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Perinatal Outcome in High-Risk Pregnancies with and without Meconium Stained Liquor Amnii

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Abstract
Meconium leads to increased sleepiness of fetus in mother's womb. Prevalence of meconium stained amniotic fluid (MSAF) is 12-16% of all the deliveries. In utero passage of meconium may simply represent the normal gastro intestinal maturation or may indicate an acute or chronic hypoxic event, thereby making it a warning sign of foetal compromise. Fetal assessment and wellbeing has traditionally been evaluated on the basis of fetal movements and color of the amniotic fluid. Presence of meconium in the amniotic fluid has long been considered as ominous sign for fetal distress. Meconium reduces the antibacterial property of amniotic fluid by altering the level of zinc in it which leads to intra amniotic infections. In case of hypoxia, gasping of fetus results in meconium aspiration which neutralizes the surfactant action and promotes inflammation of lung tissues, whereas persistent hypoxia after birth, aspirated meconium results in pulmonary vascular and pulmonary hypertension. Conflicting outcomes have been reported in the deliveries complicated by meconium staining, which differs with the degree of meconium staining.
The aim of this study is to know the association between the meconium stained amniotic fluid and its association with the perinatal outcome.
It is a cross-sectional design was considered suitable for the study. This study was carried out on the admitted patient in the department of Obstetrics and Gynecology, Combined Military Hospital (CMH), Dhaka. The study was carried out during the period from February 2018 to July 2018, 6 months. Total 86 patients who admitted in "high-risk antenatal ward" in the department of Obstetrics and Gynecology to present hospital for delivery with meconium stained liquor during the study period were included in the study. Among sample patients 12 (14.0%) were found with meconium stained liquor (group A) and 74 (86.0%) cases were found without meconium stained liquor (group B). In group A common risk factors were prolonged pregnancy (33.3%) then hypertensive disorder 25.0%. In group B common risk factors were hypertensive disorders 23.0% then diabetes 18.9 %. Pattern of antenatal care was regular in 83.3% cases in group A which was 83.8% in group B. Gestational age was between 37-40 weeks in 50.0% cases in both group, Gestational age was found ≥ 40 weeks in 33.3% cases in group A, in comparison to 39.2% in group B. In group A vaginal delivery was 8.3%, LUCS 91.7% which was 16.2% and 83.8% in group B respectively. Still birth was 8.3% in Group A. In group B Still birth was 1.4% and neonatal death was 2.7%.Incidence of low birth weight (<2.5 Kg) was 33.3% in group A in comparison to 9.5% in group B. 27.0% baby of group A required resuscitation and 45.5% needed admission in neonatal care unit which was 8.2% and 16.4% in group B respectively. Among the study population (n=86) babies were found without complication 83.7%, still birth 2.3%, meconium aspiration 1.2%, birth asphyxia 10.5% and neonatal death was 2.3%.
In this study, it was observed that perinatal mortality was not directly related to meconium aspiration syndrome rather premature separation of placenta, placental insufficiency, prematurity & low birth weight were the main association. Present study showed that thick meconium is associated with more complications like increased operative interference, birth asphyxia, meconium aspiration syndrome, low Apgar score, prolonged NICU stay and overall increased perinatal mortality compared to thin meconium stained liquor.
Keywords: *MAS (meconium aspiration syndrome), MSAF (meconium stained amniotic fluid), NICU (neonatal intensive care unit).*

Introduction

The nearness of meconium recolored amniotic liquid (MSAF) is a genuine indication of foetal compromise, which is related with an expansion in perinatal morbidity[1,2] clear amniotic fluid on the other hand is considered reassuring. Presence of MSAF is seen in 12-16 % of deliveries[3]. In-utero, passage of meconium may simply represent the normal gastrointestinal maturation or it may indicate an acute or chronic hypoxic event, thereby making it a warning sign of a foetal compromise. Meconium passage is rare before 34 weeks of gestation and incidence increases steadily beyond 37 weeks of gestation[4]. Factors such as placental insufficiency, maternal hypertension, pre-eclampsia, oligohydramnios or maternal drug abuse (tobacco, cocaine) result in in-utero passage of meconium[5].

Meconium is thick, dark green, sticky tar-like substance containing mucus, bile, epithelial cells that are passing as baby's first bowel motion. At times this can be passed before baby's birth discoloring water. It is often used the term "mec" or "mec-stained liquor" (written as MSL).It complicates about 15% of all pregnancy. Meconium stained liquor categories into three grades, namely grade I (light), grade II (moderate), grade III (heavy).

Meconium stained liquor categories into three grades-

Grade I (light): Light meconium staining is when there is small amount of meconium diluted in a plentiful amount of amniotic fluid. This gives the waters only a slight, greenish or yellowish tinge or discoloration. A slight discoloration is generally not a concern and the baby could have passed it any time during the last weeks of pregnancy. It is usually not related to distress in labor and will usually not cause meconium aspiration syndrome.

Grade II (moderate): Moderate meconium staining is when there is a fair amount of amniotic fluid, but it is clearly stained with meconium. In this case the waters will definitely look greenish or brownish in color. Moderate meconium staining is a possible sign of fetal distress for the baby. This would be confirmed with abnormal or low heart rates in the baby. Moderate meconium passed early in the labor can be more of concern, than if noticed towards the end, near the birth. This is because the baby is suspected of being distressed before having to deal with the labor to come. That is also a concern that the baby could inhale the meconium at birth, with a risk of Meconium, Aspiration Syndrome (MAS).

Grade III (heavy): Heavy meconium staining is when there is reduced amniotic fluid and a large amount of meconium, making the staining quite thick. This is often likened to "pea soup". The waters are more like a thick, green, oozy discharge rather than a watery flow and can be very dark green or black in color.

Infants born through MSAF are about 100 times more likely to develop respiratory distress than those which are born through clear fluid[6]. Even in women who are at very low risk for obstetric complications, MSAF is common and it is associated with a five-fold increase in perinatal mortality as compared with low-risk patients with clear amniotic fluid. Presence of meconium below vocal cord is known as meconium aspiration and it is seen in around 20-30 % of all infantswith MSAF[7]. Aspiration can beoccurred in-utero with foetal gasping, or after birth, with the first breaths of life. Meconium aspiration syndrome (MAS) is defined as a respiratory distress that develops shortly after birth, with radiographic evidence of aspiration pneumonitis and presence of MSAF [8]. MAS occurin about 5% of deliveries with MSAF and death occurs in about 12% of infants with MAS[9].

Meconium in utero is associated with a poor perinatal outcome such as low Apgar score, chorioamnionitis, increased rate of Neonatal intensive care unit (NICU) admission and perinatal death. Meconium passage is a normal event programmed within first 24-48 hours after delivery. Fetomaternal stress factors like hypoxia and infection lead to meconium passage in utero in near term foetuses, leading to perinatal morbidity and mortality **[10]**. Even though the

meconium appears very early in the foetal intestine in utero, it is not seen in amniotic fluid before 38 weeks of gestation age. Detection of MSAF is associated with abnormal FHR, so once the MSAF is detected, continuous FHR monitoring is needed as is associated with abnormal foetal outcome. Meconium aspiration into the neonatal lungs is associated with clinical entities ranging from respiratory distress to severe respiratory compromise thus leading to significant increase in perinatal morbidity and mortality [11].

MSAF is associated with both maternal and foetal risk factors. Maternal factors include hypertension, gestational diabetes mellitus, maternal chronic respiratory or cardiovascular diseases, post term pregnancy, pre-eclampsia and eclampsia. Foetal factors include oligohydramnios, foetal growth restriction and poor bio physical profile [12]. MSAF is associated with increased risk of operative interference in terms of instrumental delivery or caesarean section and increased rate of neonatal resuscitation and meconium aspiration syndrome (MAS) [13].

This study was carried out to know the correlation of MSAF with perinatal outcome, also, to know the difference between thin and thick MSAF on fetal outcome and in relation with stage and mode of delivery and antenatal complications.

Objectives

1. To evaluate the perinatal outcome in term pregnancies with meconium stained amniotic fluid.
2. To bring out the correlation between fetal heart rate abnormalities and perinatal outcome inmeconium stained amniotic fluid.

Materials and Methods

Study design: A cross-sectional design was considered suitable for the study.

Place of Study: This study was carried out on the admitted patient in the department of Obstetrics and Gynecology, Combined Military Hospital (CMH), Dhaka.

Period of Study: The study was carried out during the period from February 2018 to July 2018, 6 months.

Study population: The sample was collected from women who were admitted in "high-risk antenatal ward" at CMH, Dhaka during the study period.

Inclusion criteria

- High-risk pregnancies with or without meconium stained liquor.
- High-risk pregnancies: Identified by following criteria (WHO, 1978):

Elderly primi (≥ 30 years), short statured primi (≤ 140 cm), threatened abortion and APH, malpresentation, preeclampsia, eclampsia, anemia, elderly grandmultiparas, twin and hydramnios, previous stillbirth, IUD, manual removal of placenta, prolonged pregnancy, previous caesarean section and instrumental delivery, pregnancy with medical diseases, PROM, prolonged labor, hand, feet or cord prolapse, placenta retained more than a half an hour, PPH, puerperal fever or sepsis.

Exclusion criteria: Congenital anomaly of baby (diagnosed antenatally by USG or diagnosed during or after delivery).

Sample size: Total 86 patients who admitted in "high-risk antenatal ward" in the department of Obstetrics and Gynecology, CMH, Dhaka were enrolled for this study.

Sample size determination: The sample size was determined by following formula

$$n = (Z^2 \times p \times q)/d^2$$

Where,

z=1.96 (Value of standard normal distribution).

p=0.2 (20% prevalence)

q=(1-p)=0.8

d=acceptable error = 0.085

From the formula calculated sample size = 86

Variables studied

(1) Neonatal outcome

a) Status of child at birth

- Dead or alive
- If alive degree of asphyxia (or APGAR score)
- Resuscitation needed - yes/no

b) Any other complication

(2) Neonatal factors associated with meconium stained liquor.

a) Birth weight of the baby
b) Sex of the baby
c) Duration of gestation.
d) Length of cord.
e) Cord around the neck.

(3) High-risk factors commonly associated with meconium stained liquor.

Operational definition

Perinatal period: For the study perinatal period was taken as : From the time of delivery till discharge form hospital.

Flow chart showing sequences of tasks:

Month 1 ► Planning and preparation.
Month 2-5 ► Data collection and analysis.
Month 6 ► Report writing and submission to BCPS.

Ethical consideration: The aims and objectives of the study were explained to the patients in easily understandable local language and then consent was taken from each patient. It was assured that all actions and records would be kept confidential.

Method of data collection: After discussing the patient and getting consent from patient a detailed history was taken, regarding obstetrical, mens-trual, medical, and surgical. Physical examination was done relevant investigation recorded.

Detailed history was taken regarding any known medical disorder, abortion, caesarean section, age of the patient, any stillbirth, IUD.

Physical examination was done. Height of the patients, anemia, jaundice, BP, edema, fundal height, FM, FHR was recorded.

Patients were followed up closely during intra-partum and post-partum period, all the important events were recorded including mode of delivery, nature of liquor (whether meconium stained or not). Neonatal details considering sex of baby, weight of the baby, APGAR score, baby resuscitation, cord around the neck (detected during delivery), cord length recorded. Both mother and neonate followed up to discharge from hospital. All the necessary information was recorded in data collection sheet.

Patient having meconium stained liquor was labeled as group A and without meconium stained liquor was labeled as group B.

Quality control: After collection, data were checked for inadequacy, irrelevancy and inconsistency. Irrelevant and inconsistent data were discarded.

Data analysis: All data were processed and analyzed by using computer based statistical Software.

Limitation of the study

1) Fetal scalp blood PH study and fetal blood sampling were not possible at CMH, Dhaka.

2) Neonates were followed up upto the discharge from hospital; therefore, actual number of neonatal morbidity and mortality could not be detected.

3) Study was carried out in a small group of population in a Military Hospital where treatment is free of cost. As such, outcome of this study does not reflect the entire picture of Bangladesh.

Results

Table I: Risk scoring of the study population (n=86)

Risk Group	Number of Patients	Percentage
High-risk Pregnancy	78	90.7
Severe High-risk Pregnancy	8	9.3
Total	**86**	**100.0**

Table I shows among the 86 cases high-risk pregnancy was 78(90.7%) and severe high-risk pregnancy was 8 (9.3%).

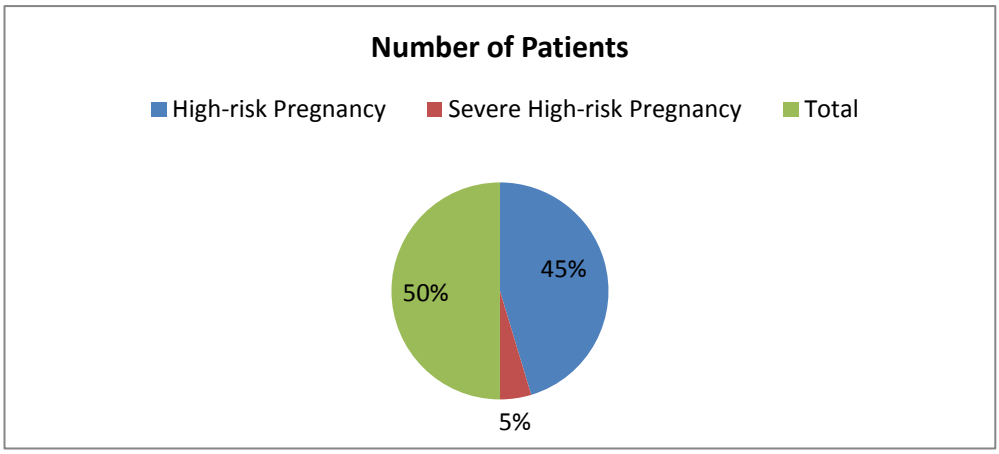

Figure I: Pie chart of risk scoring of the study population

Table II: Association of meconium stained liquor in relation to risk scoring (n = 86)

Risk groups	**Group A** (n = 12)	**Group B**(n = 74)	**p value**
High risk pregnancy	9 (11.5)	69 (88.5)	0.079
Severe high-risk pregnancy	3 (37.5)	5 (62.5)	
Total	**12 (14.0)**	**74 (86.0)**	

Table II shows that out of 78 patients in high-risk pregnancy group 9 (11.5%) in group A, 69 (88.5%) in group B. In severe high-risk pregnancy group 3 (37.5%) in group A in comparison to 5 (62.5%) in group B. Total number of patient with meconium stained liquor was 12 (14.0%) and without meconium stained liquor was 74 (86.0%).

The parameters are taken in an aim to compare the prenatal outcome with-

Group A = with meconium stained liquor ii) Group B = without meconium stained liquor

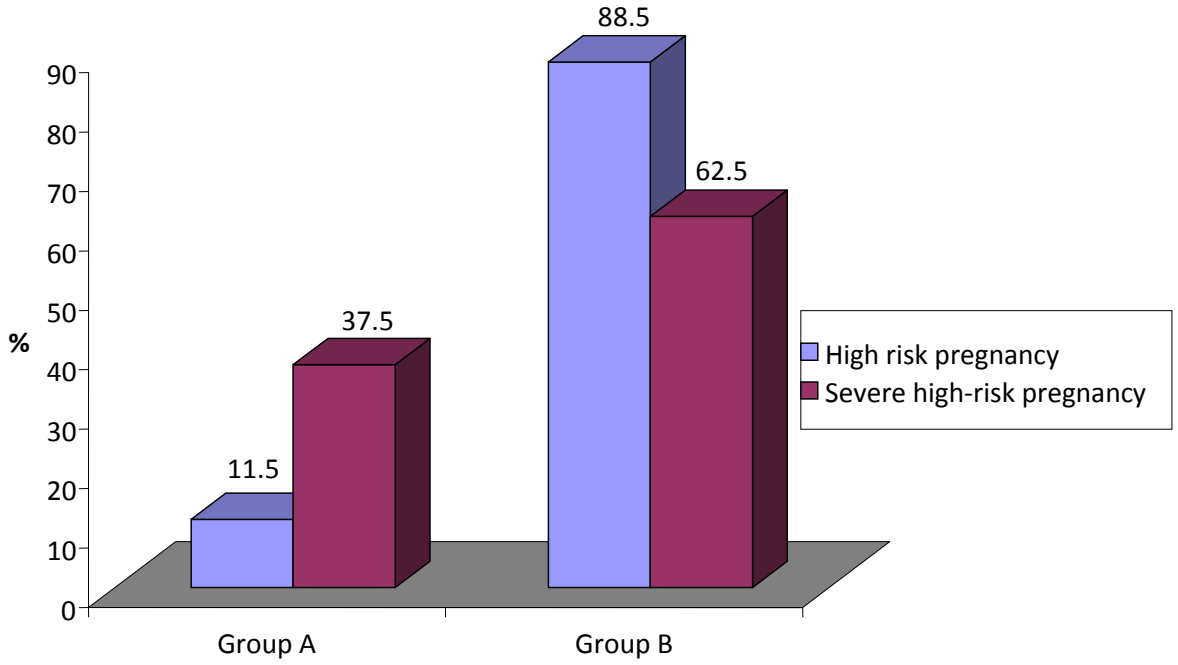

Figure II: Bar diagram of association of meconium stained liquor in relation to risk scoring

Table III: Risk factors associated with and without meconium stained liquor

Risk Factors	Group A	Group B	p value*
Hypertensive disorders	3 (25.0)	17 (23.0)	0.999
Diabetes	2 (16.7)	14 (18.9)	0.999
Prolonged pregnancy	4 (33.3)	12 (16.2)	0.224
Previous caesarean section	1 (8.3)	10 (13.5)	0.999
PROM	2 (16.7)	6 (8.1)	0.309
Malpresentation	0 (.0)	6 (8.1)	0.306
Other medical disorders	0 (.0)	9 (12.2)	0.348

*Fisher's Exact test was done to measure the level of significance.

Table III shows risk factors associated in group A were prolonged pregnancy 4 (33.3%), hypertensive disorders 3 (25.0%), diabetes 2 (16.7%), PROM 2 (16.7%) and previous caesarean section 1 (8.3%). On the other hand, in Group B hypertensive disorder was 17 (23.0%), diabetes 14 (18.9%), prolonged pregnancy 12 (16.2%), previous caesarean section 10 (13.5%)), other medical disorders 9 (12.2%), PROM and malpresentation were 6 (8.1%) & 6 (8.1%) respectively.

Table IV: Pattern of antenatal care

Antenatal Care	Group A	Group B	p value*
Regular	10 (83.3)	62 (83.8)	0.999
Irregular	2 (16.7)	12 (16.2)	
Total	**12 (100.0)**	**74 (100.0)**	

*Fisher's Exact test was done to measure the level of significance.

Table IV shows 10 (83.3%) patient in group A were on regular antenatal care and 2 (16.7%) were on irregular care. In group B 62 (83.8%) were on regular antenatal care & 12(16. 2%) were on irregular antenatal care.

Table V: Duration of gestation

Duration of gestation in week	Group A	Group B	p value*
28 - < 34	1 (8.3)	3 (4.1)	0.911
34 - < 37	1 (8.3)	5 (6.8)	
37 – 40	6 (50.0)	37 (50.0)	
>40	4 (33.3)	29 (39.2)	
Total	**12 (100.0)**	**74 (100.0)**	

*Chi-square test was done to measure the level of significance.

Table V shows in group A gestational age was between 37-40 weeks in 6 (50.0%), >40 weeks in 4 (33.3%) between 28-<34 weeks in 1 (8.3%) and between 34-<37 weeks in 1 (8.3%) patient.

In group B gestational age was between 37-40 weeks in 37 (50.0%), > 40 weeks in 29 (39.2%), between 34-<37 weeks in 5 (6.8%) and between 28-<34 weeks. in 3 (4.1%).

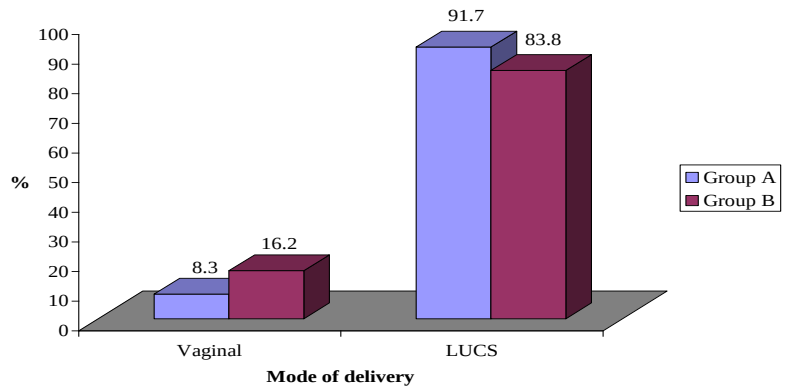

Figure III: Bar diagram of mode of delivery

Bar diagram shows patient in group A 1(8.3%) patient delivered vaginally in comparison to 12 (16.2%) patient in group B. Mode of delivery was LUCS in group A and group B was 11 (91.7%) & 62 (83.8%) respectively.

Table VI: Perinatal mortality in relation to meconium stained liquor

Perinatal mortality	Group A	Group B	p value*
Stillbirth	1 (8.3)	1 (1.4)	0.261
Neonatal death	0 (.0)	2 (2.7)	0.999

*Fisher's Exact test was done to measure the level of significance.

Table VI shows stillbirth was 1 (8.3%) in group A and 1 (1.4%) in group B, neonatal death was 2 (2.7%) in group B. Overall perinatal mortality in study population (n=86) was 4.6%.

Table VII: Cord around neck of the baby and percentage

Amniotic fluid	Cord around the neck of the baby	
	No of patient	Percentage
Meconium Stained (N=12)	3	25
Without meconium (N=74)	6	8.1

Table VII shows 3 (25%) babies were found with cord around neck in group A in comparison to 6 (8.1%) in group B. Cord around the neck of the baby causing cord compression which causes hypoxia and increase vagal response, ultimately causes relaxation of anal sphincter and passage of meconium.

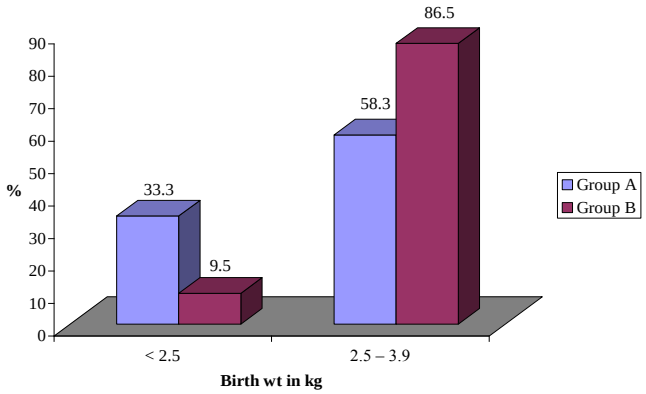

Figure IV: Bar diagram of birth weight of the babies

Bar diagram shows in group A birth wt<2.5 kg in 4 (33.3%), (2.5-3.9) kg in 7 (58.3%) and ≥ 4 kg in 1 (8.3%) and in group B < 2.5 kg in 7 (9.5%), (2.5-3.9) kg in 64 (86.5%) and ≥ 4 kg in 3 (4.1%).

Table VIII: Perinatal complication

Outcome	Number of Patient	Percentage
No complication	72	83.7
complication	14	16.3

Table IX: Perinatal outcome in study population (n=86)

Perinatal outcome	Number of Patient	Percentage
Still Birth	2	2.3
Meconium aspiration	1	1.2
Birth asphyxia	9	10.5
Neonatal death	2	2.3
Without complication	72	83.7

Table IX shows among (n=86**)** the study population overall perinatal outcome was still birth 2 (2.3%), meconium aspiration 1 (1.2%), birth asphyxia 9 (10.5%) and neonatal death 2 (2.3%). 72 (83.7%) babies were without complication.

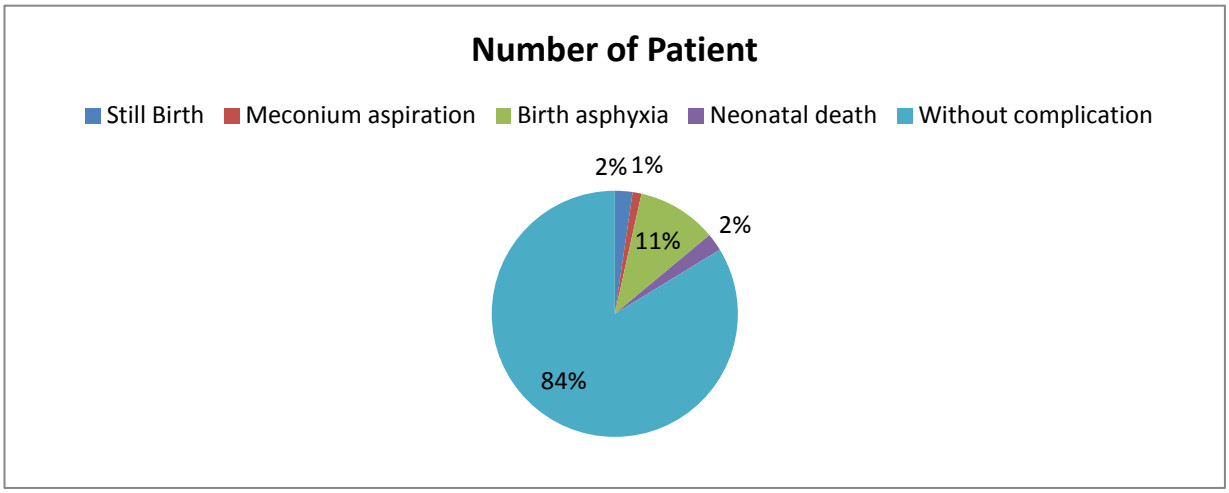

Figure V: Pie chart of perinatal outcome in study population

Discussion

High-risk pregnancy is one in which mother, fetus or newborn is or may possibly at increased risk of morbidity or mortality, before, during or after delivery. Perinatal outcome is thought to be more adverse when liquor stained by meconium, because meconium stained liquor is generally interpreted as one sign of baby possibly unwell or distressed when inside the uterus, other health concern is meconium aspiration syndrome.

There are limited data available regarding effect of meconium on perinatal outcome in our country. But a comparative study between perinatal outcome in high-risk pregnancy with meconium stained liquor and perinatal outcome in high risk pregnancies without meconium stained liquor has not been studied yet. Present study was undertaken to find out and compare perinatal outcome in high-risk pregnancies with meconium stained liquor (group A) and without meconium stained liquor (group B). In present study, WHO criteria have been used to identify high-risk cases**.**

Table I shows risk-scoring of study population (n= 86) developed by Coopland et al (1977) . 90.7% patient was in high-risk group and 9.3% patient was found in severe high risk group. This was well supported by Afroza's study, in her study is was 85% and 15% respectively

Among study population (n=86) 12 (14.0%) patient was found with meconium stained liquor amnii.

Table III shows in group A prolonged pregnancy was associated in 33.3% cases then hypertensive disorder 25.0% cases, In Bhatia et al. (2007) in his study showed meconium stained amniotic fluid was in postdated pregnancy 32.4% cases and pre-eclampsia 13.9% cases. In group B hypertensive disorders associated in 23.0% cases then diabetes in 18.9% cases.

Table IV shows 83.3% patient was in regular antenatal care in group A which was 83.8% in group B.

In Table V, Gestational age 37-40 weeks was in 50.0% cases in group A which was similar in group B.

Figure III shows in group A vaginal delivery was 8.3% and LUCS 91.7%. Irin in her study showed, vaginal delivery in meconium stained baby was 22.0% and LUCS in 78.0%, in group B mode of delivery was vaginal in 16.2% and LUCS in 83.7%. Here difference of mode delivery between two groups was significant. Higher rate of LUCS in group A was mainly due to previous LUCS, fetal distress and associated medical disorders.

Table VI shows, in present study stillbirth was 8.3% in group A in comparison to 1.4% in group B, Neonatal death was 2.7% in group B. In group A, stillbirth was due to abruption placenta, consequence of hypertension. In group B stillbirth was due to chronic placental insufficiency consequences of various medical disorders. In group B neonatal death was due to low birth weight, prematurity.

Perinatal mortality in group A was 8.3%. In Irin's study it was 4.0%, it is significant may be due to study population of present study was high-risk cases having one or more co-morbiding which played significant role in perinatal mortality. It was observed that in group A, perinatal mortality was due to abruptio placenta (premature separation of placenta), low birth weight, prematurity but was not directly related to meconium aspiration syndrome.

Overall perinatal mortality among study population (n=86) was 4.6% this is well supported by Y. Malik, Nisar's study. Y Malik in his study showed that perinatal mortality in high risk population is 4.0%.

Table VII shows in group A 25% baby had cord around the neck in comparison to 8.10% in group B. So, meconium stained liquor has a strong association with cord around neck of baby but cord around neck not always causes meconium stained liquor.

Table IX shows in group A alive baby was 11 and stillbirth 1. Among the lived babies 27.0% babies required resuscitation and 45.5% required admission in neonatal care unit. In group B total live birth was 73 and stillbirth was 1. Among the live birth 8.2 % required resuscitation and 16.4% required admission in neonatal care unit. Neonatal admission in group A was higher due to birth asphyxia and low birth weight.

Present study showed, among study population (n= 86) 83.7% baby was without complication, 10.5% having birth asphyxia, 2.3% still birth, 1.2% meconium aspiration and 2.3 % neonatal death,. Main causes of neonatal death were prematurity, low birth weight.

This study showed 93.0 % mother was without complication, 3.5% had PPH, 2.3% perinatal tear and 1.2% had DIC. Maternal mortality was nil.

Present study showed meconium stained liquor amnii is associated with higher rate of LUCS, fetal distress, low Apgar score, low birth weight. Eriksen et al, (1994) in his study showed presence of meconium is associated with higher incidence of abnormal labor, fetal distress, intervention in delivery and low Apgar score. This study is well supported by Eriksen's study.

Conclusion

Meconium stained amniotic fluid is really worrisome from both obstetrician's and pediatrician's point of view. Based on our study we conclude that meconium stained amniotic fluid is associated with increased incidence of caesarean section, birth asphyxia, neonatal nursery admissions and meconium aspiration syndrome (MAS). So, presence of MSAF requires intensive foetal monitoring in order to decrease perinatal morbidity and mortality.

Presence of meconium in the amniotic fluid during labor often causes anxiety in delivery room because it is assumed as an indicator of poorfetal outcome. Fetal statusduring labor is usually assessed by measuring the fetal heart rate abnormalities and checking the color of the amniotic fluid. It is often assumed that fetal heart rate abnormalities, especially in the presence of meconium stained liquor which indicates hypoxia and acidosis.

Passage of meconium may be a normal physiological event reflecting fetalmaturity. It also reflects fetal hypoxia or increased vagal activity from cord compression. The presence of meconium during labor is associated with an increased risk of perinatal mortality and morbidity. Most workers showed there is an association with fetal heart rate abnormalities, low Apgar scores and low arterial cord PH in the presence of meconium stained amniotic fluid. The present study was undertaken to evaluate the significance of meconium stained amniotic fluid and its fetal outcome inparturient admitted to the hospitals.

In order to improve perinatal outcome at national level decentralization of MCH care, extension of EOC coverage, increased intensive neonatal care unit are essential. These high-risk cases need to manage by joint action of obstetrician, anesthesiologist and neonatologist.

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