

## Role of Intrapartum Transcervical Amnioinfusion in Meconium Stained Liquor

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### ABSTRACT

**Background:** Pregnancy is associated with several risks to both mother and fetus. Meconium staining of amniotic fluid is one of the important risk factors associated with neonatal mortality. Thus the aim of this study was to assess the effectiveness of amnioinfusion in treatment of thick meconium stained amniotic fluid and compare the results with control group.

**Materials and Methods:** It was a prospective case control study conducted from October 2015 to September 2017, in the department of Obstetrics and Gynaecology, at Indira Gandhi Institute of Medical Sciences (IGIMS), Patna. We included 100 cases of thick meconium complicated deliveries. The patients were categorized as study group who received amnioinfusion and control group who received standard treatment. Each group contained 50 patients.

**Results:** We found that the need for caesarean section was low in study group. The Apgar score also effectively improved in the study group compared to the control group at 1 minute, 5 minute and 10 minutes interval. Amnioinfusion reduced the incidence of meconium below the vocal cord and meconium aspiration syndrome. There was also reduction in admission of

infants to NICU in those cases who received amnioinfusion compared to control groups.

**Conclusion:** We concluded that transcervical amnioinfusion is simple and effective method that aids in improvement of perinatal outcomes of those cases complicated with thick meconium.

**Keywords:** Meconium, Amnioinfusion, Meconium Aspiration Syndrome, Fetal Distress.

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### INTRODUCTION

Pregnancy is one of the complicated phases of women's life and is associated with various risk factors to both the mother and growing fetus. During pregnancy, the produced amniotic fluid serves as the medium for growth and development of fetus by protecting from external trauma and regulating the intra-uterine temperature. Amniotic fluids in 12-20% of pregnancies are reported to be stained with meconium and its passage in utero has been reported among 7-22% cases of live births. Of the meconium stained liquor, 20-30% leads to its aspiration and 4-5% contribute to the meconium aspiration syndrome that is associated with 4-10% of infant death.<sup>1</sup>

Meconium (poppy juice like substance in Greek language) is a viscous and dark green coloured substance that is composed to:

- 5-15% of solid components constituted by intestinal epithelial cells, intestinal secretions, bile, mucus, lanugo verinix and glycerophosphates
- 85-95% of water (major components)<sup>2,3</sup>

The primary factor that differentiates meconium from stool is that meconium does not contain bacteria as it is sterile.<sup>2</sup> It is released as the first neonatal intestinal discharge. The level of meconium is low during the first and second trimesters while as the gastrointestinal tract of the fetus matures, the level starts to increase.<sup>4</sup> However, the amniotic fluid somewhat remains clear due to closure of external and internal sphincters during fetal life. But in presence of several stimuli, the sphincters may get relaxed causing the passage of meconium and staining of amniotic fluid. Factors facilitating meconium passage in utero may be maternal hypertension, placental insufficiency, oligohydrominos, pre-eclampsia, acidosis, infections and maternal drug abuse (tobacco and cocaine).<sup>2</sup>

Meconium, if present in amniotic fluid is a matter of great concern as it may be the sign of fetal distress. It can increase the risk of perinatal morbidity and mortality since thick meconium if drawn in fetal respiratory tract, can result in lung collapse, rupture of alveoli,

emphysema, pneumo-mediastinum and pneumothorax.<sup>5,6</sup> Thick meconium also promotes the microbial growth like that of *Listeria* and *E. coli*. However, meconium if thin is associated with less abnormal outcomes.<sup>7</sup>

During labour, fetal heart rate and presence of meconium are assessed to evaluate the fetal condition in those clinical setting where there is lack of electric monitoring facilities and estimation techniques of fetal scalp blood. Both (abnormal heart rate and meconium) when present together increase the risk of fetal mortality. It shows that meconium also may not be always related with such increased risk however it may warrant vigilant monitoring of fetus at times.<sup>8</sup> Meconium aspiration basically is an intra-uterine event, however, it may also occur at the time of delivery or during initial breaths of neonates.<sup>9</sup>

Meconium if thick possess the higher risk of aspiration, therefore any techniques that can convert thick meconium in thin can result in positive neonatal outcomes.<sup>10</sup> Meconium stained amniotic fluid is associated with low Apgar scores, meconium aspiration syndrome, neonatal acidosis, fetal distress (accounting for cesarean section) and perinatal morbidity and mortality.<sup>11</sup>

A recent technique known as amnioinfusion have been developed in fetal medicine. Two basic methods of amnioinfusion are present namely transabdominal and transcervical amnioinfusion.<sup>12</sup> Gabbe et al in 1976 first described amnioinfusion in the fetal rhesus monkey model. According to the authors, removal of amniotic fluid from the uterine cavity resulted in variable decelerations of amniotic fluids<sup>13</sup> Major breakthrough was observed only in 1983 when Miyazaki and Taylor et al demonstrated beneficial effects of transcervical saline amnioinfusion on resolution of variable decelerations observed during labours.<sup>14</sup> Amnioinfusion alleviates variable deceleration and results in improvement of pH of umbilical artery and veins, volume (causing cushioning of umbilical cord), dilution of thick meconium stained fluid and reduction of need of surgery for fetal distress.<sup>14</sup> Later Wenstrom and Parson et al proposed intrapartum amnioinfusion techniques to dilute thick meconium so as to lower the occurrence of meconium aspiration syndrome.<sup>15</sup>

Amnioinfusion involves infusion of physiological solutions such as normal saline into the uterine cavity.

Usually amnioinfusion is indicated for three purposes:

- Meconium stained liquor
- Treatment of prolonged and variable decelerations
- Cases of oligohydrominos.<sup>16</sup>

The current method of treatment was described by Carson et al<sup>17</sup> which included combined pediatric and obstetric approach. Treatment strategies involve deep suctioning of nasopharynx and hypopharynx during delivery and oropharynx after delivery. Vocal cords are evaluated by direct laryngoscopy. The association between neonatal decelerations and incidence of meconium in amniotic fluid is still unclear. Meconium aspiration is associated with almost 28% of neonatal death.<sup>8,18</sup> Therefore, we proposed to study the effectiveness of intrapartum amnioinfusion in the resolution of meconium stained liquor with an aim of minimizing fetal morbidity and mortality and thus improving labour outcomes.

## MATERIALS AND METHODS

It is a prospective case control study conducted in the department of Obstetrics and Gynaecology from October 2015 to September 2017, at Indira Gandhi Institute of Medical Sciences (IGIMS),

Patna. After taking ethical clearance from the institute and written consent from the patients, we included 100 cases of complicated labour due to thick meconium. Of these cases, two groups were created each containing 50 patients each. One group was considered study group that received amnioinfusion and the other group was control group who were provided with the standard treatments (no amnioinfusion).

### Inclusion Criteria

- Gestation period of more than 37 weeks
- Singleton pregnancy
- Presence of thick or moderately thick meconium
- Vertex presentation
- Fetus with normal heart rate

### Exclusion Criteria

- Multiple gestations
- Fetal congenital anomalies or mal-presentations
- Chorioamnionitis
- Antepartum hemorrhage and sepsis
- Maternal medical disorders complicating pregnancy
- Preterm labour
- Placenta previa
- Uterine scar

### Materials Used

- Normal saline
- Drip set
- Artery forceps
- Foleys catheter no. 14
- Sims vaginal speculum
- Sterile swabs
- Gloves
- Drapes
- Betadine
- Retractor (for anterior vaginal wall)
- Pinard Fetoscope

### Procedure

Initially abdominal examination was carried out in order to assess the fetal presentations. Pinard Fetoscope was used to auscultate fetal heart rate. The duration and rate of uterine contractions were also evaluated. Stages of labour were determined by vaginal examination. The amniotic fluid obtained via artificial or spontaneous rupture of membranes was evaluated and graded as:

- Thin Meconium: Grade I (watery with uniform green staining)
- Moderate: Grade II (watery with thick green stain)
- Thick Meconium: Grade III (thick, green, tenacious and opaque)

The patients in study group who received amnioinfusion were proceeded as follows:

- Vagina was thoroughly cleaned and betadine was applied followed by draping. Sterile towel was used.
- Foleys catheter no. 14 was inserted transcervically between the fetal head and ruptured membrane. Sims vaginal speculum was used for direct vision of insertion procedure.
- Catheter at the other end was connected with normal saline bottle kept at room temperature.
- Amnioinfusion was initiated using 500ml normal saline which was infused at the rate of 10-15ml/min for one hour followed

by the infusion rate of 3-5 ml/min till delivery. During the process, the fetal heart rate was continuously monitored using electronic monitor.

- Partogram was maintained with continuous monitoring of progress of labour and fetal heart rate.
- Amnioinfusion was terminated when there was necessity of emergency operation or when the patients were at the second stage of labour.
- Infants after delivery in both the groups were efficiently monitored for the presence of meconium in upper respiratory tract followed by aspiration if needed. The neonates were also given stomach wash. Both the mother and new born in each groups were provided equal obstetrical and perinatal care.
- The outcomes of amnioinfusion were recorded on the basis as follows: mode of delivery, neonatal Apgar score, incidence of meconium below the vocal cord, meconium aspiration syndrome and requirement of NICU admission.

**Table 1: Age wise distribution of patients**

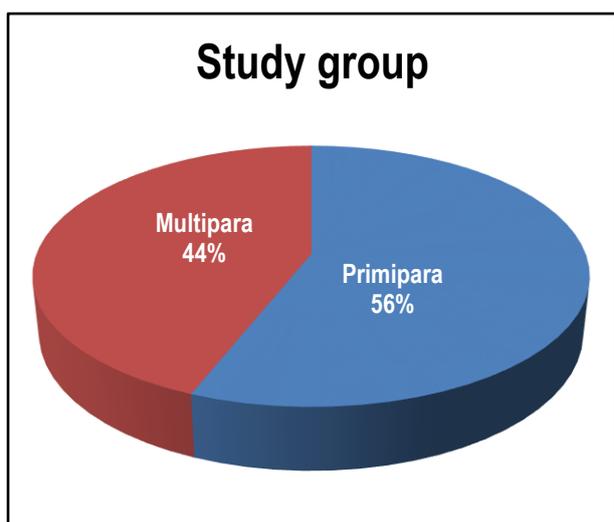
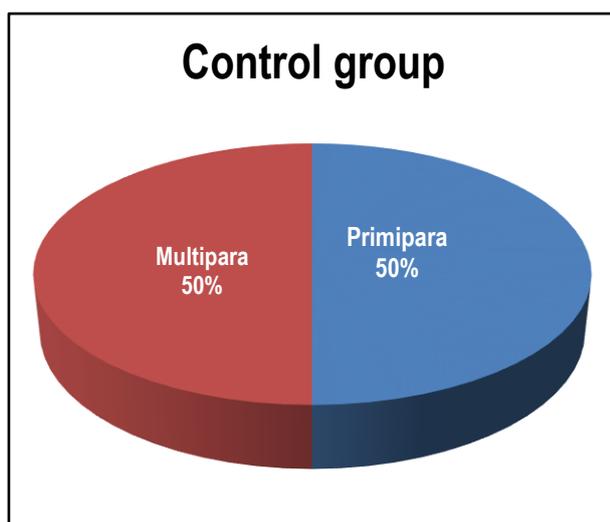
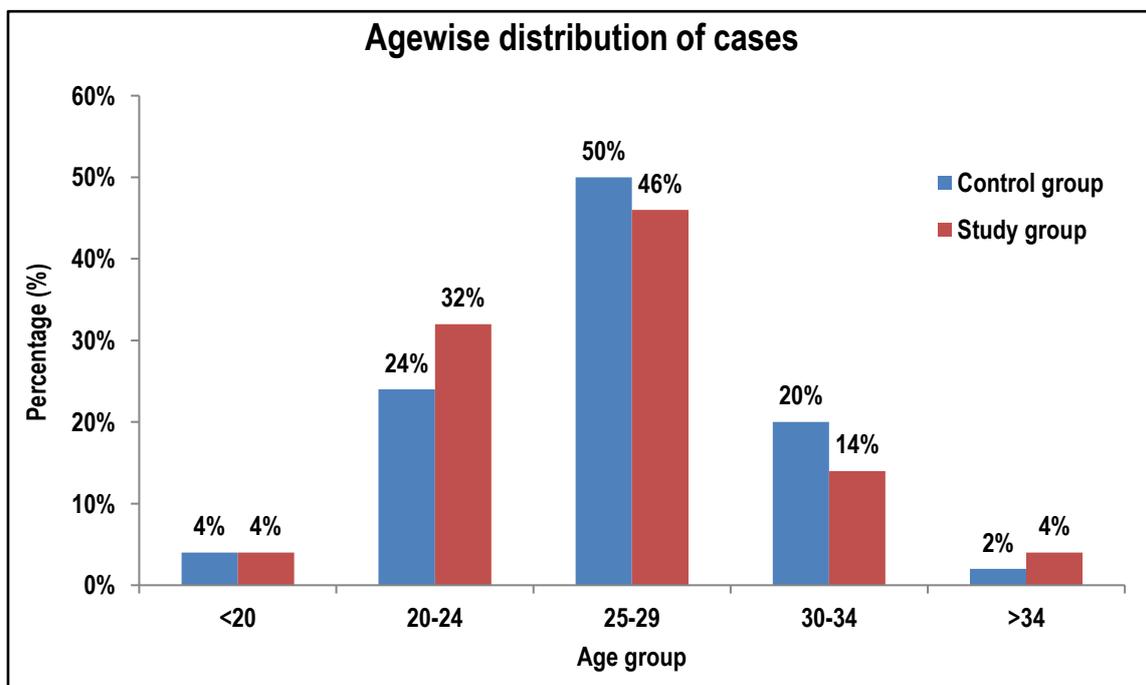
Age	Control group (n/%)	Study group (n/%)
<20	2 (4%)	2 (4%)
20-24	12(24%)	16 (32%)
25-29	25 (50%)	23 (46%)
30-34	10 (20%)	7 (14%)
>34	1 (2%)	2 (4%)

**Table 2: Parity of patients**

Parity	Control group (n/%)	Study group (n/%)
Primipara	25 (50%)	28 (56%)
Multipara	25 (50%)	22 (44%)

**Table 3: State of meconium before amnioinfusion**

Meconium quality	Control group (n/%)	Study group (n/%)
Moderately Thick	35 (70%)	33(66%)
Thick	15 (30%)	17 (34%)



**Table 4: State of meconium after amnioinfusion**

Meconium quality (n)	Thin (n/%)	Clear (n/%)
Moderately Thick (33)	5 (10%)	28 (56%)
Thick (17)	6 (12%)	11 (22%)

**Table 5: Mode of delivery**

Delivery	Control group (n/%)	Study group (n/%)
Normal vaginal	23 (46%)	31 (62%)
Assisted vaginal	10(20%)	8 (16%)
Caesarean section	17 (34%)	11 (22%)

**Table 6: Apgar scores of neonates**

Time	Apgar score	Control group (n/%)	Study group (n/%)
1 minute	<7	31 (62%)	27 (54%)
	≥7	19 (38%)	23 (46%)
5 minutes	<7	17 (34%)	11 (22%)
	≥7	33 (66%)	39 (78%)
10 minutes	<7	10 (20%)	3 (6%)
	≥7	40 (80%)	47 (94%)

**Table 7: Incidence of meconium below the vocal cord and meconium aspiration syndrome**

Incidence	Control group (n=50)		Study group (n=50)	
	Below vocal cord (n/%)	MAS (n/%)	Below vocal cord (n/%)	MAS (n/%)
Present	18 (36%)	6 (33.3%)	12 (24%)	3 (25%)
Absent	32 (65%)	3 (9.6%)	38 (76%)	0

**Table 8: Application of resuscitative measures**

Measures	Control group (n/%)	Study group (n/%)
Not applied	30 (60%)	38 (76%)
Applied	20 (40%)	12 (24%)

**Table 9: NICU admission**

NICU	Control group (n/%)	Study group (n/%)
Not required	28 (56%)	35 (70%)
Required	22 (44%)	15 (30%)
≤10 days	15 (68%)	12 (80%)
>10 days	7 (32%)	3 (25%)

## DISCUSSION

Fetal distress, indicated by fetal decelerations such as abnormal fetal heart rate and amniotic fluid stained with thick meconium, is associated with increased morbidity and mortality of fetus. The condition is even more alarming when there is presence of meconium aspiration syndrome. In this study we assessed the cases of pregnancy associated with meconium stained amniotic fluid which were monitored with amnioinfusion (study group) and standard treatment (control group) and compared the efficacy of amnioinfusion technique with the neonatal outcomes. In our study we found that 34% of patients in study group had thick meconium while 66% presented moderately thick meconium. Similarly for

control group, the results were respectively 30% and 70%. Study of Anuragayamai et al showed the presence of thick meconium in 40% and moderately thick meconium in 60% of the cases in study group. The prevalence of meconium stained amniotic fluid occurs in almost 10-15% of delivery cases.<sup>18</sup>

We also assessed the quality of meconium in the study group after amnioinfusion. In those patients with thick meconium, 12% presented thin meconium stained amniotic fluid and 22% showed clear amniotic fluid while among the patients with moderately thick meconium, 10% and 56% had thin meconium stained fluid and clear fluid respectively. Our results were comparable with that of previous studies.<sup>18</sup>

In this study normal vaginal delivery was reported in 62% of study group compared to 46% in control group. Similar to our results, Gavali UG et al<sup>9</sup> also demonstrated higher incidence of normal vaginal delivery (78.75%) in the patients receiving amnioinfusion compared to controls (61.25%). It was also in consistence with the study of Mistri Pk et al.<sup>19</sup> These findings supported the efficacy of amnioinfusion technique in reducing the rate of caesarean section, no matter whether the meconium present is thick or thin. Usta et al<sup>20</sup> and Cialone et al<sup>21</sup> demonstrated higher requirement of oxytocin in labour augmentation among the patients receiving amnioinfusion.

After delivery we compared the Apgar scores of neonates at 1 minute, 5 minutes and 10 minutes interval. We found that Apgar score subsequently improved in both the groups but the rate of improvement was comparatively high in the study group receiving amnioinfusion. The Apgar score was <7 among 54%, 22% and 6% of cases at 1 minute, 5 minutes and 10 minutes respectively while it was ≥7 respectively in 46%, 78% and 94% of cases in study group. When the score was compared with control group, we found the Apgar score to be <7 in 62%, 34% and 20% at 1 minute, 5 minutes and 10 minutes respectively. Similarly, it was ≥7 among 38%, 66% and 80% cases respectively in the control group. Similar to our results, study of Nath KK et al<sup>12</sup> also showed higher Apgar score among the amnioinfusion group at 5 minutes interval (90% in study group vs 74% in control group). Study of Gavali UG et al<sup>9</sup> also reported high 5 minute Apgar scores in amnioinfusion group which correlated positively with the results of CRAMP study.<sup>22</sup> As per the authors, increase in Apgar score reduces the incidence of respiratory distress in infants. These results were supported by that of Mahomed et al<sup>22</sup>, Macri et al<sup>23</sup>, Keith et al<sup>24</sup> and Usta et al.<sup>20</sup> However these reports in contrast to the findings of AM Rathore et al<sup>25</sup> and Mukhopadhyay P et al<sup>26</sup> who showed significantly low Apgar scores in the cases receiving amnioinfusion.

We found 24% of infants in study group and 36% of infants in control of to have meconium below the vocal cord. Meconium aspiration syndrome was reported in 25% of cases and 33.3% of controls. In the study of Gavali UG et al<sup>9</sup>, presence of meconium below the vocal cord was observed in 8.75% of amnioinfusion cases while the incidence was 23.75% in control groups. These observations were comparable with that of Bansal et al (12% vs 36%)<sup>27</sup>, Sahis et al (12% vs 42%)<sup>28</sup> and Mukhopadhyay P et al (6.3% vs 35.76%).<sup>26</sup> As per Rathore et al<sup>25</sup> amnioinfusion significantly reduced the meconium presence below the vocal cord.

Study of Nath KK et al<sup>12</sup> demonstrated incidence of MAS in 2% and 8% of study and control groups respectively. Other studies

like that of Sherbeny MFE et al<sup>29</sup>, Hofmeyer et al<sup>30</sup>, Mahomed et al<sup>23</sup> and Macri et al<sup>24</sup> showed the similar observations. Bano CD et al<sup>31</sup> demonstrated 0.7% and 15.8% incidence of MAS in study group and control group respectively. As per Sowmya K et al<sup>32</sup>, prevalence of MAS is significantly low in study group (10%) compared to control group (26%) which was also comparable to the findings of Ashfaq et al.<sup>33</sup> The authors also reported death of 6% of infants due to MAS which was similar to the reports of Lathika et al.<sup>34</sup> In our study we did not observe any neonatal mortality. Further Sood et al<sup>35</sup> demonstrated 6.3% incidence of MAS in study group compared to 20% in control group. However, Singh and Magu et al showed only 1% incidence in both the groups.<sup>36</sup> In contrast, Rathore et al<sup>26</sup> did not show any significant occurrence of MAS in amnioinfusion group compared to 1% in control group. Likewise, as per Mahomed et al the incidence of MAS was 3.3% in control group and 3.1% in study group.<sup>23</sup> In Das AK et al<sup>16</sup> on their prospective comparative study found significant reduction in the incidence of cesarean deliveries, low APGAR score, meconium aspiration syndrome and perinatal death in amnioinfusion group.

Resuscitative measures were applied in 40% of infants in control group compared to 24% of those in study group. Similarly Asnani M et al<sup>37</sup> also reported requirement of resuscitative measures in majority of babies (55%) in control group compared to babies (32.5%) of study group. Likewise, Uhing et al<sup>38</sup> suggested it to be 2.7% in study group and 10.1% in control group, thereby showing a significant difference between the two groups.

In our study, 30% of the study group required NICU admission while it was 44% in control group. Nath KK et al<sup>12</sup> reported NICU admission in 11% of cases in study group and 21% of cases in control group. We also observed that duration of NICU stay was less in the study group. This indicates that amnioinfusion reduces the percentage and duration of NICU admission.

## CONCLUSION

Thick meconium stained amniotic fluid increases the risks of fetal decelerations. To prevent the abnormal and unwanted outcomes in both mother and fetus, amnioinfusion can surely be a possible solution. It has emerged as a new and novel technique in pediatric medicine as it is simple procedure involving normal saline infusion in uterine cavity so as to dilute the thick meconium and replenish the amniotic fluid. However, there are still some unanswered questions due to availability of contradictory results in the literature. Therefore, there is also a necessity of proper attention in ensuring the efficacy of amnioinfusion under specific circumstances and correlate them with clinical practice via further clinical trials.

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