

Study of the Relationship between Meconium Passage and Newborns Birth Weight and its related factors in Pregnant Women

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Abstract

Background: Previous studies have shown that meconium staining of the amniotic fluid may affect maternal and neonatal outcomes. In this study, we aimed to investigate the relationship between birth weight and meconium passage and its related factors in pregnant women.

Materials and Methods: This matched case control study was conducted on a total of 200 newborns (100 as cases and 100 as controls) in Imam Reza and Valiasr hospitals in Qom city- Iran in 2014 and 2015. A questionnaire was used to collect required data including the passage or non-passage of meconium, newborn's birth weight, gestational age, maternal age, newborn gender, maternal weight, comorbidities, type of delivery, and history of abortion or stillbirth. Data were analyzed by SPSS using independent t- test, Fisher exact test, and Chi-square test.

Results: Based on the results of this study, there was a significant difference between the two groups in terms of birth weight ($P=0.001$). So, the birth weight was higher in the cases than in the controls. There was also a significant differences between the two groups in terms of the relationship between newborns gender and meconium passage ($P=0.04$). In addition, there was a significant difference between the two groups in terms of gestational age ($P=0.035$). Moreover, a significant difference was observed between the two groups in terms of birth height ($P=0.003$).

Conclusion: The newborns birth weight associated meconium passage. Therefore, meconium passage must be monitored and controlled through examination and screening during the period of pregnancy.

Keywords: Birth weight, Meconium, Newborns, Pregnancy.

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1- INTRODUCTION

About 20% of deliveries occur after 40 weeks of pregnancy. With an increase in gestational age, the risk of fetal complications and hazards that threaten the fetus increases too (1). Meconium is composed of secretions of digestive system, dead cells, and mucus. Meconium is the first feces of a fetus' or newborn's bowel. Meconium passage in utero may occur due to physiological or pathological factors. Meconium staining of the amniotic fluid is relatively common and is observed in about 5-15% of births. Previous studies have shown that meconium staining of the amniotic fluid could affect neonatal and maternal pregnancy outcomes. Meconium passage often occurs in deliveries after 42 weeks of pregnancy. According to different studies, the prevalence of this problem is about 7% to 22% of total deliveries. In normal evolutionary process of childbirth, a newborn generally excretes meconium 24 to 48 hours after the birth and it is considered as a signs of normal functioning of intestine in newborns. Meconium passage in the utero in preterm babies is attributed to intrauterine stress while in post-term babies it is due to the development of the digestive system (2, 3). Passage of meconium continues 3 to 4 days usually. Meconium is followed by transitional stool which is greenish brown stool, non- sticky in nature. Transitional stool is then replaced by regular stool within 1 to 2 days (4).

The main causes of meconium passage by fetus are fetal asphyxia, hypoxia, infection, and acidosis. Meconium aspiration syndrome is an important complication of meconium passage and its prevalence is about 2% to 8% (5, 6). In a study that was carried out in the USA, of a total of 8,967 cases of delivery, 708 cases (7.9%) were faced with meconium passage, of whom 24 cases had been affected by meconium aspiration syndrome, and of these 11 people were in need of respiratory

ventilation (7). Also, de Lorijn et al. showed that premature infants (28-32 weeks) with delayed first passage of meconium all exhibited a normal anorectic inhibitory reflex. Moreover, all other anorectic motility parameters were similar to preterm infants of same age who passed meconium within 48 hours (8). When the oxygenation of a healthy fetus is good and the volume of amniotic fluid is normal, the excreted meconium will be diluted in amniotic fluid and it will be simply removed through physiological mechanisms. But in some babies such a condition leads to meconium aspiration syndrome which itself causes lung diseases including bacterial and chemical pneumonia, mechanical obstruction of the airway, and severe hypoxia. The prevalence of perinatal mortality associated with meconium passage is about 1 in every 1,000 live births (9).

Naseri et al. showed that there were no relation between Meconium Aspiration Syndrome (MAS), and type of delivery, gestational age and birth weight (10). Based on the results of many studies, researchers have found that the excretion of meconium is more prevalent in women with high blood pressure, mothers with hepatitis, nulliparous women, and mothers who took magnesium sulfate during childbirth (11). It has been observed that a lot of low birth weight infants pass their first stool several days after birth; yet they do not demonstrate any evidence of gastrointestinal problems (12). Meconium stained deliveries are associated with many negative outcomes and serious risks that make hazards for newborns. Nevertheless, there is a small number of researches that has been conducted in this area. Considering the above mentioned facts, this study was aimed to assess the relationship between meconium passage and birth weight in pregnant women referred to Valiasr and Imam Reza hospitals in the city of Qom- Iran.

2- MATERIALS AND METHODS

2-1. Study design and population

This matched case- control study was conducted via visiting the maternity wards of Valiasr and Imam Reza hospitals in Qom city, the capital of Qom province, Iran, from April 2014 to December 2015. Case and control are hospital records of women who were giving birth.

2-2. Methods

In this study, by referring to the hospitals, mother's records and documents of them were examined and according to checklist questions, data were extracted and entered the checklist. In the current study used the sample size formula and simple random sampling method to select case and control. According to Dysart et al. (13), with meconium passage rate = 26%, $d=0.06$ and confidence interval (CI) 95% sample size was calculated as 200 participants. Of all, 100 participants selected as cases with meconium passage) and 100 as controls (without meconium passage). For each case, a matched control was randomly selected. Cases and controls were matched on five criteria: fetal gender, gestational age, newborns' birth weight, maternal age. Therefore, patients' hospital records and documents were reviewed to collect data. The sample size was calculated according to the following formula.

$$n = \frac{z^2_{1-\frac{\alpha}{2}} [p(1-p)]}{d^2}$$

$$n = (1.96)^2 \times (.26 \times .74) / (0.06)^2 = 200$$

2-3. Measuring tools: validity and reliability

The study was aimed to examine the relationship between birth weight and meconium passage and its related factors in pregnant women. A researcher-made checklist was used to data collection from hospital records and documents that including passage or non-passage of

meconium, newborns' birth weight, gestational age, maternal age, fetal gender, maternal weight, comorbidities, type of delivery, and history of abortion or stillbirth. The validity of the checklist was confirmed by a panel of experts and its reliability was calculated through Cronbach's alpha test ($\alpha=0.87$).

2.4-Ethical consideration

In order to observe the ethical issues, all the data extracted from patients' files were kept confidential by the researcher and no data revealing mothers identities were released.

2-5. Inclusion and exclusion criteria

The inclusion criteria were all mothers with meconium stained amniotic fluid. The exclusion criteria were the followings: having preterm newborns, experiencing intrauterine deaths, and insufficiency or lack of data in maternal and neonatal hospital files.

2-6. Data Analyses

Data were analyzed using SPSS version 22.0 with Chi-square test for comparison of gestational age, number of pregnancies, number of parity, number of abortions and underlying diseases in case and control groups; Fisher exact test for comparison of newborn gender in case and control groups; and independent t- test for comparison of birth weight and birth height in case and control groups with significance level at 0.05.

3- RESULTS

In this study, 100 persons were selected as cases and 100 persons as controls. According to the findings of this study, no significant difference was observed between the two groups in terms of number of pregnancies, gestational age, maternal age, parity, number of abortions, and underlying diseases ($P>0.05$) (Table.1).

Table-1: Comparison of frequency of pregnancies, parity, abortions and underlying diseases in case and control groups

Variables		Number of pregnancies	Frequency	Percent	P-value
Group	Cases with meconium passage	1	69	69	0.53
		2	24	24	
		3	7	7	
		4	0	0	
	Controls without meconium passage	1	64	64	
		2	30	30	
		3	5	5	
		4	1	1	
		Number of parity	Frequency	Percent	P-value
Group	Cases with meconium passage	1	79	79	0.11
		2	21	21	
		3	0	0	
	Controls without meconium passage	1	67	67	
		2	32	32	
		3	1	1	
		Number of abortions	Frequency	Percent	p
Group	Cases with meconium passage	0	93	93	0.79
		1	5	5	
		2	2	2	
	Controls without meconium passage	0	95	95	
		1	4	4	
		2	1	1	
		Underlying diseases	Frequency	Percent	P-value
Group	Cases with meconium passage	No disease	84	84	0.13
		Diabetes	6	6	
		Preeclampsia	9	9	
		Hypothyroidism	1	1	
	Controls without meconium passage	No disease	89	89	
		Diabetes	6	6	
		Preeclampsia	2	2	
		Hypothyroidism	3	3	

The mean birth weight was $3,427 \pm 4,740$ grams in the group with meconium passage and $3,082 \pm 3,45$ grams in the group without meconium passage. Based on the results of this study, there was a significant difference between the two groups in terms of birth weight ($P=0.001$); so that the mean birth weight was higher in the newborns with meconium passage. Also, the mean height of newborns was 50.3 ± 2.09 cm in the group with meconium passage and 49.5 ± 1.86 cm in the group without meconium passage. As the results showed, there was a significant

difference between the two groups in terms of birth height ($P=0.003$); so that the mean height was higher in the newborns with meconium passage. In addition, of all newborns with and without meconium passage, 46% and 32% were male and 54% and 68%, respectively, were female; thus there was a significant difference between the two groups in terms of the relationship newborns gender and meconium passage, so that the number (frequency) of male newborns was higher in the group with meconium passage ($P=0.04$). Also, the frequency distribution

of participants with and without meconium passage, at different gestational age was as follows: 2% and zero between 34-35 weeks, 15% and 14% between 36-37 weeks, 66% and 80% between 38-39 weeks, and 17% and 6% between 40-41 weeks, respectively. There was a

significant difference between the two groups in terms of gestational age ($P=0.03$), as a larger number of participants in the group with meconium passage reached the gestational age of 40-41 weeks (**Table.2**).

Table-2: Comparison of birth weight, birth height, newborn gender and gestational age in case and control groups

Variables		Cases with meconium passage	Control without meconium passage	P-value
Birth weight	Mean \pm SD	3427.1 \pm 474.9	3082.7 \pm 346.2	0.001
	Weight range	2500-4100	2450-4000	
Birth height	Mean \pm SD	50.37 \pm 2.09	49.54 \pm 1.86	0.003
	Height range	47-53	46-53	
Newborn gender	Male, Number (%)	46 (46%)	32 (32%)	0.04
	Female, Number (%)	54 (54%)	68 (68%)	
Gestational age	34-35	2 (2%)	0 (0%)	0.03
	36-37	15 (15%)	14 (14%)	
	38-39	66 (66%)	80 (80%)	
	40-41	17 (17%)	6 (6%)	

SD: Standard deviation.

4- DISCUSSION

Meconium is a thick green liquid and about 70% to 80% of its content is made of water. It includes the secretions of digestive system, cellular debris, bile and pancreatic fluids, lanugo, mucus, and vernix. In the sixth to tenth weeks of pregnancy, meconium first appears in the ileum. The presence of meconium in the amniotic fluid is potentially a serious condition which indicates that the fetus is at risk; this condition is associated with increased rate of mortality and prenatal complications. Meconium passage before 34 weeks of pregnancy is rare, but after 37 weeks of pregnancy (with an increase in gestational age) its incidence will rise. Making attempts to increase people's awareness of known risk factors, can help to prevent or reduce the incidence of this condition. It can also help to detect cases more quickly during childbirth. Moreover, intensive care and rapid intervention can improve neonatal outcomes (14). This

study aimed to investigate newborn's birth weight as a predictor of meconium staining of the amniotic fluid. It was conducted on 100 subjects as cases and 100 subjects as controls in Imam Reza and Valiasr hospitals in Qom- Iran. In the current study, 9% of newborns who had meconium passage in utero weighed more than 4,000 grams and there was a significant difference between case and control groups in terms of the relationship between meconium staining of the amniotic fluid and birth weight. Similarly, in a study by Gupta et al. newborns birth weight in meconium stained amniotic fluid (MSAF) group was higher than that in the control group (15). Moreover, Fakhri conducted a study and investigated 5,440 deliveries (4,400 cases of vaginal delivery and 1,040 cases of cesarean section), to examine the relationship between macrosomia and maternal – neonatal complications. According to the results of the mentioned study, cesarean rate was

15.5% in the case group and 11.5% in the control group. Fetal distress and failure to progress were recognized as the main reasons for caesarean section in macrosomia group. Furthermore, shoulder dystocia and meconium passage were the most common complications in newborns with macrosomia, as compared with the control group ($P < 0.05$) (16). Also, Arnoldi et al. was found an inverse relationship between gestational age, birth weight and meconium passage. So that a high rate (81%) of all very low birth weight infants had delayed passage of the first stool (12).

The contrary, Raith et al. which was conducted on 127 infants in 2013; the mentioned study was aimed to evaluate and compare the excretion of meconium in two groups of newborns: the first group had a mean gestational age of 28.6 weeks and a weight of 0.825 grams, and the second group had a mean gestational age of 28.4 weeks and a weight of 0.1168 kg. No significant difference was observed between the two groups and the signs and symptoms indicating the need for surgical interventions were similar in both groups. However, mortality rate was higher in the first group (11.5%) as compared with the second group (9.2%) (17). According to the above results, a delay in the passage of the first stool according to birth weight in newborns, may result in a clinical condition simulating meconium ileus.

In this study, the incidence of meconium passage in gestational age of 38-41 weeks was increased in cases, as compared with the control group. In a study by Dysart et al. which was conducted from 1980 to 1986, the researcher studied a total of 45,115 newborns to evaluate the effect of gestational age at different years on excretion of meconium in the amniotic fluid. Based on their findings, the prevalence of meconium passage in the course of the study was increased by 40.9% (from 18.8% in 1980 to 26.5% in 1986); the increase had a linear trend. In

addition, with increasing gestational age, meconium passage increased too; again, the increase had a linear trend (13). Also, Lorijn et al. showed that, preterm infants (PNA 28-32 weeks), with delayed first passage of meconium all exhibited a normal rectoanal inhibitory reflex (8). McLain using amniography, showed that progression of contrast from mouth to colon took 9 hours at 32 weeks of gestational age, but only half that time at term (18). In addition, decreased gestational age was significantly associated with prolonged duration meconium passage (4). It seems likely several factors during pregnancy based on lifestyle had an impact on meconium.

In the current study, the variables of maternal age, maternal comorbidities, type of delivery, number of gravity, and gestational age had no significant relationship with meconium passage. Sean et al. conducted a study on 365 samples (124 cases with meconium staining and 241 cases without meconium staining), in order to assess the prevalence of meconium staining of the amniotic fluid and its relationship with maternal factors. As the results showed, the prevalence of meconium staining of the amniotic fluid was 11.1% and it had a relationship with the following maternal and neonatal factors: gestational age, parity, mode of onset of labor, first minute Apgar score, neonatal resuscitation, and method of discharging the secretions (19).

In addition, Naseri et al. found that there were no relationship between Meconium Aspiration Syndrome (MAS) gestational age, type of delivery and birth weight (10). Zarkesh et al. conducted a study to investigate the relationship between maternal and neonatal risk factors at the time of delivery and meconium stained amniotic fluid and clear amniotic fluid. Based on the results of their study, the most common maternal and neonatal complications associated with meconium

stained amniotic fluid were the followings: gravity and low parity of mothers, cesarean delivery, high gestational age, low Apgar score, high birth weight, and excess number of hospitalization days of newborns. There was no statistically significant difference between the two groups in terms of signs of maternal and neonatal infection (20). It seems that some factors such as; prenatal care, nutrition during pregnancy, maternal physiological conditions and even mother's social and economic conditions in different countries affect in meconium.

In the current study, there was a significant difference between case and control groups in newborn gender ($p=0.042$). In this regard, Malek Mohammadi et al. (2006) conducted a study on 320 subjects in Tabriz to investigate the relationship between meconium staining of the amniotic fluid and pregnancy outcome. Based on the study findings, the prevalence of meconium staining of the amniotic fluid was 9.6%. Moreover, meconium aspiration syndrome and dense meconium, respectively, were observed in about 3.8% and 72.5% of the cases. There were significant differences between the two groups in terms of maternal age, abnormal heart rate of the fetus, newborn gender, fifth minute Apgar scores, gestational age, mode of delivery, first minute Apgar score, and respiratory distress ($P<0.05$). However, there was no significant difference between the two groups in terms of parity, induction of labor, birth weight, and neonatal tetanus (21). It seems in this regard, should be done more studies through prospective and interventional to determine all aspects.

5- CONCLUSION

Based on the findings of this study, increased gestational age (post term) and newborns high birth weight associated meconium passage. Therefore, must be monitored and controlled through

examinations and screening during the period of pregnancy. Also, in order to reduce the severity of these conditions, it is necessary to consider them from the early time of birth and adopt preventive measures.

6-CONFLICT OF INTERESTS: None.

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