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Factors associated with birth asphyxia among neonates in India

Karam Chandrajit Singh*, Prabhkiran Dhillon, Vandana Singh & V Pruthvi Raj

Department of Obstretics and Gynaecologist, 7 Airforce Hospital, Kanpur-Cantt, Kanpur, Uttar Pradesh, India; *Corresponding author

Affiliation URL:
https://indianairforce.nic.in
E-mails: capsnetdroff@gmail.com & capsoffice@capsindia.org

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Author contacts:
Karam Chandrajit Singh – E-mail: karamtondon513@gmail.com; Mobile: +91-9894482399
Prabhkiran Dhillon - E-mail: hennadhillon@gmail.com
Vandana Singh - E-mail: docvs6222.med@gmail.com
V Pruthvi Raj - E-mail: drpruthviraj12@gmail.com

Abstract:
It is of interest to identify the factors associated with birth asphyxia. Data shows that the neonates delivered from January to December, 2022 in the neonatal ward of the 7 Airforce Hospital, Kanpur, India, had a rate of birth asphyxia of 5.6 per 1000 births. Data further shows that maternal age of 24-30 years, primigravida mothers, POG of 37-41weeks and foetal distress are associated factors in birth asphyxia. These risks can be diminished if women receive adequate care in the labor room, such as early treatments and close monitoring of the foetal heart.

Keywords: Birth asphyxia, contributing factors, hypoxia, primigravida, foetal distress.

Background:
Birth asphyxia is defined by the World Health Organization as 'the failure to initiate and sustain breathing at birth' **[1]**. Hypoxemia (lack of oxygen) and hypercapnia (accumulation of carbon dioxide) are caused by ineffective breathing; both of these impair heart function **[2]**. Birth asphyxia is a prominent cause of neonatal mortality around the world, accounting for 24% of all neonatal deaths **[3, 4, 5]**. Almost 98% deaths of birth asphyxia occur within the first week of life **[6]**. It is estimated that 2.5 million infant fatalities occur worldwide each year, accounting for 47% of all under the age of 5 child mortality **[7, 8]**. Furthermore, an estimated 1.3 million newborns are "fresh stillborn", indicating an intrapartum death just before delivery **[9, 10]**. The first day, and especially the first hour, is important to newborn survival, with the highest risk of intrapartum-related neonatal fatalities (60-70%) happening within 24 hours of birth **[7, 8, 11]**. Severe hypoxia damage occurs in many organs in asphyxiated infants, including the brain, heart, lungs, liver, gut and kidney, but brain damage is of particular concern and may be the least likely to recover **[12]**. Severe birth asphyxia can harm brain cells and result in potentially fatal disorders such as hypoxic-ischemic encephalopathy, brain damage, cerebral palsy, seizures, attention deficit hyperactivity disorder and autism **[13]**. Survivors frequently endure lifelong health issues (80%), such as impairments, developmental delays, palsy, intellectual difficulties, and behavioral issues **[14, 15, 16]**. Birth asphyxia is connected with a complicated set of risk variables that differ between industrialized and non-industrialized countries. These risk factors are classified as being before delivery (antepartum risk actors), during birth (intrapartum risk factors), or after birth (postpartum risk factors) **[17]**. Low birth weight **[18, 19]**, high birth weight **[20]**, multiple gestations **[21]**, tight nuchal cord **[18; 20]**, preterm delivery **[21, 22]**, resuscitation, and foetal distress **[23, 24]** are fetal risk factors connected to birth asphyxia. Therefore, it is of interest to assess the associated factors of birth asphyxia among neonates delivered in 7 Airforce Hospital, Kanpur, Uttar Pradesh, India.

Materials and Methods:
The most prevalent signs of birth asphyxia include: irregular foetal heart rate before birth; low pH readings, which indicate too much acid; and possible non-obvious symptoms.

Data collection:
Data were collected from department of Obstretics and Gynaecologist and department of Pediatrics of 7 Airforce Hospital, Kanpur, Uttar Pradesh, India. Data collection began with a mother's admittance to the labour room and continued until the 5th minute after birth. Data was gathered throughout the day (even at night).

Design and Methods:
This is a descriptive cross-sectional study that used quantitative data collection and analysis methodologies to determine the risk factors for birth asphyxia. Case notes for the mothers and neonates were used as data sources. Newborns admitted to the neonatal unit with birth asphyxia were chosen as cases. The newborns were recruited within 24 hours of birth. The case notes of the neonates' mothers and the neonates' admission forms were evaluated to identify the risk factors for birth asphyxia.

Study Population:
The population consisted of neonates who were admitted to neonatal ward at the 7 Airforcehospital, Kanpur. 1071 mothers were involved in this study

Ethical Consideration:
The study was approved by Ethics Committee of 7 Airforce hospital in Kanpur. A written consent was obtained from mothers of neonates with birth asphyxia. All other ethical problems, such as preventing injury and protecting confidentiality, were observed.

Results:
Diagnosis of birth asphyxia was considered in neonates with failure to cry at birth. The diagnosis was confirmed by checking the admission diagnosis.

Socio demographic and clinical characteristics of mothers:
A total of 1071 mothers were involved in this study. There were 710 (66.3%) mothers who had a mode of delivery as spontaneous vaginal birth and 57 (5.3%) mothers had vacuum delivery and the remaining 304 (28.4%) delivered by cesarean section (Table 1). Among the 1071 study participants, 594 (55.5%) of them were multigravida and another 477 (44.5%) were primigravida. The

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majority of the mothers, 824 (76.9%) had gestational age of 38-40 weeks shown in Table 1.

Table 1: Socio demographic and clinical characteristics of mothers admitted from January to December, 2022.

Variables		Frequency (N = 1071)	Percent (%)
Age group	< 25yrs	320	29.9
	25-30yrs	505	47.2
	31-35yrs	205	19.1
	> 36yrs	41	3.8
Parity	Primi	477	44.5
	Multi	594	55.5
Period of gestation (POG)	< 34wks	10	0.9
	34-37wks	140	13.1
	38-40wks	824	76.9
	≥ 41wks	97	9.1
Mode of delivery	Full term normal delivery (FTND)	710	66.3
	Vaccum	57	5.3
	Lower segment Caesarean section (LSCS)	304	28.4

Contributing factors of birth asphyxia:

Ten neonates who had very weak respiration were admitted to the neonatal intensive care unit (NICU). These suspected cases of Birth Asphyxia were diagnosed. Distress that disappears in the first few hours after birth may be categorized as delayed transition. Four newborns were found to have delayed transition as shown in table 2. Six newborns were found to have Birth Asphyxia or its related complications (table 2).One newborn had Severe Birth Asphyxia and Meconium Aspiration Syndrome and was died. All the mothers are Primi which had Birth Asphyxia or related complications. Mothers with POG of 37-41 weeks had Birth Asphyxia or its related complications (table 2).Birth Weight of newborns was 2.31-3.60 (kgs), who's had Birth Asphyxia or its related complications. 4 male and 2 female had Birth Asphyxia or its related complications. 2 Lower segment Caesarean section, 1 Vacuum and 3 Full terms normal delivery deliveries were found in Birth Asphyxia or its related complications (table 2). Majority of case FTND deliveries found. Mother with 24-30 yrs of age had Birth Asphyxia or its related complications (Table 2).

Table 2: Clinical features of mother and neonates at the 7 Airforcehospital, Kanpur, 2022

Sl. No	Age of mother	Parity of mother	POG of mother	Mode	Date of Birth neonate	Sex of neonate	Birth Weight (kgs)	Diagnosis
1	26yrs	Primi	38wks	LSCS	27/07/2022	Male	2.36	Delayed Transition
2	28yrs	Primi	39wks	FTND	22/07/2022	Male	2.80	Delayed Transition
3	30yrs	Primi	38wks 03 days	LSCS	14/06/2022	Male	3.33	Birth Asphyxia
4	25yrs	Primi	40wks 01day	Vacuum	25/04/2022	Female	2.90	Birth Asphyxia
5	29yrs	Primi	39wks	FTND	14/07/2022	Male	2.79	HIE Stage-1
6	30yrs	Primi	40wks 03days	LSCS	13/09/2022	Male	3.60	Mild MAS
7	24yrs	Primi	39wks	FTND	12/09/2022	Female	3.26	Delayed Transition
8	24yrs	Primi	40wks 03days	FTND	18/11/2022	Male	2.31	Birth Asphyxia, Meconium Aspiration Syndrome, HIE Stage-1
9	26yrs	Primi	37wks	FTND	08/09/2022	Female	2.90	Severe Birth Asphyxia, Meconium Aspiration Syndrome
10	27yrs	Primi	38wks 03days	FTND	24/08/2022	Male	3.01	Delayed Transition

FTND: Full term normal delivery; LSCS: Lower segment Caesarean section;POG: Period of gestation

Significant variations in foetal distress were found between the asphyxia and non-asphyxia groups, indicating that foetal suffering was a risk factor for birth asphyxia. However, no significant differences in birth weight indicating that it was not responsible factors for birth asphyxia.

Discussion:

Birth asphyxia rates in developing nations are several times higher, ranging from 4.6 per 1000 to 26 per 1000 births, with case fatality rates of 40% or greater **[25]**. However, accurate epidemiological data are insufficient, and the true burden of birth asphyxia in country such as India remains unknown. Primigravida was identified as a significant risk factor for birth asphyxia in our investigation. This is similar study was conducted in India and Nepal **[23, 26]**. The primigravida are frequently denied the antenatal demands, such as early booking and regular visits, so they are unaware of their duty to both themselves and their unborn foetus **[27]**. This could result in complications that lead to birth asphyxia. Primipara mothers were shown to be four times more likely than multiparous women to suffer from delivery asphyxia **[28]**. This results is consistent with a study conducted in Rio Grande do Norte that identified being primipara as a risk factor at birth, as well as another study conducted in Pakistan that found a similar result **[22]**. According to the findings of this study, mother age was a risk factor for birth asphyxia. In Finland, Lamminpaa *et al.* **[29]** and Berglund *et al.* **[30]** discovered that the risk of birth asphyxia

increased with maternal age. Birth asphyxia was not associated with the factors such as method of delivery and birth weight. This is similar with prior research conducted in Sweden and Cameroon **[31, 32]**.

Conclusion:

Current data shows that maternal age of 24-30 years, primigravida mothers, POG of 37-41 weeks and foetal distress are associative factors for birth asphyxia. These factors can be reduced if women in labour are effectively observed with the partograph and fast decisions and actions are implemented.

Limitations of Study:

The limitation of the study is its small sample size of newborns from 7 Airforce Hospital, Kanpur, Uttar Pradesh, India. A larger investigation across all hospitals is needed.

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