Original Article

The comparison of umbilical cord artery pH in newborns with and without thick meconium stained amniotic fluid

Meconium-stained amniotic fluid (MSAF) affects 15-20% of term

pregnancies. Recent studies have shown that MSAF has adverse

effects on neonatal outcomes. There is no scientific consensus on the

incidence of fetal distress in MSAF neonates, and most cesarean sections due to MSAF are unnecessary. The present study was conducted to assess umbilical artery blood pH in neonates with MSAF and to examine whether there is a relationship between MSAF and fetal distress. A clinical survey case-control was conducted on the neonates of 200 pregnant women admitted to a delivery unit of the obstetrics and Gynecology center in Amir al-Momenin Hospital,

Zabol in 2014. Neonates born with MSAF made up the case group,

and the control group consisted of neonates born with clear amniotic fluid. Umbilical cord arterial pH, gestational age, gender, mode of delivery, and one and five-minute Apgar scores were considered in both groups. The mean pH of the umbilical cord artery blood in the infants of the case group was 7.25, and the mean pH of the umbilical cord artery in the infants of the control group was 7.29 (P = 0.93). The mean gestational age in the case and control groups was 40.08 weeks and 38.32 weeks, respectively (P= 0.03). In this study, a cesarean delivery (P=0.001) and female gender (P= 0.016) were higher in the case group than in the control group. MSAF does not necessarily imply fetal distress, so urgent cesarean sections are unnecessary. This study showed that based on the acidity variables of the umbilical cord artery, there is no statistically significant

correlation between the Apgar score at the 1st and 5th minute.

While a significant difference has been observed between the type of



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ABSTRACT

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1. Introduction

Meconium-stained amniotic fluid (MSAF) occurs in 10-20% of post-term deliveries [1]. Some risk factors include advanced gestational age, the prolonged second stage of labor, and intra-amniotic infection [1, 2].

only 20-25% of pregnancies with MSAF and 2-4% of all pregnancies[3, 4]. One-third of 40week pregnancies and half of the post-term pregnancies with 42 weeks of gestation are delivered through MSAF[5]. Recent studies have reported MSAF as one of the risk factors associated with neonatal meconium aspiration syndrome, pulmonary disease, and

Meconium aspiration syndrome occurs in

delivery, gestational age and baby's gender.

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neonatal death[5, 6]. By itself, meconium does not have a negative impact on neonatal outcome; however, heart rate abnormality with thick meconium amniotic fluid shows hypoxia, and subsequent fetal distress^[7]. Therefore, if the labor continues, fetal heart rate monitoring is recommended because it detects fetuses at risk of hypoxia [3, 8]. In another word, a timely diagnosis of fetal distress prevents acidosis and the incidence of meconium aspiration[8]. Since umbilical artery blood PH provides a safe method to control oxygenation in neonates, the umbilical artery blood PH is the best test for metabolic monitoring in neonates[9]. Evaluation of acidbase conditions in the umbilical artery in the first hour after delivery can be beneficial and is considered a non-invasive method to assess the respiratory and metabolic status of the neonate[10].

Meconium is a thick black substance that fills the baby's intestines before birth. Some healthy full-term babies pass their first stool within the first 48 hours after birth; however, most will defecate meconium stool within the first 24 hours after delivery. In some cases, the baby passes meconium while it is still inside the uterus. It happens when babies are "under stress" due to a decline in blood or oxygen supply. Therefore, it is possible to breathe MSAF before birth, and meconium aspiration syndrome will happen[<u>11</u>, <u>12</u>]. Although this syndrome is often not lifethreatening, it has adverse consequences for the child's health and can be fatal[<u>12</u>].

Some gynecologists and obstetricians suggest cesarean section in the first hours after detecting meconium-stained amniotic fluid, while cesarean section has more adverse outcomes than vaginal delivery. The present study was conducted to assess umbilical cord artery pH and neonatal outcomes in babies born with MSAF and those born with clear amniotic fluid.

2. Material and Methods

The present study was carried out on the neonates of 200 pregnant women who were admitted to the obstetrics and gynecology ward of Amir Al-Momenin Hospital in Zabol for delivery between March 2014 and March 2015.

2.1. Sample size and its calculation method

Those who had preeclampsia, eclampsia, diabetes, hypertension, breech presentation and twin pregnancy were excluded. The minimum sample size of the study was calculated as 200 (P = 0.15, d = 0.05 and α = 0.05). The participants were divided into two groups. Those with MSAF (n = 100) as the case and those with clear amniotic fluid (n =100) as the control group. In this study, we estimated the gestational age in all the women based on LMP (the first day of the last period) first-trimester menstrual or ultrasound of pregnancy. MSAF was detected amniotomy during labor. After the bv newborn was born, two clamps were placed on the umbilical cord at a distance of 10-20 cm from each other. It was done soon after birth, before the first respiratory effort. Umbilical artery blood was transferred into the lab in a heparin-coated syringe within an ice bag. The first and fifth minutes of Apgar scores were determined after delivery. The newborns with respiratory effort or cyanosis received oxygen or mechanical ventilation.

2.2. Ethical considerations

There is no added risk to the mother or child.

2.3. Statistical Analysis

The data were analyzed in SPSS18.0 using the mean, standard deviation and frequency for presenting the quantitative variables. The Chi-square test for qualitative and the t-test for quantitative variables were used. The statistical significance was set at < 0.05 for all the values.

3. Results

The present study examined 200 neonates divided into two groups, meconium-stained or clear amniotic fluid. The mean umbilical artery pH in the MSAF group was not significantly different from that observed in the control group (P = 0.93) (Table 1). The mean one and five-minute Apgar scores showed no significant differences between the MSAF group and the control group (P = 0.20) and (P = 0.14) (Table 1).

There were significant differences in the mean gestational age of the pregnant women

between the MSAF group and the control group (P = 0.03) (Table 1). The number of female neonates was higher in the MSAF group (P = 0.016) (Table 2).

Cesarean section was significantly more common among the case group compared to the neonates with clear amniotic fluid (P = 0.001) (Table 2).

Evaluated indicators	Investigated groups	Average	Standard deviation	Minimum	Maximum	P-value	
Umbilical cord artery PH	Case group	7.25	0.07	7.02	7.36	0.93	
	Control group	7.29	0.05	7.14	7.39		
One-minute Apgar score	Case group			7	9	0. 20	
	Control group			7	9		
Five-minute Apgar score	Case group			8	10	0.14	
	Control group			9	10		
Gestational age	Case group	40.08	0.88	38	41	0.03	
	Control group	38/32	0.97	37	40		

Table 1. Comparing the study variables between the neonates with MSAF and those with clear amniotic fluid

Table 2: The relationship of gender and the mode of delivery with meconium-stained amniotic fluid

Investigated groups	control group		case gr	D voluo		
Investigated variables	Frequency	Percent	Frequency	Percent	P-value	
Girl	35	43	65	60	0.016	
Boy	57	57	40	40	0.010	
NVD*	89	89	71	71	0.001	
C/S**	11	11	29	29	0.001	

*Normal vaginal delivery **Cesarean section

4. Discussion

The present study was conducted to compare umbilical artery blood pH among MSAF neonates and neonates with clear amniotic fluid. The findings showed no significant differences between the two groups regarding their mean umbilical artery blood pH. It has studied 70 pregnant women with MSAF or clear amniotic fluid. They explained the same results as our study^[13]. In contrast to the present findings, it has declared that neonates with thick meconium amniotic fluid had a significantly lower umbilical artery blood PH compared to those who had clear amniotic fluid [14]. Some differences such as the time of umbilical artery sampling and the inclusion and exclusion criteria may be responsible for the disparity of results between the present study and the others cited.

The mean gestational age of the mothers was significantly higher in the MSAF group than in the control group. It has reported an increased risk of MSAF with higher gestational age [15]. In another study, it has found that the risk of MSAF increased with developed gestational age [16]. It is because of the fact that in neonates with higher gestational age, the gastrointestinal system is more developed, and the possibility of meconium passage increases. In contrast with the present findings, Choi et al. supported no significant relationship between gestational age and the risk of MSAF [17].

In the present study, the one and fiveminute Apgar scores were not significantly different between the MSAF neonates and the control group. Choi et al. reported that the one-minute and five-minute Apgar scores were lower in the MSAF group than in the control group [<u>17</u>]. It has reported that the one and five-minute Apgar scores were lower in the neonates with MSAF than in the other neonates [<u>15</u>].

In the present study, the rate of cesarean section was significantly higher in the MSAF group compared with the other group. It was similar to the findings of previous research that They reported the rate of cesarean section was significantly higher among mothers with MSAF compared to other pregnant women[15]. They also clarified that the risk of fetal asphyxia, meconium aspiration syndrome, neonatal mortality, and NICU admission was higher in pregnant women with MSAF.

5. Conclusion

The present findings showed that the mean umbilical artery pH was not significantly different between the neonates with MSAF and those with clear amniotic fluid. Therefore, the majority of neonates with MSAF did not suffer from distress and did not require an urgent cesarean section. However, accurate fetal heart rate monitoring during labor is recommended.

Conflict of Interest

The authors hereby declare that they have no conflict of interest.

Author's contributions

All authors equally participated in designing experiment analysis and interpretation of data. All authors read and approved the final manuscript.

Consent for publications

All authors have read and approved the final manuscript for publication.

Availability of data and material

The authors have embedded all data in the manuscript.

Informed Consent

The authors declare not used any patients in this research.

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