

## RISK FACTORS ASSOCIATED WITH BIRTH ASPHYXIA

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**Abstract:** This study aimed to identify factors contributing to prenatal asphyxia in full-term neonates born at Hayatabad Medical Complex in Peshawar. The research was conducted over one year (January 2022 to January 2023) at the Pediatrics Department of Hayatabad Medical Complex in Peshawar. The study involved mothers delivering twins vaginally, comprising 100 newborns with gestational ages between 37 and 42 weeks and birth weights from 2,000 to 4,000 grams. A case-control design was employed, categorizing infants with Apgar scores of five or less at one minute as cases and those with scores exceeding five as controls. Data collection utilized a customized form, capturing demographic variables and risk factors. Statistical analysis employed SPSS version 26.0, applying the chi-square test for comparison. The results showed significant differences between cases and controls regarding gender distribution, birth weight, mode of delivery, maternal age, and gestational age. Key risk factors, including parity, fetal distress, meconium in amniotic fluid, and prolonged labor, displayed significant differences between cases and controls. The study concluded that birth asphyxia is influenced by factors such as meconium-stained amniotic fluid, prolonged labor, and fetal distress. Obstetrician involvement in ongoing research enhances data reliability. Community-specific risk factors underscore the need for tailored interventions to mitigate birth asphyxia. Despite study limitations, including a single-center design, the findings contribute valuable insights for future research and targeted strategies.

**Keywords:** Birth Asphyxia, Neonatal Mortality, Case-Control Study, Hayatabad Medical Complex, Peshawar, Risk Factors, Apgar Score.

### Introduction

One of the leading causes of early neonatal mortality, or delivery asphyxia—the inability to begin breathing at birth—is responsible for the deaths of over 600,000 infants annually (or 24% of all fatalities). The International Classification of Diseases, Tenth Revision (ICD-10) by the World Health Organization defines severe birth asphyxia as an Apgar score of 0 to 3 within 1 minute after delivery. At 1 minute postpartum, an Apgar score between 4 and 7 indicates mild to severe birth asphyxia (Ahmed et al., 2021). The prevalence of birth asphyxia is higher in developing countries compared to industrialized ones. The main reason is a shortage of medical professionals trained to assist in delivering. The illness may develop due to factors that occur before, during, or after the baby's delivery, or even a mix of these factors (Yadav and Damke, 2017).

Babies are more likely to die from birth asphyxia due to a drop in cerebral blood flow, but there are other factors as well (Tasew et al., 2018). The factors above encompass a variety of birth complications, including but not limited to uterine events like tearing, placental events like abrupt separation, cord events like a cord that is tightly wrapped around the baby's neck or comes out before the baby, intrapartum infection, and a lengthy or complicated delivery (Torres-Muñoz et al., 2017).

Repercussions of neonatal hypoxia might be mild to severe, depending on the case. Death, organ failure, and hypoxic-ischemic encephalopathy (HIE) are all possible consequences. More severe cases of asphyxia lead to more

serious issues; this relationship is proportional to the degree of asphyxia. As a child grows older, the severe neurodevelopmental and motor damage caused by hypoxic-ischemic encephalopathy (HIE) becomes more noticeable (Woday et al., 2019).

To combat this issue, the Pakistani government has launched a slew of programs. Among these steps are the provision of postnatal care, the expansion of prenatal care options, and the assurance of the presence of trained professionals throughout labor (Igboanugo et al., 2020). Healthcare institutions in Pakistan have easy access to well-defined standards for the assessment and categorization of cases of birth asphyxia (Kibai, 2017).

### Methodology

This study used a case-control design and was conducted over one year at the Pediatrics Department of Hayatabad Medical Complex in Peshawar. The study conducted from 2022 to 2023 focused on moms who gave birth to twins vaginally. The study comprised 100 newborns weighing 2,000 to 4,000 grams born as single live births at ages 37 and 42 weeks. Infants were categorized as belonging to the case group if their first Apgar score, taken one minute after birth, was five or less. Conversely, infants were classified as belonging to the control group if their score was more than five at that time. Neonatal physicians assessed the Apgar scores within the delivery room using established protocols. The study did not include women who had preterm births,

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defined as pregnancies ending before 37 weeks. The sample size was estimated using EPI INFO, considering the proportions from a prior study conducted in Nigeria. The sample consisted of 426 individuals, including 213 cases and 213 controls. The research aimed to achieve a statistical power of 80% and a confidence interval of 95%.

Critical demographic characteristics such as mother age, newborn gender, birth weight, and delivery style were recorded using a customized form to gather the data. Parity, fetal distress, extended labor, and meconium in the amniotic fluid were among the risk variables that attending gynecologists recorded throughout the delivery process. The Dubowitz technique was employed to find the gestational age. Labor that lasts more than 24 hours, from the beginning of regular contractions in the uterus until the baby is born, is called prolonged or protracted labor.

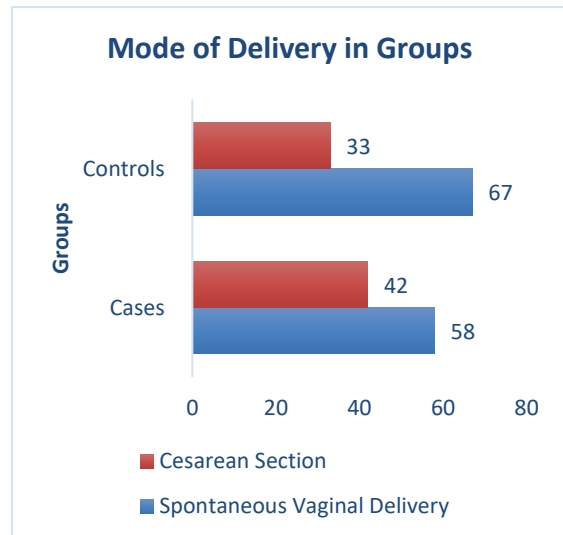
Mother age, gestational age, and infant weight were tested using SPSS version 26.0 to determine the average and variability. Gender and delivery type frequencies and percentages were used to portray the data. This study employed stratification to control for confounding variables like gestational age, infant weight, and mother's age. The researchers employed a chi-square test to determine how often each research variable occurred in the cases and controls. For statistical purposes, a p-value less than 0.05 was considered significant. This study aimed to add to the existing medical knowledge base by using a rigorous approach to gain a comprehensive grasp of the variables that affect twin birth asphyxia.

**Results**

The comparison of baseline characteristics between cases and controls in this study, each comprising 50 subjects, revealed notable trends. Regarding gender distribution, 60.0% of cases were male, slightly higher than the 50.0% observed in controls. Conversely, 40.0% of cases were female, compared to 50.0% in controls. However, the gender difference did not reach statistical significance. Examining birth weight categories, 52.0% of cases fell within the 2,000-2,400 grams range, while only 38.0% of controls shared this characteristic. The disparity persisted across other weight categories, yet the overall birth weight distribution did not yield a statistically significant difference. Regarding the mode of delivery, cases demonstrated a higher prevalence of Cesarean Section

(45.1%) compared to controls (36.6%), although the overall distribution did not achieve statistical significance. Analysis of maternal age categories (<18, 18-35, >35) and gestational age groups (37-38 weeks, 39-40 weeks, >40 weeks) similarly did not yield statistically significant differences between cases and controls.

Table 2 compares cases and controls, each consisting of 50 individuals, revealing significant differences in key risk factors related to pregnancy and labor. In terms of parity, a higher percentage of cases (62.0%) were primigravida compared to controls (51.6%), and multigravida individuals were more prevalent in controls (48.4%) than in cases (38.0%), with a statistically significant p-value of 0.0314. Fetal distress was markedly more common in cases, with 56.0% experiencing it, while only 22.0% of controls reported the same, resulting in a highly significant p-value of <0.0001. The presence of meconium in amniotic fluid also demonstrated a substantial difference, with 50.0% of cases having meconium-stained fluid compared to 24.0% in controls, yielding a highly significant p-value of <0.0001. Prolonged labor was more prevalent in cases (52.0%) compared to controls (22.0%), with a highly significant p-value of <0.0001.



**Figure 1: Distribution of mode of delivery between the groups**

**Table 1: Baseline characteristics in cases and controls (n=100)**

Characteristics	Constructs	Cases (n=50)	Controls (n=50)
<b>Gender</b>	Male	30 (60.0%)	25 (50.0%)
	Female	20 (40.0%)	25 (50.0%)
<b>Birth Weight (grams)</b>	2,000-2,400	26 (52.0%)	19 (38.0%)
	2,500-3,500	72 (68.1%)	82 (77.0%)
	3,600-4,000	8 (16.0%)	6 (12.0%)
<b>Mode of Delivery</b>	Spontaneous Vaginal Delivery	58 (54.9%)	67 (63.4%)
	Cesarean Section	42 (45.1%)	33 (36.6%)
<b>Age of Mothers (years)</b>	< 18	12 (24.0%)	9 (18.0%)
	18-35	41 (82.0%)	43 (86.0%)
	>35	7 (14.0%)	6 (12.0%)
<b>Gestational Age</b>	37-38 weeks	50 (46.9%)	59 (55.9%)
	39-40 weeks	47 (44.1%)	41 (38.0%)
	>40 weeks	9 (9.0%)	6 (6.1%)

**Table 2: Comparison of study variables in cases and controls (n=100)**

Risk Factor	Case (n=50)	Control (n=50)	P-value
<b>Parity</b>			
Primigravida	31 (62.0%)	26 (51.6%)	0.0314
Multigravida	19 (38.0%)	24 (48.4%)	
<b>Fetal Distress</b>			
Yes	28 (56.0%)	11 (22.0%)	<0.0001
No	22 (44.0%)	39 (78.0%)	
<b>Meconium in Amniotic Fluid</b>			
Meconium Stained	25 (50.0%)	12 (24.0%)	<0.0001
No Meconium	25 (50.0%)	38 (76.0%)	
<b>Prolonged labour</b>			
Yes	26 (52.0%)	11 (22.0%)	<0.0001
No	24 (48.0%)	39 (78.0%)	

## Discussion

The main aim of our study was to identify the different factors that contribute to prenatal asphyxia in full-term neonates born at Hayatabad Medical Complex in Peshawar. Our analysis showed that 62.0% of the cases were male, higher than the 54.0% in the control group. However, this difference was not statistically significant. Research conducted at Pakistan's Children's Hospital Lahore found that among newborns diagnosed with hypoxia, the gender ratio was 2:6:1. Among the striking findings of our study was the identification of primigravida, or first-time pregnant woman, as a significant risk factor for birth asphyxia. In the study group, 62% of patients and 51.6% of controls had this problem, with a p-value of just 0.0314. Collaboration between research in Nepal and India informed the study (Kibai, 2017; Nadeem et al., 2021).

Not all pregnant women have the same level of knowledge about their rights and obligations, especially first-time moms who may not have had the opportunity to get the screenings and prenatal care they need. Because of this misunderstanding, problems may arise during delivery, increasing the risk of asphyxia. Consistent with other studies, the investigation showed that there was a significantly different rate of fetal distress between the cases and controls (56.3% vs. 21.1%,  $P < 0.0001$ ) (Berhe et al., 2020).

Significantly higher than the control group's 40.4% rate ( $P < 0.0001$ ), 80.3% of cases had meconium-stained amniotic fluid. With this new information, meconium might be seen as an additional indicator of fetal distress. Evidence of severe hypoxia, as measured by grade III or IV meconium staining, was seen. Results from studies conducted in India, Nigeria, Cameroon's Yaounde Tertiary Hospital, and Ethiopia's University of Gondar Referral Hospital show that meconium in amniotic fluid is associated with an elevated risk. The fact that this is a known risk factor has been acknowledged (Sunny et al., 2021). Study after study at different medical centers, such as Dhaka Medical College Hospital, Jimma Medical Center in Ethiopia, and Referral Hospitals of Amhara National Regional State in Ethiopia, Nigeria, Stockholm, and Gotland in Sweden, has reliably demonstrated that longer labor duration significantly increases the likelihood of newborn hypoxia ( $P < 0.0001$ ) (Sendeku et al., 2020).

Statistical analysis of the correlation between gestational age and the likelihood of hypoxia after birth was not performed. However, other studies have indicated that the risk of newborn asphyxia increases with increasing gestational age. Moreover, our study found that birth asphyxia was more common among mothers aged 18–35, but this difference was not statistically significant. Consistent with other studies that have shown emergency cesarean delivery to be a substantial risk factor for hypoxia, the patient group had a more significant percentage of cesarean deliveries than the control group (45.1% vs. 36.6%,  $P = 0.0760$ ) (de Souza et al., 2016).

Although the study provided valuable insights, its limitations stemmed from its single-center design, which restricted its generalizability. We lacked full knowledge due to the absence of data regarding maternal hypertension, diabetes, or anemia. Furthermore, future research should address the limitations of being unable to evaluate cord blood gases and acquire Apgar ratings at particular intervals. This will allow for a more detailed investigation of neonatal hypoxia.

## Conclusion

The occurrence of birth asphyxia, a disease that poses significant hazards to neonates, is strongly influenced by the presence of meconium-stained amniotic fluid. Birth asphyxia poses a significant risk when labor lasts more than 24 hours and when there are signs of fetal distress. Obstetricians' participation in continuous research strengthens the dependability of collected data on prenatal asphyxia. The occurrence of prenatal asphyxia is closely connected to significant risk factors influenced by various variables. To reduce the dangers linked to prenatal asphyxia, healthcare practitioners and policymakers can collaborate to create focused treatments that improve the health of mothers and newborns.

## Declarations

### Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

### Ethics approval and consent to participate

Approved by the department Concerned.

### Consent for publication

Approved

#### Funding

Not applicable

#### Conflict of interest

The authors declared absence of conflict of interest.

#### Author Contribution

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*Conception of Study, Development of Research Methodology Design, Review of Literature, Drafting article, Review of manuscript, final approval of manuscript*

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*Review of Literature, Drafting article*

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*Data entry and Data analysis, drafting of article*

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