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Original Research Article

Frequency of Apnea of Prematurity in Preterm Neonates Presenting at DHQ Hospital, Dera Ismail Khan

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Abstract: *Apnea of prematurity is a common clinical problem in preterm neonates and may contribute to short-term morbidity in neonatal units. Local data on its frequency may help improve early recognition and monitoring in resource-limited settings.* ***Objective:*** *To determine the frequency of apnea of prematurity in preterm neonates presenting at DHQ Hospital, Dera Ismail Khan.* ***Methodology:*** *This study was conducted on 138 preterm neonates (gestational age <37 weeks) aged 1–25 days. Neonates with lung malformations, sepsis, or birth asphyxia were not included. This study was conducted at the Department of Pediatrics, DHQ Hospital, DI Khan, from 29-April-2024 to 29-October-2024. Apnea of prematurity was assessed in all patients, defined as cessation of breathing for>15 seconds, along with bradycardia (<100 bpm on electrocardiogram). SPSS 27 was used to analyze the collected data. Frequencies and percentages were calculated for apnea of prematurity; a chi-square test was conducted for stratification, with a p-value < 0.05 considered significant.* ***Results:*** *In the present study, the mean age of the neonates was 11.14 ± 7.20 days, and their mean birth weight was 2.38 ± 0.42 kg. Apnea of prematurity was diagnosed in 43 (31.2%) neonates. Significant associations were found between apnea and lower age (p=0.008) and lower birth weight (p=0.002).* ***Conclusion:*** *The frequency of apnea of prematurity in preterm neonates in the present study was 31.2%. The condition was significantly associated with lower birth weight and lower age.*

Keywords: Apnea of prematurity, preterm neonate, birth weight

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Introduction

Apnoea of prematurity is a medical condition affecting newborns, characterised by episodes of breathing cessation lasting longer than 20 seconds. Infants born before 37 gestational weeks are predominantly susceptible, as their breathing centres are not fully developed. (1,2) A study conducted on the preterm neonates reported the most common complications were respiratory distress syndrome (50%), intracranial haemorrhage (28.1%) and sepsis (4.8%). (3)

Apnoeic episodes can lead to serious complications due to ineffective management. Management of apnoea of prematurity necessitates a multidisciplinary approach involving neonatologists, paediatricians, and nursing staff. Continuous monitoring of vital signs, mainly heart rate and oxygen saturation, is vital for early detection of apnoea and timely commencement of appropriate interventions. These incidents may negatively affect brain development and other organs, as they can result in hypoxaemia as well as bradycardia, which in severe instances may necessitate positive pressure ventilation. (4-7).

A study described that the occurrence of apnoea of prematurity among preterm neonates 35.7%.(8) Non-pharmacological interventions, minimising environmental stressors and upholding the appropriate sleep positioning, play a significant role in reducing the occurrence of apnoeic episodes and boosting respiratory stability. Long-term prognosis for infants identified with apnoeic episodes is based on numerous factors, such as disease severity and the occurrence of related medical conditions. (9-11)

Despite advances, apnoea of prematurity is still a condition with a multifaceted pathophysiology and diverse clinical course, sometimes influenced by gestational age and the overall maturity of the infant. Though most suffering newborns experience spontaneous apnoea resolution as their respiratory centres usually develop by 36 to 40 weeks postmenstrual age. However, a subset of infants experience respiratory instability beyond the neonatal phase, requiring prolonged hospitalisation. Gaining insight into the vital mechanisms underlying apnea of prematurity is critical for the well-organized management and therapy of this disorder. As there is no local literature on this subject, the goal of this study is to determine the frequency of apnea of prematurity in preterm neonates at our hospital. The results of this study will help our medical professionals understand apnea of prematurity and guide evidence-based protocols for immediate intervention and complete treatment to maximize outcomes and minimize the risk of sequelae. Ongoing investigation and progress in this area of neonatal care will be vital to improve treatment and the long-term outlook for infants affected by this condition.

Methodology

This study was conducted using a cross-sectional design in the Department of Pediatrics, DHQ Hospital, DI Khan, from 29-April-2024 to 29-October-2024, after receiving ethical approval from the hospital. The study sample size was 138, calculated using the WHO sample size calculator, based on a previous apnea of prematurity frequency in preterm neonates of 35.7% (8), a confidence interval of 95%, and a margin of error of 8%. Non-probability consecutive sampling was used.

Eligible patients were preterm neonates who were born before 37 weeks of gestation, of either gender, aged 1 to 25 days. Neonates with lung malformation, sepsis and birth asphyxia were excluded from the study.

Written consent was obtained from the patients' parents/guardians. Baseline demographics, including the neonate's age, weight, and gender, socioeconomic status, and area of residence, were recorded. Pre-term neonates (born before 37 weeks of gestation) were evaluated for apnea of prematurity, defined as cessation of breathing for>15 seconds on physical examination, and bradycardia, i.e., heart rate <100 beats per minute on electrocardiogram. The entire evaluation was conducted under the supervision of a consultant with at least 5 years of experience. All the details were recorded on a pre-designed proforma.

SPSS 27 software was used to analyze the data. Mean and SD were calculated for the neonates' age and weight. Frequencies and percentages were used for gender, mode of delivery, apnea of prematurity, socioeconomic status, and area of residence. Effect modifiers such as age, weight, gender, socioeconomic status, mode of delivery, and area of residence were addressed through stratification. Post-stratification Chi-square exact test was performed, with p-values < 0.05 considered significant. Results were presented in tables and charts.

Results

The current study was conducted on 138 preterm neonates. The mean age of the neonates was 11.14 ± 7.203 days. Their mean birth weight was 2.375 ± 0.418 kg.

Regarding the cohort's gender, 83 (60.1%) were male, while 55 (39.9%) were female. Seventy-two neonates (52.2%) were from urban areas. Socioeconomic status showed that 59 neonates (42.8%) were from lower-class families, while 57 (41.3%) were from middle-class families (Table 1).

Regarding mode of delivery, the majority of neonates, 74 (53.6%), were delivered vaginally (Figure 1). The frequency of apnea of prematurity was 43 (31.2%), while 95 (68.8%) neonates did not develop the condition (Table 2).

It was observed that the majority of the neonates with apnea, 26 (60.5%), fell in the 1 to 7-day age range (p=0.008). Lower birth weight was also significantly associated with apnea, with 34 neonates (79.1%) with apnea having birth weights between 1.7 and 2.4 kg (p=0.002) (Table 3).

Table 1: Demographics

Demographics		**n**	**%**
Gender	Male	83	60.1%
	Female	55	39.9%
Area of residence	Urban	72	52.2%
	Rural	66	47.8%
Socioeconomic status	Lower class	59	42.8%
	Middle class	57	41.3%
	Upper class	22	15.9%

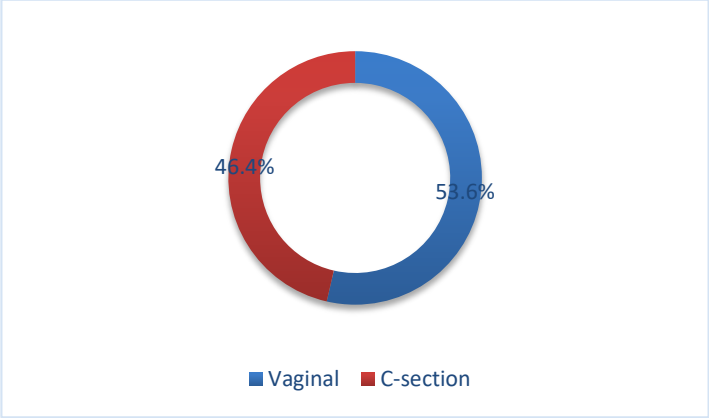

Figure 1: Mode of delivery

Table 2: Frequency of apnea of prematurity

		n	**%**
Apnea of prematurity	Yes	43	31.2%
	No	95	68.8%

Table 3: Association of apnea of prematurity with demographics

Demographics		**Apnea of prematurity**				**P value**
		Yes		**No**		
		n	**%**	**n**	**%**	
Age distribution (Days)	1 to 7	26	60.5%	31	32.6%	0.008
	8 to 15	8	18.6%	33	34.7%	
	> 15	9	20.9%	31	32.6%	
Weight (Kg)	1.7 to 2.4	34	79.1%	48	50.5%	0.002
	> 2.4	9	20.9%	47	49.5%	
Gender	Male	28	65.1%	55	57.9%	0.42
	Female	15	34.9%	40	42.1%	
Area of residence	Urban	22	51.2%	50	52.6%	0.87
	Rural	21	48.8%	45	47.4%	

Socioeconomic status	Lower class	16	37.2%	43	45.3%	0.114
	Middle class	16	37.2%	41	43.2%	
	Upper class	11	25.6%	11	11.6%	
Mode of delivery	Vaginal	22	51.2%	52	54.7%	0.69
	C-section	21	48.8%	43	45.3%	

Discussion

Apnea of prematurity is a significant clinical concern in neonatal intensive care, which represents a developmental disorder fundamentally associated with immaturity of respiratory control. The underlying pathophysiology involves immature central and peripheral chemoreceptor responses, a laryngeal chemoreflex, and diminished central respiratory drive. (13) As mentioned in several studies, the incidence is inversely related to gestational age and birth weight, with almost all infants born below 28 weeks of gestation. (13,14) The history of the condition involves resolution with progressing postmenstrual age, though extremely preterm infants may reveal events well beyond term-equivalent age. (15)

Therapeutic management has historically centred on pharmacologic stimulation of respiration with methylxanthines, especially caffeine citrate, which forms the basis of treatment. The Caffeine for Apnea of Prematurity (CAP) trial has established the efficacy and long-term safety of caffeine, demonstrating not only a reduction in apnea but also significant benefits, including decreased incidence of bronchopulmonary dysplasia and improved neurodevelopmental outcomes at 18 months. (16) Follow-up confirmed these benefits, though the significant improvement in survival without disability that was observed at 18 months was not statistically significant by the age of five years, although no adverse events were observed. (17) Non-pharmacological interventions such as nasal continuous positive airway pressure (CPAP) are aimed at splinting the upper airway to prevent obstructive events. (18)

Apnea of prematurity remains a diagnosis of exclusion. A thorough evaluation to rule out secondary causes such as infection, metabolic disturbances, intracranial pathology, and anaemia is vital before attributing apnoeic spells solely to immaturity. (19,20) This is a crucial clinical distinction, as the prognosis and management differ substantially.

In the present study, conducted on 138 preterm neonates, the frequency of apnea of prematurity was 31.2%. This finding is consistent with the established inverse relationship between gestational maturity and apnea risk, as the cohort consisted of infants born to mothers with gestational age <37 weeks. The demographic profile of the cohort showed that the majority of infants were male (60.1%), resided in urban settings (52.2%), and were delivered vaginally (53.6%). Socioeconomic distribution showed that the majority were from lower and middle socioeconomic strata.

The study found that apnea of prematurity was significantly associated with infants aged 1 to 7 days and lower weight. This requires careful interpretation within the neonatal context. This finding is consistent with the literature, which confirms lower birth weight as a critical risk factor for apnea of prematurity. (18) The mechanism is likely related to greater physiological immaturity, including underdeveloped respiratory control and decreased pulmonary reserve. This study suggests that, in this population, the risk of apnea is more closely related to early neonatal age and lower birth weight.

Conclusion

In conclusion, the present study found that the frequency of apnea of prematurity in preterm neonates was 31.2%. The study also found that apnea of prematurity was significantly associated with lower neonatal age (1 to 7 days) and lower weight.

Declarations

Data Availability statement

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

Ethics approval and consent to participate

Approved by the department concerned. (IRB-DIKHANDHQ-293/24)

Consent for publication

Approved

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Conflict of interest

The authors declared no conflict of interest.

Author Contribution

MA (Postgraduate Resident)
Data Collection, Manuscript drafting, Study Design,
FB (Professor)
Review of Literature, Data entry, Data analysis, and drafting articles.
FU (Assistant Professor)
Critical input and literature review

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the study's integrity.

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