)
Sepsis	23 (31.51%)	2 (2.74%)
Low birth weight	29 (39.73%)	30 (41.1%)
Respiratory distress syndrome	11 (15.07%)	1 (1.37%)
Transient tachypnea of the newborn	25 (34.25%)	2 (2.74%)
PT	19 (26.03%)	1 (1.37%)

Based on the findings of the study, infants delivered to mothers in the MSAF group were more frequently admitted to the neonatal intensive care units compared to the control group. Out of 73 babies born to the mothers in the MSAF group, 48 (65.75%) were admitted to NICU (p<0.0001). See table 4.

Table	4.	Association	MSAF	with	the	admission	to	Neonatal
Intensi	ve	Care Unit afte	r delive	ry				

Variables	Case	Control	p-value
No NICU	25 (34.25%)	61 (83.56%)	< 0.0001
NICU Admission	48 (65.75%)	12 (16.44%)	

DISCUSSION

The present study evaluated the neonatal outcome of mothers with MSAF during delivery at term. We found that the APGAR scores of the newborns born with MSAF were significantly lower in the MSAF group compared to the control group. On comparing mean APGAR score at one and five minutes in both groups, it was found that significantly lower Apgar scores were seen in subjects with MSAF as compared to the clear amniotic fluid group. The 1 min Apgar score was low in subjects in the MSAF (group I) as compared to subjects with clear liquor. Birth asphyxia, hypoxic-ischemic encephalopathy, meconium aspiration syndrome, and neonatal sepsis were more frequent in the MSAF group compared to the controls. Furthermore, transient tachypnea of the newborn (TTN) and respiratory distress syndrome were both associated with MSAF. However, incidence of low birthweight was not significantly associated with MSAF.

One study looked at the ratio of amniotic fluid stained with meconium versus factors associated with pregnant women giving birth in an Ethiopian hospital [17]. The study found out a correlation of age with meconium stained amniotic fluid (MSAF) as aging is linked to having old vessels which can lead to hypoxia in the fetus and meconium inside amniotic fluid. A correlation was also found between meconium stained amniotic fluid and induced labor. This link may lead to excretion of meconium.

A similar study was conducted on neonates who had MAD and were born at greater than 37 weeks [18]. The authors concluded that the main factors of MAS include maturity after birth. IUGR, c-section, tracing of fetal heart rate and distress of the fetus. Meconium stained amniotic fluid still remains an essential cause of death in term and babies and those who are born after term [19]. The neonate who aspirates meconium during intrauterine life is more at risk of MSAF and this death. The authors argued that new innovations should be invented to find out the root cause early in the disease so that it can be managed early and the number of deaths due to MAS can be reduced in these patients.

Another study was conducted to evaluate the risk factors, association and the occurrence of MSAF and maternal risk factors [20]. This particular study was conducted on 100 neonates who had MSAF and were admitted in the hospital with their mothers for a duration of 6 months. It was concluded that taking a long and detailed history and examination of the mother during pregnancy as well as examination of the neonates properly can significantly improve the outcomes of the neonates. The risk factors were similar to our research which included asphyxia at birth, emergency c-section, distress of fetus, Oligohydramnios, anemia, preeclampsia and pregnancy induced hypertension. Birth asphyxia have been found to be one of the main causes of neonatal mortality and morbidity in many studies [21,22] as well as thick meconium [23]. A thick meconium has mostly been observed to lead to more frequent admissions in the NICU as babies who have thick meconium more often need suctioning at birth [24]. A thick meconium in association with birth asphyxia may lead to vigorous resuscitation and thus a longer hospital stay or in severe cases death of the neonate [25].

Apart from the evident strengths of the study, there were some limitations. A larger and a more diversified sample could have allowed for a better understanding and comparison of patients. An interview styled questionnaire could have allowed more insight into more factors that lead to MSAF in neonates and how to prevent them.

Additional research is required into the outcome of MSAF which often leads to mortality and morbidity in neonates. A more advanced diagnostic criteria is required to catch MSAF early to avoid complications.

CONCLUSION

The current study highlights the association of meconium-stained amniotic fluid with poor neonatal outcomes including meconium aspiration syndrome, hypoxia-induced encephalopathy, neonatal sepsis, and respiratory distress. Prompt diagnosis and management can improve the perinatal outcomes.

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