

Investigation of meconium aspiration syndrome in newborns, after NRP protocol changing.

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Abstract

Meconium is a thick green-black odorant substance, which is produced in the embryo's gut at 12th week of gestation and then stored in the colon throughout the pregnancy. Meconium excretion occurs naturally within the first 24 to 48 hours after the birth, although the fetus may excrete meconium into the amniotic fluid for various reasons during pregnancy. Amniotic fluid impregnated with meconium before week 37 of gestation is uncommon, but its occurrence increases with gestational age. For this reason, MSAF is found in 9% to 20% of term and post-term pregnancies, but its onset is only 5% in pre-term pregnancies. The exact cause of meconium excretion in amniotic fluid remains unclear. However, previous studies have suggested the role of labor factors such as: Prolonged labor, post-term pregnancy, low birth weight neonates, oligohydramnios, intrauterine growth retardation, pregnancy hypertension, medical factors-anemia and cholestasis, ethical and social factors and demographic factors such as: Maternal high age, maternal drug abuse, especially tobacco and cocaine are the major contributing factors to the excretion of meconium into the amniotic fluid.

Keywords: Meconium, Hypertension, Oligohydramnios, Cholestasis.

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Introduction

Meconium can lead to pulmonary injury by various mechanisms, which in the presence of respiratory distress and other radiological findings in neonates born with Meconium-Stained Amniotic Fluid (MSAF) are defined as Meconium Aspiration Syndrome (MAS). Clinical manifestations vary from mild respiratory distress to severe respiratory failure. Hypoxic encephalopathy, air leakage, persistent pulmonary hypertension may be added to these manifestations. Meconium-impregnated amniotic fluid has long-term and short-term adverse effects in neonates, especially increasing neonatal resuscitation, respiratory distress, low Apgar score, MAS, neonatal sepsis and pulmonary diseases. MAS worldwide has a 5 to 10 percent incidence in infants born from MSAF, accounting for 12 percent of all neonatal deaths. In addition, the severity of mental retardation and cerebral palsy in these newborns is significantly higher than that of MSAF-born neonates. MSAF clearly increases the rate of congenital complications such as: Amniotic fluid embolism, chorioamnionitis, wound infection, endometritis and delivery complications [1].

Approximately 4 million live births occur in the United States annually, of which approximately 400,000 infants require adjuvant breathing and/or Positive Pressure Ventilation (PPV)

to continue their lives outside the uterus and about 12,000 infants need ion with chest compressions and cardiac medications. Given the frequent need for newborns to be resuscitated at birth, educated people are needed to resuscitate them. In the United States, the Neonatal Resuscitation Program (NRP) is a training guideline for newborns. The purpose of the NRP is to provide the cognitive, technical and behavioral skills needed to successfully resuscitate neonates after delivery. The NRP curriculum is reviewed and investigated at five-year intervals in co-ordination with the International Liaison Committee on Resuscitation (ILCOR). According to the ILCOR, the American Heart Association has developed newborn resuscitation guidelines [2].

Due to the changes of NRP 6 and 7 guide lines in using PPV, tracheal intubation and suctioning and using both guidelines in Shahid Mostafa Khomeini and Taleghani hospitals of Ilam, during 2015-2019, we decided to compare these two methods in terms of infant mortality and morbidity over the mentioned years. In this study we aimed to determine the meconium aspiration syndrome in neonates, born between the years 2015 and 2019, in Shahid Mostafa Khomeini and Taleghani Hospitals of Ilam, before and after the NRP protocol change [3].

Materials and Methods

Type of study and statistical sample

This cross-sectional study was performed on live neonates born with meconium aspiration syndrome in Mostafa Khomeini and Taleghani hospitals of Ilam during 2014-2017 [4].

Sample size and method of calculation

All neonates born with meconium aspiration syndrome in Mostafa Khomeini and Taleghani hospitals of Ilam during 2015-2017.

Type and specifications of data collection tool

Sample collection is done through a census of all live births in the years 1394 to 1397.

Data analysis method

Relevant information is extracted from patient records and included in pre-prepared forms. The data extracted after analysis was processed by SPSS software version 19.

Method

This cross-sectional, retrospective study is a census sampling of all live births between 2015 and 1977. The inclusion criteria were all neonates born with meconium aspiration syndrome during the years 2014 to 2017 at Shahid Mostafa Khomeini (RAH) and Taleghani Ilam hospitals. Exclusion criteria included those with insufficient information in patient records,

intrauterine death, neonatal congenital heart disease, out-of-hospital birth, neonatal congenital anomaly, systemic diseases during pregnancy and before maternal and neonatal births [5].

Among the cases the information on maternal age, number of pregnancies, type of delivery (cesarean section, normal, assisted delivery), duration of delivery, PROM, induction of delivery, preeclampsia, placental ductal, fetal distress, meconium class, gestational age, Apgar score at birth and 5 minutes later, neonatal weight and sex, symptoms of asphyxia, admission to NICU and cause and duration of hospitalization, need or not for ventilator, symptoms of meconium aspiration syndrome, neonatal resuscitation process and neonatal mortality and morbidity were examined [6].

Results

The results of the study showed that the mean age of mothers was 27.5 ± 15.7 NRP years before the change of protocol and after the change was 28.4 ± 2948 NRP years, which was not statistically significant.

Gestational age in this study was reported 55.6% NRP in the pre-change group and in the post-change group WAS 44.4% NRP and the post-term and pre-term gestational age was lower in the post-change NRP group [7].

The results of amniotic fluid status of meconium before and after NRP changes were 9.1% thin and 12.1% thick and in the group after NRP changes (thin and thick) were 4.4% but there was no statistically significant relationship between meconium amniotic status and NRP changes (Table 1).

Age	Mean ± STD		P
	Before the NRP	After the NRP	
Mother	5.7 ± 27.15	4.48 ± 28.29	0.42
Pregnancy	1.67 ± 38.86	2.23 ± 38.82	0.93

Table 1. Determining the relationship between maternal age and gestational age and neonatal morbidity and mortality.

Maternal age and gestational age were somewhat homogeneous before and after NRP protocol change and there was no

statistically significant relationship between maternal age and gestational age with NRP protocol change (Tables 2 and 3) [8].

Type of delivery	Frequency (%)		P
	Before the NRP	After the NRP	
Cesarean section	24 (57.1%)	18 (42.9%)	0.54
Normal	9 (60%)	6 (40%)	

Table 2. Determination of the relationship between type of delivery (cesarean section, normal, with device) and neonates with meconium sphincter syndrome.

Variable		Frequency (%)		P
		Before the NRP	After the NRP	
Baby sex	Girl	16 (57.1%)	12 (42.9%)	0.56
	Boy	17 (58.6%)	12 (41.4%)	
Baby weight	<3500	24 (55.8%)	19 (44.2%)	0.4
	>3500	9 (64.3%)	5 (35.7%)	

Table 3. Determination of relationship between weight and sex of infant and meconium spirosis syndrome.

There was no significant relationship between gender and infant weight before and after NRP changes (Table 4).

Duration of hospitalization	Mean ± STD		P
	Before the NRP	After the NRP	
NICU	9.02 ± 6.09	3.99 ± 6.29	0.91

Table 4. Determination of the relationship between meconium aspiration syndrome and length of stay in NICU before and after NRP protocol modification.

The length of stay in the ICU increased after the NHRP (Tables 5-8). protocol change but no significant relationship was observed

Variable		Frequency (%)		P
		Before the NRP	After the NRP	
Need to be revived	Yes	6 (46.2%)	7 (53.8%)	0.25
	No	27 (61.4%)	17 (38.6%)	

Table 5. Determination of the association between meconium aspiration syndrome and the need for resuscitation before and after NRP modification.

Need ventilation	Frequency (%)		P
	Before the NRP	After the NRP	
No need	25 (75.8%)	15 (62.5%)	0.34
Intube	7 (21.2%)	5 (20.8%)	
Laryngoscope suction	1 (3%)	1 (4.2%)	
PPV	0	1 (4.2%)	
Intube+ppv	0	2 (4.2%)	

Table 6. Determination of the relationship between ventilation requirement and meconium aspiration syndrome before and after NRP protocol modification.

Variable		Frequency (%)		P
		Before the NRP	After the NRP	
Infant mortality	-	31 (60.8%)	20 (39.2%)	0.19
	+	2 (33.3%)	4 (66.7%)	

Table 7. Determination of relationship between neonatal mortality and meconium spiration syndrome before and after NRP protocol modification.

Morbidity	Frequency (%)		P
	Before the NRP	After the NRP	
Hypotonia	4 (12.1%)	1 (4.2%)	0.45
Pneumothorax	2 (6.1%)	1 (4.2%)	
Sepsis	1 (3%)	0	
HIE grade1	0	1 (4.2%)	
Brain edema	0	1 (4.2%)	
Brain edema	1 (3%)	0	
PPH+right pulmonary hemorrhage +metabolic acidosis and hypoglycemia	1 (3%)	0	
Hypnatremia+hyperkalemia+brain edema	0	1 (4.2%)	
Hypnatremia+hyperkalemia+brain edema	0	1 (4.2%)	

Table 8. Determination of relationship between neonatal morbidity of meconium aspiration syndrome before and after NRP protocol modification.

Discussion

The results of the study showed that the mean age of mothers was 27.5 ± 15.7 NRP years before the change of protocol and after the change was 28.4 ± 2948 NRP years, which was not statistically significant.

Gestational age in this study was reported 55.6% NRP in the pre-change group and in the post-change group WAS 44.4% NRP and the post-term and pre-term gestational age was lower in the post-change NRP group [9].

In the study of Ziadeh et al. in Amman and Jazayeri et al. in America the mean age of mothers and gestational age were higher in the case group. But they also failed to show a significant difference between the mean age of mothers and gestational age between case and control groups.

The results of amniotic fluid status of meconium before and after NRP changes were 9.1% thin and 12.1% thick and in the group after NRP changes (thin and thick) were 4.4% but there was no statistically significant relationship between meconium amniotic status and NRP changes.

In the group before change NRP 57.1% and in the group after change NRP 42.9% cesarean section was reported and there was no statistically significant relationship.

Cesarean delivery in the pre-change group was more than the post-change group and other studies in this field, both in Iran and in other countries (American-Israel, Oman, etc.) had similar results [10].

In our study 73.7% of cases had cesarean section, in Israel study 33.7%, Spain 52.5% and in Oman study the rate of cesarean section increased by 14%-7% compared to normal. In Zimbabwe, cesarean delivery rates are twice as high. This reference figure is 60% in the reference book.

The results showed that 42.6% neonates before and 53.8% after the changes of NRP needed to be resuscitated but this relationship was not statistically significant. There was no significant relationship between gender and infant weight before and after NRP changes. The length of stay in the NICU increased after the NRP protocol change but no significant relationship was observed.

Intubation was used in the 21.2% of the group before the changes of NRP preterm infants and in the 20.8% of the group after the changes of NRP. But there was no significant relationship between need for ventilation before and after NRP changes. Aspiration meconium syndrome that needed ventilator estimated 21% in our study and 0.6% (15%) in the US, Singapore 1.4%, Syria 5.5%, Italy 28%. That our study is in line with the study of Italy.

The results of this study showed that in the group before NRP changes in mothers with cesarean section out of 6 patients with amniotic membrane dilated 8.3% thin and 16.7% thick and in the group of after NRP changes only one patient with cesarean section with amniotic membrane thickness was reported. Birth weight was reported 72.7% in the pre-changes group and 72.9% NRP in the post changes groups of less than 3500 g.

But t-test showed that there was no significant difference between the two groups in terms of mean neonatal weight. Mean weight was reported $3094/54 \pm 624/1$ in pre-group changes and $3002/08 \pm 590$ in the post changes group.

Jazayeri et al., Maymon et al., achieved similar results in their studies. But Ziadeh and colleagues observed a significant $P < 0.05$ difference in mean neonatal weight between the two groups. In this study, the mean score of first minute apgar score in both homogeneous groups and in the 5th minute was higher in the

pre-change group than in the post-NRP group. This difference was not statistically significant. Whereas in Jazayeri et al. study, only the first minute apgar score was significantly different between the two groups.

First minute apgar was less than 7% in our study, while in another study it was 1.9%. It seems in our study that high meconium excretion, which is indicative of severe fetal distress, is higher than the above study, with a lower apgar score in the study.

Conclusion

In our study, as in other studies, fortunately most of the studied units were discharged in two groups with improved outcome. In the group before the changes one death due to pneumothorax and in the next group 4 deaths due to no morbidity, pneumothorax and one case occurred due to hypothermia and hyperkalemia.

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