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Original Article

Meconium-Stained Amniotic Fluid and Associated Factors among Women Undergoing Childbirth in Maternity Teaching Hospital in Erbil City

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ABSTRACT

Background and objectives: The purpose of this study was to identify the risk factors for Meconium-Stained Amniotic Fluid among women who delivered vaginally and were admitted to the delivery room at Maternity Teaching Hospital in Erbil city."

Methods: A descriptive case-control study was conducted in the labor ward of Maternity Teaching Hospital in the Kurdistan region, Iraq. The study setting was the delivery room. A non-probability purposive sample included 342 mothers with singleton pregnancies: 171 cases with Meconium-Stained Amniotic Fluid and 171 controls with clear amniotic fluid. The data were analyzed using Version 23 of the Statistical Package for the Social Sciences.

Results: The majority of women (82.7%) were illiterate, and more than half (58.2%) were multiparous. 57% of the newborns were male. Approximately 18.7% of cases had caesarean sections compared to 5.3% in the control group, which is statistically highly significant (P-value < 0.001). Additionally, about 30% of cases involving neonates were admitted to the neonatal intensive care unit, compared to just 1.8% in the control group, which is also statistically highly significant (P-value < 0.001). Postdate (B Coefficient: 2.487, 95% Confidence Interval: 4.686 to 30.854) and fetal distress (B Coefficient: 3.048, 95% Confidence Interval: 5.662 to 78.393) were highly significantly associated with Meconium-Stained Amniotic Fluid.

Conclusion: There is a highly significant association between risk factors such as postdate and fetal distress in the case-control groups. The following factors did not significantly correlate with the case-control groups: preeclampsia, premature rupture of membranes, polyhydramnios, oligohydramnios, prolonged labor, induction of labor, or spontaneous labor.

Keywords: Meconium Stained; Amniotic Fluid; Risk Factors; Delivery Room.

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INTRODUCTION

Meconium is the first stool that is found in the intestine of the fetus from 14–16 weeks gestation. Meconium amniotic fluid (MAF) occurs when there is a passage of the fetal colonic contents into the amniotic cavity (1). MSAF can be found in 10–20% of mothers during delivery across the world (2). Though the passage of meconium could be physiological, it may become an environmental risk in the presence of fetal acidemia. The latter supervenes acutely and thus it is highly unpredictable and unpreventable (3). The exact causes of meconium-stained amniotic fluid are not clear (4). Numerous factors are linked to Meconium-stained amniotic fluid, including advanced maternal age, early rupture of the membranes, obstructed labor, induced labor, an unsettling heart rate pattern, pregnancy longer than 42 weeks, labor longer than 15 hours, pregnancy-induced hypertension, oligohydramnios, inter-pregnancy intervals shorter than two years, and a monthly family income of less than 5000 Ethiopian birr (5). Meconium-stained amniotic fluid results in short and long-term prenatal outcomes such as lower Apgar score, respiratory distress, meconium aspiration syndrome (MAS), neonatal sepsis (early onset neonatal sepsis and late -onset neonatal sepsis), and hyaline membrane disease. The meconium-stained amniotic fluid causes respiratory distress, specifically meconium aspiration syndrome, which results in morbidity and mortality of neonates (6). is beneficial for obtaining baseline rates of risk factors and identifying clues to the etiology of conditions This information is also helpful to plan and assess antenatal care for pregnant women, especially for high-risk populations. The main objectives of this study are to identify the main risk factors associated with the Meconium-Stained Amniotic Fluid in pregnant women and to find out the association between socio-demographical characteristics and obstetric characteristics of women in case-control groups.

METHODS

A descriptive case-control study was used to conduct this study. The study was carried out at the Maternity Teaching Hospital in Erbil city. This hospital is located on the main street of Shaqlawa and has been established since 2004 in Erbil city in the Iraqi Kurdistan Region. The Maternity Teaching Hospital consists of many departments, including Emergency, In Vitro Fertilization, Postpartum unit, Postoperative unit, Delivery unit, and Neonatal Intensive Care Unit (NICU). The study was conducted in the Delivery unit. The duration of the study from 1st of February to 1st of October 2023.A non-probability purposive sample of 342 mothers with singleton pregnancies (171 cases and 171 controls) admitted to the Delivery room at MTH were respectfully asked to participate in the study. Mothers were divided into two groups: the first group diagnosed with meconium amniotic fluid (MAF) and the second group with clear amniotic fluid (CAF). Epi Info 7 was used to determine the sample size by entering the total number of 3100 women who gave birth during three months in the delivery room in Erbil city. The sample size was calculated using this method, yielding a 95% confidence level and a 5% margin of error. The calculation resulted in 342 samples. The inclusion criteria for this study were all pregnant mothers with singleton fetuses (not twin pregnancies) admitted to delivery room. Additionally, the exclusion criteria were intrauterine fetal death (IUFD), mothers with psychological problems, mothers with bloody amniotic fluid, and preterm birth.Data were collected using a patient file records by the researchers and through

direct (face to face) interviews with pregnant women in the labor room who kindly accepted to participate in the study. The interviews were conducted in the Delivery unit of MTH. Data collection started from the period 1st of February to 1st of May 2023. To avoid overcrowding, the researcher attended the hospital during the evening shift from 2 PM to 6 PM. The questionnaire format was categorized into three parts, including the following: Part one: The socio-demographic characteristics of mothers such as age, level of education, residential area, occupation, income status, access to prenatal care and smoking.Part two: Women's obstetrical history, including gestational age, parity, newborn sex, oligohydramnios, preeclampsia, gestational diabetes mellitus (GDM), abnormal placentation, placental abruption, chorioamnionitis, intrauterine growth restriction (IUGR). Part three: Maternal comorbidities including overt diabetes mellitus, chronic hypertension, cardiovascular disease, thyroid dysfunction, drug addiction, hepatitis, anemia, infertility, and COVID-19 at the time of admission). After constructing the questionnaire, it was sent to a number of experts in the fields of medicine, nursing, and biostatistics. The comments of experts were taken into consideration regarding clarity relevance, and adequacy to achieve the objectives, and the pilot study of 30 patients in the delivery room indicated that the tool was suitable for data collection. Before data collection, formal permission was obtained from Hawler Medical University/College of Nursing and Maternity Teaching Hospital to conduct the study. Ethical approval was obtained from the Hawler Medical University/Nursing College. The code number was 5, and the date of approval was January 30, 2023. Verbal Informed consent was obtained from women before data collection, after explaining the purpose of the study, benefits, rights to privacy, rights to withdraw at any time, and that their information would be kept confidential and anonymous. The data were analyzed using the Statistical Package for the Social Sciences version 27 (SPSS). Descriptive statistics were used to report frequency and percentages, regression analysis was used to explore the factors associated with meconium amniotic fluid (MAF), and odds ratios (OR) with 95% confidence intervals (95% CI) were calculated. The chi-square test was used to find the association between case and control groups.

RESULT

The association between socio-demographical and obstetrical characteristics of women and case control groups was illustrated in Table 1. The analysis shows no statistically significant associations between the case control groups and the following variables: age category, residency place, and new-born sex. There were a significant statistical association between the case control groups and educational level (P-value=0.002). The majority (90.1%) of the case group was illiterate compared to 75.4% in the control group. There was also a significant statistically association between the case control groups and smoking status (P-value=0.037). The majority (99.4%, 95.3%) of the control and case groups were non-smokers, respectively. In addition, there were a significant statistical association between the case control groups and parity (P-value=0.014). The majority (63.7%) of the control group was multiparous and 52.6% of cases were multiparous. Furthermore, there were a significant statistical association between the case control groups and access to prenatal care (P-value=0.005). Fifty-five percent of the cases had no access to prenatal care compared to 39.8% of the control group.

compared to 5.3% in the control group and this is statistically highly significant at P-value<0.001. In addition, regarding those babies who were admitted to NICU, around 30% of the cases were admitted to NICU compared to only 1.8% in the control group. This is statistically highly significant at P-value<0.001.

Table 1: Association between socio-demographical and obstetrical characteristics of women in both groups

Socio-demographic and Obstetric variables		Case		Control		Total		P-value
		No.	(%)	No.	(%)	No.	(%)	
Age category (years)	< 20	38	(22.2)	28	(16.4)	66	(19.3)	0.651
	20-26	61	(35.7)	62	(36.3)	123	(36.0)	
	27-33	48	(28.1)	51	(29.8)	99	(28.9)	
	34-40	21	(12.3)	25	(14.6)	46	(13.5)	
	> 40	3	(1.8)	5	(2.9)	8	(2.3)	
Educational level	Illiterate	154	(90.1)	129	(75.4)	283	(82.7)	0.002
	Elementary	13	(7.6)	22	(12.9)	35	(10.2)	
	High school/ diploma	2	(1.2)	12	(7.0)	14	(4.1)	
	College	2	(1.2)	8	(4.7)	10	(2.9)	
Residency place	Urban	133	(77.8)	139	(81.3)	272	(79.5)	0.421
	Rural	38	(22.2)	32	(18.7)	70	(20.5)	
Smoking	Yes	8	(4.7)	1	(0.6)	9	(2.6)	0.037
	No	163	(95.3)	170	(99.4)	333	(97.4)	
Parity	Primipara	70	(40.9)	45	(26.3)	115	(33.6)	0.014
	Multipara	90	(52.6)	109	(63.7)	199	(58.2)	
	Grand multipara	11	(6.4)	17	(9.9)	28	(8.2)	
Access to prenatal care	Yes	77	(45.0)	103	(60.2)	180	(52.6)	0.005
	No	94	(55.0)	68	(39.8)	162	(47.4)	
Current Cesarean section	Yes	32	(18.7)	9	(5.3)	41	(12)	<0.001
	No	139	(81.3)	162	(94.7)	301	(88)	
Admitted to NICU	Yes	51	(29.8)	3	(1.8)	54	(15.8)	<0.001
	No	120	(70.2)	168	(98.2)	288	(84.2)	
Current Newborn sex	Female	66	(38.6)	81	(47.4)	147	(43)	0.101
	Male	105	(61.4)	90	(52.6)	195	(57)	

The association between risk factors and case-control groups is illustrated in Table 2. The analysis reveals a significant association between postdate and case-control groups, as 28.1% of the cases were postdate compared to only 4.1% in the control group, and this is statistically highly significant at P-value < 0.001. In addition, around 29% of the cases had fetal distress compared to only 1.8% in the control group, and this is statistically highly significant at P-value < 0.001. Furthermore, there was a significant statistical association between the case-control groups and anemia (P-value = 0.021). Around 19% of the cases had anemia compared to 9.9% in the control group. The analysis shows no significant statistical associations between the case-control groups and the following factors: spontaneous labor, induction

of labor, prolonged labor, polyhydramnios, oligohydramnios, preeclampsia, premature rupture of membranes, PIH, gestational diabetes, IUGR, chorioamnionitis, and chronic hypertension.

Table 2. Association between risk factors and case control groups.

Risk factors		Case		Control		Total		P-value
		No.	(%)	No.	(%)	No.	(%)	
Spontaneous labour	Yes	30	(17.5)	24	(14.0)	54	(15.8)	0.374
	No	141	(82.5)	147	(86.0)	288	(84.2)	
Post date (40-42 weeks)	Yes	48	(28.1)	7	(4.1)	55	(16.1)	<0.001
	No	123	(71.9)	164	(95.9)	287	(83.9)	
Induction of labour	Yes	13	(7.6)	6	(3.5)	19	(5.6)	0.098
	No	158	(92.4)	165	(96.5)	323	(94.4)	
Prolonged labour	Yes	5	(2.9)	1	(0.6)	6	(1.8)	0.085
	No	166	(97.1)	170	(99.4)	336	(98.2)	
Fetal distress	Yes	49	(28.7)	3	(1.8)	52	(15.2)	<0.001
	No	122	(71.3)	168	(98.2)	290	(84.8)	
Oligohydramnious	Yes	5	(2.9)	4	(2.3)	9	(2.6)	0.735
	No	166	(97.1)	167	(97.7)	333	(97.4)	
Preeclampsia	Yes	5	(2.9)	2	(1.2)	7	(2.0)	0.244
	No	166	(97.1)	169	(98.8)	335	(98.0)	
Anaemia	Yes	32	(18.7)	17	(9.9)	49	(14.3)	0.021
	No	139	(81.3)	154	(90.1)	293	(85.7)	
PROM	Yes	0	(0.0)	1	(0.6)	1	(0.3)	0.239
	No	171	(100.0)	170	(99.4)	341	(99.7)	
IUGR	Yes	2	(1.2)	0	(0.0)	2	(0.6)	0.095
	No	169	(98.8)	171	(100.0)	340	(99.4)	
Gestational diabetes	Yes	0	(0.0)	1	(0.6)	1	(0.3)	0.239
	No	171	(100.0)	170	(99.4)	341	(99.7)	
Chorioamnionitis	Yes	4	(2.3)	1	(0.6)	5	(1.5)	0.162
	No	167	(97.7)	170	(99.4)	337	(98.5)	
Chronic hypertension	Yes	3	(1.8)	3	(1.8)	6	(1.8)	1.000
	No	168	(98.2)	168	(98.2)	336	(98.2)	
PIH	Yes	2	(1.2)	1	(0.6)	3	(0.9)	0.558
	No	169	(98.8)	170	(99.4)	339	(99.1)	
Polyhydramnious	Yes	2	(1.2)	0	(0.0)	2	(0.6)	0.095
	No	169	(98.8)	171	(100.0)	340	(99.4)	
Post term (After 42 weeks)	Yes	2	(1.2)	0	(0.0)	2	(0.6)	0.095
	No	169	(98.8)	171	(100.0)	340	(99.4)	

In order to determine the degree of association between a range of risk factors and the case-control groups, a logistic regression analysis was conducted. Table 3 shows the findings of this analysis. As illustrated in the table, Nagelkerke R^2 is 0.513, which indicates that 51% of the variance is explained by the model. The data analysis shows no evidence of an effect of the level of education, smoking, parity, anemia, and access to antenatal care on the case and control groups. The B coefficients for C/S, NICU admission, postdate, and fetal distress are 1.129, 2.686, 2.487, and 3.048, respectively, indicating that there are positive effects of these variables on the outcome variable. The odds of cases are 3.094 times greater for babies who were delivered by C/S (95% CI 1.038-9.220, P-value = 0.043). The odds of cases are 14.675 times greater for babies admitted to NICU (95% CI 13.774-57.073, P < 0.001). In addition, the odds of cases are 12.024 times greater for babies born postdate (95% CI 4.686-30.854, P-value < 0.001). Furthermore, the odds of cases are 21.068 times greater for babies with fetal distress (95% CI 4.686-30.854, P-value < 0.001).

Table 3. Logistic regression analysis of risk factors and case control groups

Variable		B Coefficient	Wald	Odds ratio (95% CI)	P value
Intercept		-21.093	34.929		<0.001
Educational level	Educational level	-	6.011	-	0.111
	Illiterate	-0.879	0.965	0.415 (0.072 to 2.398)	0.326
	Elementary	-0.410	0.173	0.664 (0.096 to 4.585)	0.678
	High school/ diploma	1.345	1.062	3.837 (0.297 to 49.536)	0.303
Smoking		2.108	3.161	0.566 (0.27 to 1.18)	0.075
Parity	Parity	-	4.951	-	0.084
	Multipara	-1.204	4.239	0.300 (0.095 to 0.944)	0.040
	Grand multiparous	-0.742	1.735	0.476 (0.158 to 1.436)	0.188
Access to prenatal care		-0.449	2.192	0.638 (0.352 to 1.157)	0.139
Cesarean section		1.129	4.109	3.094 (1.038 to 9.220)	**0.043**
Admitted to NICU		2.686	15.027	14.675 (3.774 to 57.073)	**<0.001**
Post date		2.487	26.756	12.024 (4.686 to 30.854)	**<0.001**
Fetal distress		3.048	20.667	21.068 (5.662 to 78.393)	**<0.001**
Anemia		0.783	3.757	2.187 (0.991to 4.826)	0.053
Overall % of correct classification				81.0	
Nagelkerke R^2				0.513	

Discussion

The findings of the present study showed that the majority 52.6% of the cases and 63.7% of the control group were multiparous. There was a significant statistically association between the case-control groups and parity. This finding did not agree with a study done in Kerala, India, which showed that 64.1% of the cases were primigravida and 66.7% of the controls were primigravida. Therefore, parity was not statistically significant (7). Additionally, there was a statistically significant association between the case-control groups and access to prenatal care. This finding was not consistent with a study conducted in Ethiopia in 2024, which showed that the highest percentage of women attended antenatal checkups (8).

Another finding was that the majority of cases had C/S compared to a low percentage in the control group, and this is statistically highly significant. A similar study done in Kerala, India in 2022 illustrated a higher incidence of caesarean section, with 50% delivered by caesarean section in the case group, whereas in the control group it was 44%. The indication for caesarean section in the study group was fetal distress, associated with abnormal FHR (9). In addition, regarding those babies who were admitted to NICU, around 30% of the cases were admitted to NICU compared to only 1.8% in the control group. This is statistically highly significant at P-value < 0.001. A similar study in Northwest Ethiopia in 2021 revealed that the need for NICU care was higher in the Meconium -stained amniotic fluid group babies than in the control group (2). The result of the current study shows that the association between risk factors and case-control groups was illustrated. The analysis reveals a significant association between postdate and case-control groups, as 28.1% of the cases were postdate compared to only 4.1% in the control group, and this is statistically highly significant at P-value < 0.001. This result was in agreement with the study performed by Padmapriya in 2023 at Dharmapuri, which showed that 26% of patients were at a gestational age of more than 40 weeks (10). The current study revealed that fetal distress is significantly associated with meconium-stained amniotic fluid. This finding was supported by the study conducted in Northwest Ethiopia by Abate in 2021, which showed that fetal distress was nearly 22 times more likely to result in meconium-stained liquor (2). In addition, there was a statistically significant association between the case-control groups and anemia (P=0.021). Around 19% of the cases had anemia compared to 9.9% in the control group (P=0.021). A similar study performed by Seife and Elias in 2022 showed that 38.6% of the cases had anemia compared to only 31.3% in the control group (11). Spontaneous labor, induction of labor, prolonged labor, polyhydramnios, oligohydramnios, preeclampsia, premature rupture of membranes, PIH, gestational diabetes, IUGR, chorioamnionitis, and chronic hypertension were not significant in the current study. This finding was consistent with a study done in Southest Ethiopia by Sorsa. It revealed that preeclampsia and oligohydramnios were not significant (12). Another study, reported from Northern Ethiopia, contradicted this finding, showing that induced labor, prolonged labor, and premature rupture of membranes were significantly associated with meconium-stained amniotic fluid (13).

CONCLUSION

To conclude, 26% of the cases had thick meconium and more than a quarter of the cases (27.2%) were detected during the active phase of the labour. The majority of the study sample were post-date and had fetal distress in the case group compared to a low percentage in the control group. This means that the main risk factors were post-date and fetal distress, which were found to be highly significantly associated with meconium-stained liquor. Maternal conditions like anemia were significantly associated with meconium-stained amniotic fluid (MSAF).

RECOMMENDATIONS

We should aim at treating anaemia in adolescent girls and women of reproductive age group before conceiving. During our antenatal checkups we should detect IUGR and amniotic fluid volume while palpating. It is also recommended to detect maternal infections at term, such as vaginitis and UTIs, as they are risk factors for MSAF. We should use a partogram or labor care guide by WHO to assess whether labor is progressing at the required rate and detect prolonged labor at the earliest, as prolonged labor is a risk factor for MSAF.

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