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Original Research Article

Critical analysis of maternal risk factors and obstetric background and care of mothers of newborns requiring neonatal intensive care unit admission due to birth asphyxia - One year study in a Rural Medical College

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Abstract

Birth asphyxia depends on maternal and fetal risk factors. Early identification of high risk factors with improved antenatal and intrapartum care can decrease birth asphyxia rate. It was retrospective cross sectional study, conducted at Department of Obstetrics and Gynaecology, MMCH. Study was conducted from March, 2016 to February, 2017 with estimated sample size was 80. The study was done after approval by institutional ethics committee. Data were collected from respective mothers and analysed by SPSS19. In our study, total number of mothers was 80. Mean maternal age of babies born with asphyxia was found to be 23.86 years. Majority of mothers were belonging to lower socio-economic status (68.75%). Birth asphyxia was more common in unbooked mothers (52.50%), primipara (51.25%) and in term pregnancy (75%). It was found that birth asphyxia significantly more common in presence of maternal or fetal risk factors than absence of maternal and fetal risk factors. Maternal antepartum and intrapartum risk factors were anaemia (40%), augmentation by oxytocin (36.25%), prolonged second stage of labour (31.25%), prolonged rupture of membrane (26.25%), PIH or preeclampsia and eclampsia (26.25%), maternal fever (11.25%), history of IUFD (10%) etc. Fetal risk factors were meconium stained liquor (25%), prematurity (23.75%), breech presentation (22.50%), twin pregnancy (15%), IUGR, cord prolapse.
Birth asphyxia rate was more common in caesarean section (53.75%) delivery, low birth weight and male babies.
Keywords: Birth Asphyxia; Obstetric Background.

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1. Introduction

Maternal & Child health is one of the greatest concerns globally since long period of time. Since historical meeting in Alma-Ata, two decades back, many countries have given priorities to the mother and children in their National health strategies (World health organization 1988).[1]

According to a survey conducted by WHO in 2005, Birth asphyxia is one of the leading causes of neonatal death within first week of life [28] and one of the major cause of NICU admission.

Birth asphyxia defined by WHO as "The failure to initiate & sustain breathing at birth". [2]

The National Neonatology Forum (NNF) of India has defined Birth asphyxia as "Gasping or ineffective breathing or lack of breathing at one minute of life. [29]

WHO estimates that approximately 3% of about 120 million neonates born each year in developing country are suffering from asphyxia and need resuscitation. [3]

Worldwide, the rate of neonatal mortality due to asphyxia is very high and accounts for 23% of neonatal mortality. [4]

The causes of birth asphyxia are heterogeneous and mostly antepartum and intrapartum. A recent review suggests that asphyxia originate majority (50%) in the antepartum period, 40% is in the intrapartum and 10% is in the postpartum period.[9]

Causes of asphyxia may be maternal or fetal. Risk factors of asphyxia in community and hospital based setting in developing countries have been categorized below: -

- Demographic risk factors such as age [12], religion [32], socioeconomic status [11].
- Antepartum risk factors such as parity[2,21], anaemia[14], maternal fever[14], urinary tract infection (UTI)[3], booking status of mothers[34], pregnancy induced hypertension[21,24] (PIH), antepartum haemorrhage[21,14], bad obstetrics history[21] (BOH), gestational diabetes mellitus (GDM)[34].
- Intrapartum risk factors such as pregnancy induced hypertension or preeclampsia and eclampsia [14,32], prolonged rupture of membrane[29], prolonged second stage of labour[30,34], iatrogenic misuse of oxytotic agents.[14]
- Fetal risk factors e.g. twin pregnancy [30], meconium stained liquor [14,21], malpresentation [14,23,24], prematurity[26], low birth weight[14,27], intrauterine growth retardation [22,24] (IUGR), cord accidents.[21,24]

In India there is no much data available on the risk factors of birth asphyxia, hence studies are required to evaluate the risk factors of birth asphyxia. Not only these interventions can be done but also this helps to educate and guide people about antepartum, intrapartum fetal risk factors and management strategies. Therefore we hypothesized that maternal risk factors, their obstetric background and care of them have some association with birth asphyxia requiring NICU admission.

To test this hypothesis we assessed the relationship between maternal risk factors, obstetric background and care of mothers with newborns requiring NICU admission due to birth asphyxia in Midnapore Medical College & Hospital, a rural medical college of eastern India.

1.1 Aims and objectives

To explore the association of birth asphyxia requiring NICU admission in a rural medical college of eastern part of India with

1. Maternal potential risk factors
2. Obstetric background
3. Care of mothers

1.3 Review of literature

Birth asphyxia, although the correct definition is imprecise, is an insult to the fetus or newborn due to failure to breath or breathing poorly leading to decrease oxygen perfusion to various organs. In low income countries 23% of all neonatal deaths occurred due to birth asphyxia. [38]

According to a survey conducted by WHO in 2005, it is also one of the leading causes of neonatal deaths within first week of life. [28]

It is strongly associated with 1.1 million intrapartum stillbirths and responsible for long term neurological disability and impairment. [39]

Three important features indicative of intrapartum asphyxia are [40]:

a) Signs of fetal distress, such as meconium stained amniotic fluid

b) Depression at birth and

c) Overt neurological syndrome in long term period.

According to WHO classification of diseases ICD 10[16,41], severe birth asphyxia is when the 'APGAR score' at 1 min is 0-3. Mild and moderate birth asphyxia is when 'APGAR score' at 1 min is 4-7.

Causes of birth asphyxia may be maternal or fetal. So, maternal risk factors of birth asphyxia have been divided into antepartum or intrapartum.

Maternal age is also an important risk factor. Mothers who are in between the age of 20-25 years have higher risk of developing birth asphyxia as compares to younger or elder mothers. [29]

Lack of education, mothers often neglect regular antenatal checkup. So birth asphyxia risk decreased with increasing maternal education. [11]

Lower socio-economic status is highly associated with birth asphyxia.[11] So mother of neonates who developed birth asphyxia was mostly belonging to low socio-economic group.[19,29] But a hospital based study conducted in Bangladesh did not find association of maternal education with birth asphyxia.[9]

Parity is another risk factor of birth asphyxia. Infants of primiparaous women carried a higher risk for birth asphyxia [19, 29] and an analytical type of observational study shows more of the asphyxiated babies born to primi mother. [30]

Birth asphyxia was more prevalent in the unbooked case [31]. Regular checkup that allow doctors or midwives to treat and prevent potential health problems throughout the course of the pregnancy while promoting healthy lifestyles that will benefit both mother and child. So, increase number of booking significantly decreases the risk of birth asphyxia. [29] Cultural factors may also contribute for birth asphyxia. [19]

Deprivation of oxygen to a newborn that lasts long enough during the birth process to cause physical harm, usually to the brain. Antepartum and intrapartum maternal anaemia on fetal outcome found significant correlation between low haemoglobin and birth asphyxia and iron deficiency anaemia during pregnancy had significant adverse effect on the fetal outcome. [33]

A case control study of Pakistan showed association of birth asphyxia with increasing maternal age, prior still birth, high blood pressure, bleeding from vagina etc. [12]

Lack of antenatal care, poor nutritional status and APH and maternal toxaemia were associated with higher incidence of asphyxia. [29]

On determining risk factors for asphyxia in a study conducted in India, it was observed that prolonged first stage [25] and second stage of labour, vaginal breech delivery, PIH, fetal growth restriction contributed to increased risk for perinatal asphyxia. Among all stillbirths significant factors that contributed to asphyxia were prolonged second stage of labour and cord accidents. [24]

Maternal anaemia, hypertension, preeclampsia or eclampsia, UTI, APH of uncertain origin were evaluated, but single condition proved significant. [25]

Antepartum and intrapartum eclampsia, preeclampsia, chronic hypertension, APH, oxytocin use during labour, prolonged 2nd stage of labour, multiple pregnancy & prolonged rupture of membrane were found higher in the asphyxiated group. [19,30,37]

Pregnancy induced hypertension was the most common maternal risk factor of birth asphyxia. Others factors include oligohydramnios, multiple gestation, diabetes and UTI.[32]

An Indian study about perinatal asphyxia was found that PIH was strongly independently associated with perinatal asphyxia.[24]

Instrumental delivery, Breech delivery and prolonged delivery were also associated with birth asphyxia.[12, 19]

A retrospective case control study in Karachi found, the risk factors of birth asphyxia were lack of booking status, pre-eclampsia, breech presentation, cord accident, cephalopelvic disproportion, fever, MSL, oligohydromnios, preterm delivery, low birth weight baby etc.[34]

A study in Uganda was found that augmentation of labour with oxytocin, premature rupture of membrane, MSL, vacuum extraction, caesarean section, LBW and malpresentation were significantly associated with birth asphyxia. [14]

Prematurity was the important risk factors of birth asphyxia. Prematurity was associated with 2.28 fold higher birth asphyxia risk [11]. However in some study claimed that small size at birth has protective effect whereas larger babies are at an increased risk of asphyxia related death.[12]

A case control study was found a significant association of birth weight and birth asphyxia [34]. And another study was found there is no association of birth weight and birth asphyxia.[24]

Chandra *et al* found 51% female and 49 % males amongst live born with birth asphyxia[24]and another study noted there is some degree of male predominance in birth asphyxia.[35]

2. Materials and methods

2.1 Study area

Department of Obstetrics and Gynaecology, Midnapore Medical College and Hospital, Midnapore, Paschim Medinipur, West Bengal.

2.2 Study population

Pregnant women who delivered asphyxiated newborns requiring Neonatal intensive care unit (NICU) admission considering the inclusion and exclusion criteria.

2.3 Study period

This study period was March 2016 – February 2017.

2.4 Sample size

The estimated sample size was 80.

2.5 Sample design

Retrospective cross sectional study.

2.6 Inclusion criteria

Pregnant women who delivered newborns with birth asphyxia required Neonatal intensive care unit (NICU) admission.

2.7 Exclusion criteria

1) Pregnant women who delivered newborns with major congenital malformation of central nervous system, cardio vascular system, Respiratory system or dysmorphic babies.
2) Other cause of central nervous system encephalopathy (infection, metabolic).
3) All outpatient deliveries.

2.8 Study tools

a) NICU records.
b) Labour log book records.
c) Bed head ticket of mothers.
d) Biochemical or haematological test record of mothers.
   - Hb%
   - FBS/PPBS
   - TSH
   - ABO group & Rh typing
   - HIV 1,2
   - HbsAg
   - VDRL
   - Urine for R/E, M/E, C/S
   - Others specific investigation, if available.

e) Radiological investigation of mothers.
   - Ultra sonography
   - Colour Doppler

f) Relevant medical, surgical, personal etc. history of mothers and other relevant investigation.

2.9 Study design

The study was done after approval by the institutional ethics committee and was conducted in the department of obstetrics and Gynaecology, Midnapore Medical College and Hospital from March 2016 to February 2017. Identification of risk factors for birth asphyxia was done by retrospective cross sectional study.

Diagnostic criteria of birth asphyxia [34] –

a. Apgar score – It consists of five physical signs: Heart rate, Respiratory effort, Reflex irritability, Muscle tone and Colour of baby.

Mild to moderate asphyxia – Apgar score at 1 min is 4-7.

Severe asphyxia – Apgar score at 1 min is 0-3.

b. Multi organs failure in the first 72 hours or convulsion in first 24 hours of life.
c. History of delayed cry.

Informed written consent was taken from those mothers who are included in my study delivered babies requiring NICU admission due to birth asphyxia, in their own languages. Pre tested and pre designed questionnaire was formed. Data were collected from respective mothers, included in the study regarding –

- Mothers particulars.
- Socio-economic status.
- Past and present medical, surgical, obstetrics history.
- Level of antenatal care received in present pregnancy.
- Any obstetric related complication in antepartum and intrapartum period.

Others data were collected from the haematological, biochemical and radiological investigation reports. Obstetrics background and care including labour monitoring, intrapartum complications, mode of delivery, birth weight, sex etc. were collected from bed head ticket (BHT).

Socio economic status was calculated by 'Udai Pareek socioeconomic status scale'. [42] The scale has 9 factors e.g. caste, occupation, education, land, social participation, house, farm power, material possessions and type of family. According to the score the family was categorized into lower (score <13), lower middle (13-23), middle (24-32), upper middle (33-42) and upper class (>43).

Maternal obstetric history was taken which included the gravida, parity, abortion, still birth etc.

Mother's antenatal check up status i.e. booked or unbooked pregnancy was asked. According to WHO, a booked case is when the pregnant lady has had a minimum of three visits for antenatal check up after she was registered and confirmed pregnant. [43]

History of maternal antenatal factors like pregnancy induced hypertension (PIH), pre-eclampsia, eclampsia, hypothyroidism, polyhydramnios, oligohydramnios, jaundice, failure to weight gain, leakage of fluid, gestational age etc. were asked for.

Intra partum monitoring of labour, induction or augmentation, mode of delivery, birth weight and sex of babies, investigation reports were recorded from BHT.

Prolonged second stage of labour was defined as pushing for more than 3 hours with an epidural or more than 2 hours without an epidural in first time mothers and more than 2 hours with an epidural or more than 1 hour without an epidural in experienced mothers. [44]

Prolonged rupture of membrane was labelled when rupture of membranes was more than 24 hours before the birth of baby. [45]

Temperature of more than 101 ^{o}F (38.3 ^{o}C) was considered as febrile. [46]

Anemia in antenatal period was defined as documented evidence of haemoglobin measurement of less than 11 gm% in all trimester. [47]

Pregnancy induced hypertension (PIH) was defined as having a blood pressure higher than 140/90 mm Hg measured on two separate occasions, more than 6 hours apart, without the presence of protein in urine and diagnosed after 20 weeks of gestation. [32]

Preeclampsia is gestational hypertension plus proteinuria (>300 mg of protein in a 24 hours urine sample). [32]

Eclampsia was defined when tonic clonic seizures appear in a pregnant woman with high blood pressure and proteinuria. [32]

Information about neonate being pre-term (<37 weeks), term (≥37 weeks to ≤42 weeks), post-term (>42weeks). [32]

Intrauterine growth restriction (IUGR) is a fetal weight that is below the 10th percentile for gestational age as determined through an ultrasound. [48]

Oligohydramnios was defined when deepest vertical pocket was less than 2cm or amniotic fluid index (AFI) was less than 5 cm. [49]

Polyhydramnios was defined when deepest vertical pocket was more than 8 cm or AFI was more than 25 cm. [50]

Jaundice was said to be present when serum bilirubin level exceeds 1 mg %. [51]

Hypothyroidism was diagnosed when serum level of thyroid stimulating hormone (TSH) is greater than 2.5 mU/L in first trimester or greater than 3 mU/L in second and third trimester. [52]

Low birth weight as one whose birth weight is less than 2500 gram irrespective of the gestational age. [53]

For the statistical analysis collected data were analysed using statistical package for social sciences (SPSS) version-19. Student's two tail t-test or ANOVA test with multiple t-tests was used and p value <0.05 was considered to be significant.

3. Result and analysis

The age wise distribution of mothers of newborn requiring NICU admission due to birth asphyxia revealed that statistically significantly ($p<0.01$) more mothers (42.50%) belonged to age group of '*More than 20 years to less than 25 years*', than in the other two age groups of mother (Table 1). Among the rest subjects, 30% of mothers were in the '*25 years old or above'* group and 27.5% mothers were in the '*less than 20 years*' age group. When compared no significant ($p>0.05$) difference was found between these two groups (Table 1**)**. The mean maternal age of all the study subjects taken together was 23.86 years while the median age of the same was 23 years.

Table 1: Age wise distributions of mothers of newborn requiring NICU admission at MMCH due to birth asphyxia

Age group (Years)	Number of mothers incorporated (N=80)	Percentage of mother incorporated
<20	22	27.5±1.38[a]
≥20 to <25	34	42.5±2.13[b]
≥25	24	30.0±1.50[a]

Data are expressed as Mean± SD. ANOVA followed by multiple comparison two tail 't' test. Values with different superscripts (a, b) differ from each other significantly ($p<0.01$).

After classification of mothers of newborn requiring NICU admission into different socio-economic classes according to 'Udai Pareek socio-economic status scale' it was found that a majority (68.75%) of mothers belonged to the 'lower socioeconomic class' followed by 'lower middle class' (25%), 'middle class' (3.75%), 'upper middle class' (1.25%) and 'upper class' (1.25%) respectively. Statistical analysis showed that lower and lower middle socioeconomic class mothers were significantly ($p<0.01$) more common than other socioeconomic classes. Further, lower socioeconomic class mothers were significantly ($p<0.01$) more common than lower middle socioeconomic class mothers too. Distribution of mothers in lower, lower middle, middle socio economic class were significantly ($p>0.01$) different from each other's whereas no significant ($p>0.05$) interclass difference was found among the other two classes namely the upper and upper middle class. (Table 2)

Table 2: Mothers of newborns required NICU admission at MMCH and their socio-economic profile according to 'Udai Pareek socio-economic status scale'

Socio Economic group	Number of mothers (N=80)	Percentage of mother
Upper class	01	1.25±0.06[a]
Upper middle class	01	1.25±0.06[a]
Middle class	03	3.75±0.19[b]
Lower middle class	20	25.0±1.25[c]
Lower socioeconomic class	55	68.75±3.44[d]

Data are expressed as Mean± SD. ANOVA followed by multiple comparison two tail 't' test. Values with different superscripts (a, b, c, d) differ from each other significantly ($p<0.01$).

Table 3 demonstrated the distribution pattern of mothers according to their gestational age. Majority of the mothers were identified with term pregnancy (75%) followed by pre-term (22.5%) and post term pregnancy (2.50%). The mean gestational age was 37.65 weeks and median was 38 weeks. Following statistical analysis in between these three groups it was evident that the mean values of these groups significantly ($p<0.001$) differ with each other (Table 3).

Table 3: Distributions of mothers according to gestational age

Gestational age (Weeks)	Number of mothers (N=80)	Percentage of mother
<37	18	22.50±1.13[a]
≥37 to <42	60	75.00±3.75[b]
≥42	02	2.50±0.13[c]

Data are expressed as Mean± SD, N=80. ANOVA followed by multiple comparison two tail 't' test. Values with different superscripts (a, b, c) differ from each other significantly ($p<0.001$).

The parity wise distribution of mothers of newborn requiring NICU admission due to birth asphyxia is described in Table 4. 51.25% mothers were primipara and rests of mothers (48.75%) were multipara. When comparison was made between these two group, primipara group having insignificant ($p>0.05$) difference with multipara group.

Table 4: Parity status of mothers of newborns required NICU admission and their distribution pattern in different groups

Parity status	Number of mothers (N=80)	Percentage of mother
Primipara	41	51.25±2.56[a]
Multipara	39	48.75±2.44[a]

Data are expressed as Mean± SD. Statistical analysis performed using Student's two tail 't' test. Values with same superscript (a) does not differ from each other significantly ($p>0.05$).

A significant ($p<0.001$) difference was found following statistical comparison in between the mothers of newborns required NICU admission belongs to 'Hindu' or 'Muslim' group. Table 5 shows that the newborn required NICU admission due to birth asphyxia were more in Muslim mothers (63.75%) than Hindu mothers (36.25%).

Table 5: Categorization of mothers of newborns required NICU admission due to birth asphyxia in different study groups according to their religious status

Religion	Number of mothers (N=80)	Percentage of mother
Hindu	29	36.25±1.81[a]
Muslim	51	63.75±3.19[b]

Data are expressed as Mean± SD, N=80. Statistical analysis performed using Student's two tail 't' test. Values with different superscripts (a, b) differ from each other significantly ($p<0.001$).

Among eighty (80) babies requiring NICU admission due to birth asphyxia 42 were born to mothers who were unbooked (52.5%) and 38 were booked (47.5%). The statistical analysis confirmed that there was no

significant (p>0.05) difference between these two 'Booked' and 'Unbooked' categories (Table 6).

Table 6: Distributions of mothers according to their registration status

Registration status	Number of mothers (N=80)	Percentage of mother
Booked	38	47.5±2.38[a]
Unbooked	42	52.5±2.63[a]

Data are expressed as Mean± SD. Statistical analysis performed using Student's two tail 't' test. Values with same superscript (a) does not differ from each other significantly (p>0.05).

On the basis of maternal risk factor, the mothers were included either in the 'Absence of maternal risk factor' group (8.75%) or in the 'Presence of maternal risk factor' group (91.25%) and analysis showed the statistically significant (p<0.001) difference in between their group means.

'Presence of maternal risk factors' group further divided into two groups namely 'single' or 'multiple' maternal risk factor group. The group means of percentage of mother included into multiple risk factors (78.08%) significantly (p<0.001) differ with the group means of percentage of mother included into single maternal risk factor (21.91 %) (Table 7).

Table 7: Relative study of mothers according to presence or absence of maternal risk factor and distribution of mothers with complications depending on multiplicity and amplitude of their complications

State of mothers depending on maternal risk factors	Number of mothers (N=80)	Percentage of mother
Absence of maternal risk factor	07	8.75±0.44[a]
Presence of maternal risk factor	73	91.25±4.56[b]
Distribution of mothers comprising maternal risk factors	**Number of mothers (N=73)**	**Percentage of mother**
Single maternal risk factor present	16	21.91±1.10[a]
Multiple maternal risk factors present	57	78.08±3.90[b]

Data are expressed as Mean± SD. Statistical analysis performed using Student's two tail 't' test. Values with different superscripts (a, b) differ from each other significantly (p<0.001)

Table 8 shows the various maternal risk factors associated with birth asphyxia. Most of the mother had multiple risk factors (more than one risk factor). Maternal anaemia was the most common risk factor associated with newborns that required NICU admission due to birth asphyxia and was found in 40% of mothers. This was followed by augmentation by oxytocin (36.25%), prolonged second stage of labour (31.25%), prolonged rupture of membrane (26.25%), PIH/preeclampsia/eclampsia (26.25%), maternal fever (11.25%), history of IUFD (10%). Others risk factors found in this study were APH (8.75%), GDM (7.50%), UTI (6.25%), hypothyroidism (6.25%) and maternal jaundice (2.50%). ANOVA followed by multiple comparison two tail 't' test confirmed significant (p<0.001) difference among different categories of the mothers having antepartum and intrapartum risk factors when compared among all the groups except 'Pregnancy induced hypertension or Preeclampsia and Eclampsia' and 'Prolonged Rupture of Membrane' risk factor groups which were found with insignificant (p>0.05) difference in between their group means (Table 8).

Table 8: Distributions of mothers according to their maternal antepartum and intrapartum risk factors associated with birth asphyxia

Risk factors	Number of mothers	Percentage of mother
PIH/Preeclampsia/Eclampsia	21	26.25±1.31[a]
Augmentation by oxytocin	29	36.25±1.81[b]
Prolonged Rupture of Membrane	21	26.25±1.31[a]
Maternal Fever	09	11.25±0.56[c]
UTI	05	06.25±0.31[d]
GDM	06	07.50±0.38[e]
Hypothyroidism	05	06.25±0.31[c]
Jaundice	02	02.50±0.13[f]
APH	07	08.75±0.44[g]
Prolonged 2nd stage of labour	25	31.25±1.56[h]
History of IUFD	08	10.00±0.50[g]
Anaemia	32	40.00±2.00[i]

Data are expressed as Mean± SD, N=80. ANOVA followed by multiple comparison two tail 't' test. Values with different superscripts (a, b, c, d, e, f, g, h, i) differ from each other significantly (p<0.001).

On the basis of fetal risk factor, mothers bearing fetal risk factors were included either in the 'absence of fetal risk factor' group (17.5%) or in the 'presence of fetal risk factor' group (82.5%) and analysis showed presence of fetal risk factors with a significant (p<0.001) difference with the previous one. Mothers bearing fetal risk factors grouped into 'single' or 'multiple' fetal risk factor group depending on risk factors. The group means of percentage of mother included into multiple fetal risk factors (65.15%) significantly (p<0.001) varied with group means of percentage of mother included into single fetal risk factors (34.85 %) (Table 9).

Table 9: Comparative analysis of mothers according to fetal risk factor and its distribution

State of mothers depending on fetal risk factors	Number of mothers (N=80)	Percentage of mother
Absence of fetal risk factor	14	17.5±0.88[a]
Presence of fetal risk factor	66	82.5±4.13[b]
Distribution of mothers comprising fetal risk factors	**Number of mothers (N=66)**	**Percentage of mother**
Single fetal risk factor present	23	34.85±1.74[a]
Multiple fetal risk factors present	43	65.15±3.26[b]

Data are expressed as Mean± SD. Statistical analysis performed using Student's two tail 't' test. Values with different superscripts (a, b) differ from each other significantly (p<0.001).

Table 10 represents distribution of mothers incorporated in the study in separate nine groups according to fetal risk factors. The most common fetal risk factor was low birth weight (<2.5 Kg) (57.5%) followed by meconium stained liquor (25%), prematurity (23.75%), malpresentation (22.50%), twin pregnancy (15%), IUGR (7.50%), cord prolapse (5%), polyhydromnios (3.75%) and oligohydromnios (2.50%).

Table 10: Distributions according to fetal factors

Fetal risk factors	Number of mothers having fetal factors	Percentage of mother having fetal factors
IUGR	06	07.50±1.31[a]
MSL	20	25.00±2.31[b]
Malpresentation	18	22.50±1.31[b]
Twin Pregnancy	12	15.00±0.56[c]
prematurity	19	23.75±0.31[b]
Oligohydramnios	02	02.50±0.38[d]
Polyhydramnios	03	03.75±0.31[e]
Cord prolapse	04	05.00±0.13[f]
Low birth weight (<2.5 Kg)	46	57.60±2.88[g]

Data are expressed as Mean± SD, N=80. ANOVA followed by multiple comparison two tail 't' test. The Values with different superscripts (a, b, c, d, e, f, g) differ from each other significantly ($p<0.001$).

Table 10 shows that the groups constituted with mothers having fetal risk factors of IUGR, twin pregnancy, oligohydramnios, polyhydramnios, cord prolapse and low birth weight of baby significantly ($p<0.001$) differ with each other when comparison was made. The groups bearing the mothers having the fetal risk factors of meconium stained liquor, malpresentation, prematurity showed insignificant ($p>0.05$) difference in between their group means though significant difference ($p<0.01$) were found when they were compared to the mean values of all other groups in an individual manner.

Depending on the mode of delivery, mothers were classified into three categories i.e. 'LSCS', 'Vaginal Delivery (vertex and non-vertex)' and 'Instrumental Delivery (forceps delivery)'. From the statistical representation it was found that the mean values of all these three groups significantly ($p<0.001$) differ with each other's where the 'LSCS' process covers a major percentage (53.75%) followed by 'Vaginal Delivery' and 'Instrumental Delivery' process i.e. 37.50% and 8.75 % (Table 11).

Table 11: Distributions of mothers according to mode of delivery

Mode of delivery adopted	Number of mothers (N=80)	Percentage of mother
LSCS	43	53.75±2.69[a]
Vaginal Delivery (Vertex and Non-vertex)	30	37.50±1.88[b]
Instrumental Delivery (Forceps delivery)	07	8.75±0.44[c]

Data are expressed as Mean± SD. ANOVA followed by multiple comparison two tail 't' test. Values with different superscripts (a, b, c) differ from each other significantly ($p<0.001$).

Among 80 neonates included for the study, 46 neonates (57.5%) having low birth weight (<2.5 Kg body weight) required NICU admission due to birth asphyxia. Mean newborn weight was 2.35 kg. The 42.5% newborns were identified with normal body weight (≥ 2.5 kg). These two groups i.e. mothers of neonates having low birth weight and mothers of neonates having normal birth weight significantly ($p<0.001$) differ with each other following Student's two tail 't' test among these groups (Table 12).

Table 12: Distributions of mothers according to birth weight of baby

Weight in Kg	Number of mother having neonates (N=80)	Percentage of mother having neonates
< 2.5	46	57.5±2.88[a]
≥ 2.5	34	42.5±2.13[b]

Data are expressed as Mean± SD. Analysis was performed following Student's two tail 't' test procedure. Values with different superscripts (a, b) differ from each other significantly ($p<0.001$).

Among the included mothers in the study 57.50% of mothers gave birth to male child and 42.50% gave birth to female child. Depending on the sex variation of their neonates the mothers were classified into two groups which were significantly ($p<0.001$) differ with each other (Table 13).

Table 13: Distributions of mothers according to sex variation of their neonates

Sex variations	Number of mother having neonates (N=80)	Percentage of mother having neonates
Male child	46	57.50±2.88[a]
Female child	34	42.50±2.13[b]

Data are expressed as Mean± SD. Statistical analysis performed using Student's two tail 't' test. Values with different superscripts (a, b) differ from each other significantly ($p<0.001$).

4. Discussion

Our study objective was to evaluate the maternal (demographic, antepartum and intrapartum) and fetal risk factors of birth asphyxia.

In this study (Table 1), the mean age of mothers of babies born with birth asphyxia was found to be 23.86 years which was similar to the observations of Yadav *et al*[32] (24.28 years), Chandra *et al*[24] (23.7 years) and Padayachee *et al*[54] (25.6 years).

In our study, 42.5% of mothers of babies with birth asphyxia were aged 20-25 years. Hafiz *et al*[34], also observed that most common range of maternal age was 20-25 years as majority of births take place in between the age from 20 to 25 years but Laopaiboon *et al* [55] found in their study that advanced maternal age (35 years or older) was associated with increased cases of APGAR score <7 at 5 minutes.

We found in our study (Table 2), the mothers of babies born with asphyxia were mostly belong to low socio economic status (68.75%) followed by lower middle socio-

economic status (25%), middle (3.75%), upper middle (1.25%) and upper socio-economic status (1.25%). This study was supported by Lee *et al*[11] as low socio-economic status may increase birth asphyxia risk by influencing maternal nutritional status, care seeking and access to health care services during pregnancy period. On the other hand, Babu *et al*[56] found no association among the literacy level or socio economic status of mothers and incidence of birth asphyxia.

In our study (Table 3), the mothers of babies born with asphyxia were identified with term pregnancy (75%) followed by preterm pregnancy (22.5%). The possible explanation is that the majority of birth takes place in term pregnancy. Chiabi *et al*[57], did not find prematurity to have statistically significant association with birth asphyxia. Yadav *et al*[32] (26.25%) found the significant relationship between the prematurity and birth asphyxia.

In this study (Table 4), the total number of mother of newborn requiring NICU admission due to birth asphyxia was 80. Primipara mothers were 51.25% and multigravida mothers were 48.75% and primigravida has been one of the main risk factor of developing birth asphyxia as mentioned by Hafiz *et al*[34] (56.9%). Prolonged labour, prematurity and low birth weight, which is common in primi, might be the possible explanation. But Chiabi *et al*[57] found that birth asphyxia was more common in multigravida (67.8%).

We found in our study (Table 5), the newborns required NICU admission due to birth asphyxia were more in Muslim mothers (63.75%) followed by Hindu (36.25%). Generally, the Muslim mothers were less educated in this rural area and received inadequate antenatal care.

In our study (Table 6), unbooked mothers (52.5%) were more than booked mothers (47.5%). This result was very similar with the finding of study by Hafiz *et al*[34]. Booked cases receive better antenatal care along with early detection and management of maternal health conditions and decrease the rate of asphyxia.

In this study (Table 7 and 9), birth asphyxia was significantly more common in presence of maternal and fetal risk factors. Again it was significantly common in those where multiple maternal or fetal risk factors were present.

In our study (Table 8), one of the most important factors, maternal anaemia, which was 40 %. This result was very much similar with the finding of studies by Dalal *et al*[35] (52.2%), Hafiz *et al*[34] (48%).

Akhtar *et al*[33] also found significant correlation between correlation between low maternal haemoglobin (<10 gm %) and birth asphyxia.

Inadequate supply of oxygen across the placenta due to maternal anaemia leads to poor placental growth and neonatal development. This leads to low Apgar scores babies with birth asphyxia.

In our study (Table 8), augmentation by oxytocin (36.25%) was one of the most common intrapartum maternal risk factors of birth asphyxia, findings were comparable with previous study by Keya *et al*[14] and Liston *et al*[59] shows that oxytocin causing low Apgar score at 5 minutes.

Oxytocin is administered via intravenous infusion as a supplement to start uterine contractions, speed up labour, or decrease time between contractions. Oxytocin misuse is a risk factor for birth asphyxia. The uterus should contract and relax with a specific rhythm in order to pass oxygen adequately to placenta, and ultimately to the fetus. If contractions are frequently persistent, the placenta has no time to replenish oxygen supply, given the baby at risk for oxygen deprivation leads to birth asphyxia.

In this study (Table 8), prolonged second stage of labour was another significant risk factor for birth asphyxia as reported in past by Kiyani *et al*[60] (72%). The possible explanation is that prolonged second stage of labour can cause fetal distress by putting excessive stress on the fetus or by causing decrease blood supply to the placenta.

We found in our study (Table 8), Pregnancy induced hypertension (PIH), pre-eclampsia, eclampsia (26.5%) was one of the most important maternal risk factors for birth asphyxia.

Similar observation was noted by Yavad *et al*[32] (23.7%), Mohan *et al* [58]. On other hand, Chandra *et al*[24], found PIH as strong independent association of perinatal asphyxia.

PIH leads to decrease in placental blood flow, loss of placental integrity, and damage of endothelial cells. All these phenomena can lead to inadequate fetoplacental blood flow with fetal hypoxia, leading to birth asphyxia.

In this study (Table 8), prolonged rupture of membrane (26.25%) was important risk factor of birth asphyxia. Similar observation was also noted by Majeed *et al*[29] (24%). A major concern for foetuses, exposed to prolonged rupture of membrane is maternal- fetal infection but other risk includes placental abruption, fetal lung hypoplasia, and fetal distress due to cord compression or cord prolapse. All the risk factors are responsible for birth asphyxia.

In our study, we also found 10% mothers with history of intrauterine fetal death, 8.75% mothers with antepartum haemorrhage and 6.25% mothers with hypothyroidism.

In antepartum haemorrhage, there is decreased blood flow from mother to placenta, so the hypoxemia can occur in the fetus. This condition can lead to birth asphyxia.

Bahubali *et al* [19], in their study found perianal asphyxia associated with previous history of neonatal death (6 %), antepartum haemorrhage (10 %), and thyroid disease (13 %).

In this study, gestational diabetes was seen in 7.5 % mothers. This result was very much similar with the finding of Hafiz *et al*[34] (6.5%).

In our study, maternal fever (11.25 %) was associated with birth asphyxia .The association of pyrexia during delivery and birth asphyxia was previously observed by Hafiz *et al* [34].

Birth asphyxia due to maternal urinary tract infection (6.25%) was also noted as another risk factor and almost similar result was seen by Divid *et al*[25].

Jaundice in pregnancy e.g. liver disease in pregnancy associated with increased serum bile acids and increased rate of asphyxia. In this study, 2.5 % maternal jaundice associated with birth asphyxia was found.

In this experiment (Table 10), 25 % meconium stained amniotic fluid was found. Meconium staining of the amniotic fluid has long been regarded as a sign of fetal distress. Meconium is passed in response to hypoxia and aspiration of meconium is responsible for birth asphyxia. And almost similar observation was noted by Bahubali *et al*[19] (30%) and Mohan [58] (23.3%).

In our study (Table 10 and 12), 57.5% newborns were low birth weight (<2.5 kg). Low birth weight is mainly related to uteroplacental insufficiency and poor energy substrate transfer, resulting in neonatal complication like birth asphyxia. According to Mir *et al*[36], low birth weight was the most significant predictor of birth asphyxia.

Prematurity (Table 10) is an important fetal risk factor of birth asphyxia (23.75%) in our study. Premature babies have pulmonary immaturity and limited respiratory muscle strength.

In ologohydramnios, the placenta cannot function properly. So, fetus receives fewer nutrients and less oxygen. The inadequate oxygen is responsible for birth asphyxia. Oligohydramnois was also noted in 2.5% mothers in our study. This is in accordance with previously published study by Hafiz *et al*[34]

Our study (Table 10) found that other risk factors were breech presentation (22.5%), twin pregnancy (15%), cord prolapse (8.1%), intra uterine growth restriction (7.5%) and polyhydramnios (3.75%).

Hafiz *et al*[34], found beech presentation of fetus significantly associated with increased risk of developing birth asphyxia and Nilufar *et al*[30] also found the malpresentation (14%) associated with birth asphyxia.

Mohan *et al*[58] found that 3.3% multiple pregnancy associated with birth asphyxia.

Hafiz *et al*[34] found cord prolapse in 8.1 % mothers.

In our study (Table 11), majority of mothers were delivered by LSCS (53.75%) followed by vaginal delivery (37.50%) and instrumental delivery (8.75%). But Kiyani *et al* [60] found asphyxiated newborns delivered by vaginally in 44.39% or by caesarean section in 32.14% or by instrumental in 23.47%.

In this study (Table 13), total numbers of neonates were 80. Out of these 80 neonates, 46 (57.50%) were males and 34 (42.50%) were female. Birth asphyxia was more prevalent in male child reported earlier by Chiabi *et al*[57]

5. Limitation

1. This study conducted in a rural medical college of West Bengal, where mostly patients belong to the low and low middle socio economic class and data couldn't predict the overall situation in the country.
2. The sample size was small. So, it was difficult to detect small differences.
3. There were inadequate maternal history as well as relevant haematological, biochemical and radiological investigation reports.

6. Summary

Birth asphyxia depends on maternal and fetal risk factors. Early identification of high risk factors with improved antenatal and intrapartum care can decrease birth asphyxia rate.

It was retrospective cross sectional study, conducted at department of obstetrics and gynaecology, MMCH. Study was conducted from March, 2016 to February, 2017 with estimated sample size was 80. The study was done after approval by institutional ethics committee. Data were collected from respective mothers and analysed by SPSS19.

In our study, total number of mothers was 80. Mean maternal age of babies born with asphyxia was found to be 23.86 years. Majority of mothers were belonging to lower socio-economic status (68.75%). Birth asphyxia was more common in unbooked mothers (52.50%), primipara (51.25%) and in term pregnancy (75%). It was found that birth asphyxia significantly more common in presence of maternal or fetal risk factors than absence of maternal and fetal risk factors. Maternal antepartum and intrapartum risk factors were anaemia (40%), augmentation by oxytocin (36.25%), prolonged second stage of labour (31.25%), prolonged rupture of membrane (26.25%), PIH or preeclampsia and eclampsia (26.25%), maternal fever (11.25%), history of IUFD (10%) etc.

Fetal risk factors were meconium stained liquor (25%), prematurity (23.75%), breech presentation (22.50%), twin pregnancy (15%), IUGR, cord prolapse.

Birth asphyxia rate was more common in caesarean section (53.75%) delivery, low birth weight and male babies.

7. Conclusion

In my study it was found that low socioeconomic status and particularly some risk factors during pregnancy and parturition e.g. maternal anaemia, PIH, injudicious use

of oxytocin, meconium stained amniotic fluid, prolonged second stage of labour, prolonged rupture of membrane, low birth weight babies were associated with higher incidence of birth asphyxia. Early identification of the potential maternal and fetal risk factors and proper care may reduce the burden of birth asphyxia as well as its consequences.

References

[1]. World Health Organization (WHO, 1988): From alma-ata to the year 2000. Reflection at the midpoint. WHO 1988/2, Geneva.

[2]. World Health Organization, editor. Basic Newborn Resuscitation: A practical Guide. Geneva: World Health Organization. 1997.

[3]. World Health Organization. Perinatal mortality: a listing of available information. Geneva: WHO.1996.

[4]. Lawn JE, Consens S, Zupan J. Lancet Neonatal Survival Steering Team Lancet. 4 million neonatal deaths. *Lancet.* 2005; 5 – 11; 365 (9462): 891- 900.

[5]. Boog G. Acute fetal distress. *J Gynaecol Obstel Biol Reprod* (Paris). 2001; 30 (5): 393-432.

[6]. Zupan SU. Definition of intrapartum asphyxia and effect on outcome. *J Gynaecol Obstet Biol Reprod (Paris)*. 2008; 37(1): S7-15.

[7]. Low JA, Galbraith RS, Muir DW, Killen HL, Pater EA, Karchmar EJ. Motor and cognitive deficits after intrapartum asphyxia in the mature fetus. *J Obstet Gynaecol.* 1988; 158(2): 356 – 61.

[8]. DeVries LS, Jongmans MJ. Long-term outcome after neonatal hypoxic-ischaemic encephalopathy. *Arch Dis Child Fetal Neonatal Ed.* 2010; 95(3): F220 – F4.

[9]. Dilenge ME, Majnemer A, Shevell MI. Long-term developmental outcome of asphyxiated term neonates. *J Child Neurol.* 2001; 16: 781–92.

[10]. Barkovich AJ, Truwit CL. Brain damage from perinatal asphyxia: correlation of MR findings with gestational age. *Am J Neonatol*; 1990; 11(6): 1087-96.

[11]. Lee AC, Mullany LC, Darmstadt D. Risk factors for neonatal mortality due to birth asphyxia in Southern Nepal. *Pediatrics*.2008; 121(5): 1381-90.

[12]. Tabassum F, Rizvi A, Ariff S, Soofi S, Bhutta ZA. Risk factors associated with Birth asphyxia. *JJCM* 2014; 5(21): 1430 – 41.

[13]. Milsom I, larfors L, Thiringer K, Niklasson A, Odeback A, Thornberge E. Influence of maternal, obstetric and fetal risk factors on the prevalence of birth asphyxia at term in a Swedish urban population. *Acta Obstet Gynecol Scand*. 2002; 81(10): 909-17.

[14]. Keya D. antenatal and intrapartum risk factors for birth asphyxia among emergency obstetric referrals in Mulago Hospital, Kampala, *Uganda. East Afr Med J*. 2003; 80(3): 140-3.

[15]. Murphy DJ, MacKenzie IZ. The mortality and morbidity associated with umbilical cord prolapse. *Br J Obstel Gynaecol.* 1995; 102(10): 826-30.

[16]. Pitsawong C, Panichkul P. Risk factors associated with birth asphyxia in Phramongkutklao Hospital. *Thai J Obstet Gynaecol.* 2011; 19: 165-71.

[17]. Leijon I. The prognostic significance of antenatal diagnosis of fetal growth retardation. *Int J Technol Assess Health Care.* 1992; 8: 176-181.

[18]. Li WH, Zhang HY, Ling Y, Jin S. Effect of prolonged second stage of labour on maternal and neonatal outcome. *Asian Pac J Trop Med.* 2011; 4(5): 409-11.

[19]. Gane B, Bhat V, Rao R, Joy R, Shruti S, Prasad P. Antenatal and Intrapartum risk factors for perinatal asphyxia. *Curr Pediatr Res* 2013; 17(2): 119-22.

[20]. Mundhra R, Agarwal M. Fetal Outcome in Meconium Stained Deliveries. *J Clin Diagn Res*. 2013; 7(12): 2874 - 76.

[21]. Daga AS, Daga SR, Patole SK. Risk assessment in birth asphyxia. *J Trop Pediatr.* 1990; 36 (1): 34 -9.

[22]. Baskett TF, Allen VM, O'Connell CM, Allen AC. Predictors of respiratory depression at birth in the term infant. *BJOG.* 2006; 113(7): 769-74.

[23]. Buchmann EJ, Pattinson RC, Nyathikazi N. Intrapartum-related birth asphyxia in South Africa--lessons from the first national perinatal care survey. *S Afr Med J.* 2002; 92(11): 897-901.

[24]. Chandra S, Ramji S, Thirupuram S. Perinatal asphyxia: multivariate analysis of risk factors in hospital births. *Indian Pediatr.* 1997; 34 (3): 206-12.

[25]. Hall DR, Smith M, Smith J. Maternal factors contributing to asphyxia neonatorum. *J Trop Pediatr* 1996; 42(4): 192 - 5.

[26]. Mbweza E. Risk factors for perinatal asphyxia at Queen Elizabeth Central Hospital, Malawi. *Clin Excell Nurse Pract.* 2000; 4 (3): 158-62.

[27]. Paul VK, Singh M, Sundaram KR, Deorari AK. Correlates of mortality among hospital-born neonates with birth asphyxia. *Natl Med J India* 1997; 10(2): 54-7.

[28]. Bryce J, Boschi-Pinto C, Shibuya K, Black RE. WHO estimates of the causes of death in children. *Lancet.* 2005; 365(9465):1147-1152.

[29]. Majeed R, Memon Y, Majeed F, Shaikh NP, Rajar UD. Risk factors of birth asphyxia. *J Ayub Med Coll Abbottabad*. 2007; 19(3): 67-71.

[30]. Nilufar S, Nazmun N, Mollah AH. Risk factors and short term outcome of birth asphyxiated babies in Dakha Medical College Hospital. *Bangladesh J Child Health* 2009; 33(3): 83-89.

[31]. Etuk SJ, Etuk IS. Relative risk of birth asphyxia in babies of booked women delivered in unorthodox health facilities in Calabar, Nigeria. *Acta Trop*. 2001; 79: 143-47.

[32]. Yadav N, Damke S. Study of risk factors in children with birth asphyxia. *Int J Contemp Pediatr* 2017; 4:518-26.
[33]. Akhter S, Momen MA, Rahman MM, Parveen T, Karim RK. Effect of maternal anaemia on fetal outcome. *Mymensingh Med J.* 2010; 19(3): 391-8.
[34]. Hafiz MA, Shafaq S, Rafia A, Umair I, Sehrish MS, Nazish S. Risk factors of birth asphyxia. *Ital J Pediatr.* 2014; 40: 94.
[35]. Dalal CA, Bodar NL. A study on birth asphyxia at tertiary health centre. *Natl J Med Res.* 2013; 3: 374-6.
[36]. Mir NA, Faquih AM, Legnain M. Perinatal risk factors in birth asphyxia: relationship of obstetric and neonatal complications to neonatal mortality in 16,365 consequitive live births. *Asia Oceania J Obetet Gynaecol*.1989; 15(4):351-7.
[37]. Onyearugha CN, Ugboma HA. Fetal outcome of antepartum and intrapartum eclampsia in Aba, southeastern Nigeria. *Trop Dr.* 2012; 42(3): 129-132.
[38]. Birth Asphyxia – summary of the previous meeting and protocol overview available from URL; http://www.curoservice.com/health_professionals/news/pdf/10-09 2007_birth_asphyxia02.pdf.
[39]. Lawn JE, Manandhar A, Haws RA, Darmstadt GL. Reducing one million child deaths from birth asphyxia- a survey of health systems gaps and priorities. *Health Res Policy Syst.* 2007; 5:4. [DOI: 10.1186/1478-4505-5].
[40]. Volpe JJ. In: Neurology of the Newborn, Saunders, 2008.
[41]. World Health Organization (WHO). Certain condition originating in the perinatal period. 2003: p 21.
[42]. Singh T, Sharma S, Nagesh S. Socio-economic status scales updated for 2017. *Int J Res Med Sci*.2017; 5(7): 3264-3267.
[43]. Sahadev S, Sonali RS, Shashikanth S, Sree KG, Sudhir B. Obstetric and perinatal morbidity and mortality in booked and unbooked antenatal patients. *Indian J Basic Appl Med Res*. 2005; 4(3): 510-17.
[44]. ACOG committee on practice. "ACOG practice Bulletin Number 49, December 2003: Dystocia and Augmentation of labour." *Obstet Gynecol*. 102(6): 1445-1454.
[45]. Malcolm L, Chiswick. Prolonged rupture of membranes, pre-eclamptic toxaemia, and respiratory distress syndrome. *Archives of Disease in childhood.* 1976; 51: 674-79.
[46]. Laupland KB. Fever in the critically ill medical patient. *Crit Care Med.* 2009; 37(7): 273-8.
[47]. Sharma JB, Meenakshi S. Anaemia in pregnancy. *JIMSA*.2010; 4(23):253-60.
[48]. William's Obstetrics, Twenty-Second Ed, Cunningham, Gary F, *et al*, Ch.12.
[49]. Johnson JM, Chauhan SP, Ennen CS, Nieder Hauser A, Magann EF. A comparison of 3 criteria of oligohydramnios in identifying peripartum complications. *Am J Obstet Gynecol.* 2007; 197(2): 207.
[50]. Brady K, Polzin WJ, Kopelman JN, Read JA. Risk of chromosomal abnormalities in patients with idiopathic polyhydramnios. *Obstet Gynecol.* 1992; 79: 234-8.
[51]. Joshi R, Nilesh D. Fetomaternal outcome and raised bilirubin level in pregnancy. *Int J Reprod Contracept Obstet Gynecol.* 2017; 6(2): 710-713.
[52]. Casey BM. Thyroid disease in pregnancy. *ACOG practice Bulletin.*2015; 148.
[53]. Farzana S, Shazia M, Yasmeen N, Abdul H, Mohammad AN, Zulfiqar AQB. Low birth weight babies born at Liaquat University Hospital, Hyderabad. *Indo Am J Pharm Sci.* 2017; 4 (04): 783-6.
[54]. Padayachee N, Ballot DE. Outcome of neonates with perinatal asphyxia at tertiary academic hospital in Johannesburg, South Africa. *South African J Ch Health*.2013; 7: 89-94.
[55]. Laopaiboon M, Lumbiganon P, Intarut N, Mori R, Ganchimeg T, Vogel J, *et al*. Advanced maternal age and pregnancy outcomes. *Obstetric Anesthesia Digest.* 2015; 35(1):27.
[56]. Babu BVA, Devi SS, Kumar BK. Birth asphyxia – incidence and immediate outcome in relation risk factors and complications. *Int J Res Health Sci.* 2014; 2(4): 1064-71.
[57]. Chiabi A, Nguefack S, Mah E, Nodem S, Mbuagbaw L, Mbonda E, *et al*. Risk factors for birth asphyxia in an Urban Healthy Facility in Cameroon. *Iran J Child Neurol* 2013; 793: 46-54.
[58]. Mohan K, Mishra PC, Singh DK. Clinical profile of birth asphyxia in newborn. *Int J Sci Tech* 2013; 3(1): 10-9.
[59]. Liston WA, Campbell AJ. Dangers of oxytocin induced labour to fetuses. *Br Med J*. 1974; 3(5931): 606-607.
[60]. Kiyani AN, Khushdil A, Eshan A, Ullah A, Khan MA. Perinatal factors leading to Birth Asphyxia among term Newborns in a Tertiary Care Hospital. *Iran J Pediatr* 2014; 24(5):637-642.
[61]. Afjeh SA, Sabzehei MK, Esmaili F. Neonatal resuscitation in the delivery room from a tertiary level hospital: risk factors and outcome. *Iran J Pediatr.*2013; 23: 675-80.