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PATTERN OF PEDIATRIC ADMISSION IN TERTIARY CARE HOSPITAL: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Understanding pediatric admission patterns is crucial for healthcare planning and resource allocation. This study aimed to analyze the demographic characteristics, clinical profile, seasonal variations, and associated factors of pediatric admissions in a tertiary care hospital in northern India.

Methods: A hospital-based cross-sectional study was conducted at A.S.J.S A.T.D.S Medical College, Fatehpur, over six months from November 2024 to April 2025. Data was collected from 458 pediatric admissions using a structured proforma capturing demographic details, clinical information, and outcomes. Descriptive statistics and multivariate logistic regression were used for analysis.

Results: Children under five years constituted 74% of admissions, with male predominance (57.4%). Most patients were from rural areas (65.1%) and lower socioeconomic strata (54.1%). Neonatal conditions (28.4%) were the leading cause of admission, followed by respiratory (24.2%) and gastrointestinal (16.8%) disorders. In neonates, prematurity (15.9%), neonatal sepsis (7.4%), and birth asphyxia (5.2%) were predominant. Among post-neonatal children, pneumonia (13.5%), acute gastroenteritis (11.8%), and bronchiolitis (8.7%) were most common. Significant seasonal variations were observed, with respiratory illnesses predominating in winter and gastroenteritis in early summer. The mean hospital stay was 5.3 ± 3.8 days, with a mortality rate of 2.8%. Factors significantly associated with adverse outcomes included neonatal age (AOR: 3.24, 95% CI: 1.67-6.28), rural residence (AOR: 2.11, 95% CI: 1.01-4.41), nighttime presentation (AOR: 2.03, 95% CI: 1.05-3.92), malnutrition (AOR: 3.12, 95% CI: 1.61-6.04), and delayed presentation (AOR: 2.31, 95% CI: 1.19-4.48). Malnutrition (23.1%) and anemia (21.4%) were the most common comorbidities.

Conclusion: The study highlights neonatal conditions as the predominant cause of pediatric admissions, followed by infectious diseases with notable seasonal variations. The identified risk factors for adverse outcomes underscore the need to strengthen neonatal care, primary healthcare, nutritional interventions, community awareness, and emergency services to improve pediatric healthcare outcomes.

Keywords: Pediatric admissions; Neonatal conditions; Tertiary care; Seasonal variation; Respiratory infections; Rural healthcare

INTRODUCTION

Pediatric hospital admissions constitute a major share of healthcare utilization across the world and cast evidence on childhood diseases and the functioning of healthcare delivery systems. In India, nearly 27% of the population is classified in the under-15 age group, thus analyses of the patterns of pediatric hospital admission will go a long way toward helping in healthcare planning and allocation of resources (Census of India, 2011). Being the apex of healthcare delivery, tertiary care hospitals deal with the more complicated cases and provide specialized care, thus making them the right place to study disease patterns and healthcare utilization (Kumar et al., 2019).

The epidemiological transition in developing countries such as India has brought a shift in the pattern of pediatric morbidity and mortality. While infectious diseases continue to be a major burden, neonatal conditions remain the leading cause of pediatric admissions and mortality, particularly in tertiary care settings that include neonatal intensive care units (Gupta et al., 2022). In India, the WHO states that neonatal conditions, respiratory infections, and diarrheal diseases account for more than half of the pediatric deaths and remain the leading causes of mortality in children under five years (WHO, 2021). Neonatal admissions in tertiary care hospitals typically include conditions such as prematurity, neonatal sepsis, birth asphyxia, respiratory distress syndrome, and congenital anomalies. These conditions require specialized care and often prolonged hospitalization, significantly impacting healthcare resources and outcomes (Sharma et al., 2023). The burden of neonatal conditions varies geographically, with higher rates observed in resource-limited settings due to factors such as inadequate antenatal care, lack of skilled birth attendance, and delayed access to emergency obstetric care (Darmstadt et al., 2022).

Given the socio-economic factors, geographic peculiarities, and accessibility of healthcare, disease patterns may vary regionally. According to Singh et al. (2018), while neonatal conditions predominate across all regions, respiratory infections were more common in northern India among post-neonatal children, while gastrointestinal diseases were prevalent in southern regions. Seasonal patterns also affect admission patterns in pediatric practice: respiratory diseases peak in winter, while gastrointestinal diseases peak in the monsoon seasons (Balasubramanian et al., 2020).

Recent trends in pediatric hospital admissions show an increasing complexity of cases. Kaur et al. (2023) reported that while infectious diseases remained common, there was an increase in admissions for neonatal complications, allergic disorders, and developmental delays in tertiary care centers. The changing pattern reflects improvements in neonatal care leading to survival of high-risk infants who may require repeated hospitalizations.

From another perspective, pediatric admissions bear a burden comprising socio-economic implications. Nearly 30% of families went through catastrophic healthcare expenditure due to the hospitalization of a child, with neonatal admissions contributing significantly to this burden due to prolonged NICU stays (Sharma et al., 2019). The rural-urban patterns of admissions reflect inequalities in access to specialized neonatal and pediatric care services (Mathur et al., 2022).

While the need to understand pediatric admission patterns is clearly indicated, recent comprehensive data on pediatric hospital admissions including neonatal conditions in Uttar Pradesh, especially from newly created medical colleges such as A.S.J.S A.T.D.S Medical College, Fatehpur, is minimal. This study aims to provide comprehensive data on the complete spectrum of pediatric admissions from birth to 12 years, including both neonatal and post-neonatal conditions.

The study sought to analyze the demographic characteristics, clinical profile, seasonality of pediatric admissions including neonatal conditions, outcomes, and factors associated with adverse outcomes to provide evidence-based healthcare planning and delivery of services in pediatric departments.

METHODOLOGY

Study Design: A hospital-based cross-sectional observational study was conducted to determine the pattern of pediatric admissions including both neonatal and post-neonatal patients.

Study Site: The study was carried out in the Department of Pediatrics including the Neonatal Intensive Care Unit (NICU) and Pediatric Ward, A.S.J.S A.T.D.S Medical College, Fatehpur, Uttar

Pradesh, India. The hospital serves as a referral center encompassing the diversity of the pediatric population, including rural and urban patients.

Study Duration: The study was conducted over a six-month duration from November 2024 to April 2025.

Sampling and Sample Size: All pediatric patients admitted to the inpatient department of Pediatrics, including those in the NICU, over the study duration were included via consecutive sampling. The total sample size, based on previous hospital records and a pilot study, was estimated to be 420 pediatric admissions, with a 95% confidence level and a 5% margin of error. To account for potential incomplete records, an additional 10% was added, resulting in a target sample size of 462 patients. The actual study included 458 patients.

Inclusion and Exclusion Criteria: The study included all patients aged 0-12 years (including newborns from birth) admitted to the pediatric ward, NICU, or pediatric intensive care unit during the study period, regardless of their diagnosis, socioeconomic status, or place of residence. This included neonates admitted directly from the delivery room, those transferred from other facilities, and outborn admissions. Patients who were brought dead to the emergency department, those admitted for less than 24 hours for observation purposes only, and cases with substantially incomplete medical records were excluded from the study.

Data Collection Tools and Techniques: Data was collected using a pre-designed, structured proforma validated by subject experts and piloted on 20 cases. The proforma captured demographic details (age, gender, residence, socioeconomic status), clinical information (presenting complaints, diagnosis, comorbidities, length of stay), and outcome data. For neonatal patients, additional data included birth weight, gestational age, place of delivery, and maternal factors. Information was extracted from hospital admission records, patient files, discharge summaries, NICU records, and hospital management information systems.

Data Management and Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS (version 25.0). Descriptive statistics were calculated for demographic and clinical information. Chi-square tests were used for categorical variables, while t-tests or Mann-Whitney U tests were used for continuous variables. Multivariate logistic regression analysis examined relationships between potential confounders and adverse outcomes. Seasonal trends were analyzed using time series analysis. Statistical significance was set at $p<0.05$.

Ethical Considerations: The Institutional Ethics Committee approved the study protocol. Patient privacy was ensured through patient identification numbers and removal of identifiable information. The study adhered to Declaration of Helsinki guidelines.

RESULTS

Table 1: Demographic Characteristics of Pediatric Admissions (N=458)

Characteristics	Number (n)	Percentage (%)
Age Group (Years)		
Neonates (0-28 days)	152	33.2
1-12 months	87	19.0
1-5 years	100	21.8
6-12 years	119	26.0
Gender		
Male	263	57.4
Female	195	42.6
Residence		
Rural	298	65.1
Urban	160	34.9
Socioeconomic Status (Modified Kuppuswamy Scale)		
Upper	31	6.8
Upper Middle	67	14.6

Middle	112	24.5
Lower Middle	143	31.2
Lower	105	22.9
Health Insurance Coverage		
Covered	167	36.5
Not Covered	291	63.5

Table 2: Clinical Profile of Pediatric Admissions (N=458)

Clinical Characteristics	Number (n)	Percentage (%)
System Involved		
Neonatal Conditions	130	28.4
Respiratory	111	24.2
Gastrointestinal	77	16.8
Central Nervous System	46	10.0
Hematological	34	7.4
Renal	21	4.6
Cardiovascular	18	3.9
Endocrine	12	2.6
Others	9	2.0
Major Diagnosis Categories		
Prematurity/Low Birth Weight	73	15.9
Pneumonia	62	13.5
Acute Gastroenteritis	54	11.8
Bronchiolitis	40	8.7
Neonatal Sepsis	34	7.4
Seizure Disorders	31	6.8
Anemia	28	6.1
Birth Asphyxia/HIE	24	5.2
Urinary Tract Infection	22	4.8
Sepsis (Post-neonatal)	21	4.6
Dengue	18	3.9
Respiratory Distress Syndrome	16	3.5
Asthma	14	3.1
Meningitis/Encephalitis	12	2.6
Congenital Heart Disease	9	2.0

Table 3: Age-Specific Distribution of Major Diagnoses

Diagnosis	Neonates (0-28 days) n=152	Infants (1-12 months) n=87	1-5 years n=100	6-12 years n=119
Prematurity/LBW	73 (48.0%)	-	-	-
Neonatal Sepsis	34 (22.4%)	-	-	-
Birth Asphyxia/HIE	24 (15.8%)	-	-	-
RDS	16 (10.5%)	-	-	-
Pneumonia	3 (2.0%)	24 (27.6%)	22 (22.0%)	13 (10.9%)
Bronchiolitis	2 (1.3%)	28 (32.2%)	10 (10.0%)	-
Gastroenteritis	-	18 (20.7%)	24 (24.0%)	12 (10.1%)
Seizure Disorders	-	8 (9.2%)	15 (15.0%)	8 (6.7%)
Anemia	-	5 (5.7%)	12 (12.0%)	11 (9.2%)
UTI	-	4 (4.6%)	9 (9.0%)	9 (7.6%)
Others	-	-	8 (8.0%)	66 (55.5%)

Table 4: Seasonal Distribution of Common Pediatric Admissions (N=458)

Diagnosis	Winter (n=286)	Early Summer (n=172)	Total
Prematurity/LBW	46 (16.1%)	27 (15.7%)	73
Pneumonia	45 (15.7%)	17 (9.9%)	62
Acute Gastroenteritis	28 (9.8%)	26 (15.1%)	54
Bronchiolitis	35 (12.2%)	5 (2.9%)	40
Neonatal Sepsis	22 (7.7%)	12 (7.0%)	34
Seizure Disorders	19 (6.6%)	12 (7.0%)	31
Anemia	16 (5.6%)	12 (7.0%)	28
Birth Asphyxia/HIE	15 (5.2%)	9 (5.2%)	24
UTI	12 (4.2%)	10 (5.8%)	22
Sepsis (Post-neonatal)	13 (4.5%)	8 (4.7%)	21
Dengue	4 (1.4%)	14 (8.1%)	18
RDS	10 (3.5%)	6 (3.5%)	16
Others	21 (7.3%)	14 (8.1%)	35

Table 5: Length of Hospital Stay and Outcome of Pediatric Admissions (N=458)

Characteristics	Number (n)	Percentage (%)
Length of Stay (Days)		
1-3	142	31.0
4-7	186	40.6
8-14	89	19.4
>14	41	9.0
Mean Length of Stay	5.3 ± 3.8 days	
Admission Unit		
NICU	152	33.2
General Ward	231	50.4
Pediatric ICU	75	16.4
Outcome		
Discharged	402	87.8
Referred to Higher Center	29	6.3
Left Against Medical Advice	14	3.1
Expired	13	2.8
Mortality by System Involved		
Neonatal Conditions	6	46.2
Respiratory	3	23.1
Central Nervous System	2	15.4
Sepsis	1	7.7
Cardiovascular	1	7.7

Table 6: Factors Associated with Adverse Outcomes (Death or Referral) in Pediatric Admissions

Factors	Adverse Outcome (n=42)	Favorable Outcome (n=416)	Adjusted Odds Ratio (95% CI)	p-value
Age Group				
Neonates (0-28 days)	25 (59.5%)	127 (30.5%)	3.24 (1.67-6.28)	0.001*
Infants (1-12 months)	10 (23.8%)	77 (18.5%)	1.88 (0.78-4.53)	0.162
1-5 years	5 (11.9%)	95 (22.8%)	0.76 (0.28-2.09)	0.598
6-12 years	2 (4.8%)	117 (28.1%)	Reference	

Gender				
Male	24 (57.1%)	239 (57.5%)	0.98 (0.51-1.88)	0.961
Female	18 (42.9%)	177 (42.5%)	Reference	
Residence				
Rural	33 (78.6%)	265 (63.7%)	2.11 (1.01-4.41)	0.048*
Urban	9 (21.4%)	151 (36.3%)	Reference	
Time of Presentation				
Night (8 PM - 8 AM)	25 (59.5%)	175 (42.1%)	2.03 (1.05-3.92)	0.035*
Day (8 AM - 8 PM)	17 (40.5%)	241 (57.9%)	Reference	
Nutritional Status				
Malnutrition Present	19 (45.2%)	87 (20.9%)	3.12 (1.61-6.04)	0.001*
No Malnutrition	23 (54.8%)	329 (79.1%)	Reference	
Duration of Symptoms before Admission				
> 3 days	26 (61.9%)	172 (41.3%)	2.31 (1.19-4.48)	0.013*
≤ 3 days	16 (38.1%)	244 (58.7%)	Reference	

*Statistically significant ($p<0.05$)

Table 7: Comorbidities and Risk Factors among Pediatric Admissions (N=458)

Comorbidities/Risk Factors	Number (n)	Percentage (%)
Malnutrition	106	23.1
Anemia	98	21.4
Low Birth Weight (<2.5 kg)	89	19.4
Prematurity	73	15.9
Previous Hospitalization (within 6 months)	67	14.6
Congenital Anomalies	41	9.0
Incomplete Immunization	39	8.5
Developmental Delay	27	5.9
Chronic Respiratory Disease	25	5.5
Neurological Disorders	22	4.8
Congenital Heart Disease	19	4.1
Others	31	6.8
No Comorbidity	187	40.8

DISCUSSION

This comprehensive study of pediatric admissions at A.S.J.S A.T.D.S Medical College, Fatehpur, including both neonatal and post-neonatal patients, provides crucial insights into the pattern of childhood illnesses requiring hospitalization. Our findings demonstrate that neonatal conditions constitute the largest burden of pediatric admissions (28.4%), followed by respiratory (24.2%) and gastrointestinal disorders (16.8%), which aligns with global patterns of pediatric morbidity in tertiary care settings.

The predominance of neonatal admissions (33.2% of total admissions) reflects the critical nature of the neonatal period and the specialized care requirements during the first 28 days of life. This finding is consistent with studies by Lawn et al. (2022), who reported that neonatal conditions account for 30-35% of pediatric admissions in tertiary care hospitals in developing countries. The high proportion of neonatal admissions also reflects the referral pattern to our institution, which serves as a regional neonatal care center. Among neonatal conditions, prematurity/low birth weight was the leading cause (15.9% of total admissions), followed by neonatal sepsis (7.4%) and birth asphyxia/hypoxic-ischemic encephalopathy (5.2%). This pattern mirrors findings from other tertiary care centers in India. Dutta et al. (2023) reported similar proportions in their multicenter study across northern India, with prematurity accounting for 18.2% and neonatal sepsis for 8.1% of pediatric admissions. The high

burden of prematurity-related admissions underscores the need for improved antenatal care and prevention strategies.

The male predominance (57.4%) observed in our study is consistent with previous research and reflects both biological vulnerability and cultural factors affecting healthcare-seeking behavior. However, the gender distribution was more pronounced in neonatal admissions (62.5% males), which may be attributed to the higher biological vulnerability of male neonates to complications such as respiratory distress syndrome and infections, as documented by Stevenson et al. (2021). Among post-neonatal children, respiratory conditions remained the leading cause of admission, with pneumonia (13.5% of total admissions) being most common, followed by bronchiolitis (8.7%). This pattern is consistent with Srinivasan et al. (2021), who reported respiratory illnesses as the primary cause of admission in children beyond the neonatal period. The seasonal variation in respiratory illnesses, with higher rates during winter months (15.7% vs 9.9% for pneumonia), reflects the typical epidemiological pattern of respiratory infections.

Gastrointestinal disorders, particularly acute gastroenteritis (11.8%), showed interesting seasonal variation with higher rates during early summer months (15.1% vs 9.8% in winter). This pattern aligns with the typical seasonality of diarrheal diseases in the Indian subcontinent, as reported by Bhimwal et al. (2020). The emergence of dengue cases predominantly during early summer (8.1% vs 1.4% in winter) reflects the vector-borne disease pattern in this region. The demographic profile showing rural predominance (65.1%) and lower socioeconomic status (54.1%) is particularly significant. This pattern suggests that our tertiary care center serves as a crucial healthcare resource for underserved populations. The high proportion of uninsured patients (63.5%) further emphasizes the financial burden of pediatric healthcare on families, especially for neonatal care which often requires prolonged hospitalization.

Our multivariate analysis revealed several significant risk factors for adverse outcomes. Neonatal age emerged as the strongest predictor (AOR: 3.24, 95% CI: 1.67-6.28), which is expected given the physiological vulnerability of newborns. This finding is consistent with the WHO report (2021) identifying the neonatal period as the highest risk period for mortality and morbidity. Rural residence (AOR: 2.11) and delayed presentation (AOR: 2.31) as risk factors highlight the importance of geographic accessibility and timely healthcare seeking. These findings support the need for strengthening primary healthcare infrastructure and improving community awareness about neonatal and pediatric danger signs.

The association between malnutrition and adverse outcomes (AOR: 3.12) was particularly strong and concerning. With 23.1% of admitted children showing signs of malnutrition, this finding underscores the continued burden of undernutrition in our population. The high prevalence of anemia (21.4%) further reflects the nutritional challenges faced by children in this region. The mortality rate of 2.8% in our study compares favorably with other tertiary care centers in similar settings. However, the concentration of deaths in neonatal conditions (46.2% of all deaths) emphasizes the need for continued strengthening of neonatal care services. The relatively low rate of leaving against medical advice (3.1%) suggests good family counseling and support systems in our institution.

The study also revealed concerning gaps in preventive care, with 8.5% of children having incomplete immunization status and 19.4% being born with low birth weight. These findings highlight opportunities for improving preventive healthcare services and antenatal care in the region. The seasonal patterns observed in our study have important implications for healthcare planning. The winter surge in respiratory conditions and early summer increase in gastroenteritis and dengue cases suggest the need for seasonal preparedness and resource allocation. Healthcare facilities should anticipate increased NICU capacity requirements during winter months when both neonatal respiratory conditions and post-neonatal pneumonia cases peak.

RECOMMENDATIONS

Based on our findings, several recommendations can improve pediatric healthcare delivery:

Neonatal Care Enhancement:

- Strengthen NICU services with adequate staffing and equipment

- Improve antenatal care services to reduce prematurity and low birth weight
- Establish effective neonatal transport systems for outborn referrals
- Implement evidence-based protocols for neonatal sepsis and respiratory distress

Primary Healthcare Strengthening:

- Enhance rural primary healthcare services with pediatric and neonatal care capabilities
- Develop effective referral systems between primary, secondary, and tertiary care
- Establish community-based newborn care programs
- Improve skilled birth attendance and emergency obstetric care access

Seasonal Preparedness:

- Plan for increased NICU and respiratory ward capacity during winter months
- Prepare for dengue and gastroenteritis surge during summer months
- Develop seasonal public health messaging and prevention campaigns
- Ensure adequate staffing and resources during peak seasons

Nutritional Interventions:

- Implement systematic nutritional screening and intervention programs
- Establish feeding support services for malnourished children
- Integrate nutritional counseling into routine pediatric care
- Address micronutrient deficiencies, particularly iron deficiency anemia

Community Awareness and Education:

- Educate communities about neonatal and pediatric danger signs
- Promote timely healthcare seeking, especially in rural areas
- Strengthen immunization programs and improve coverage
- Develop culturally appropriate health education materials

Quality Improvement:

- Implement continuous quality improvement programs
- Establish pediatric and neonatal mortality review committees
- Develop standardized treatment protocols and care pathways
- Enhance infection prevention and control measures

Healthcare System Strengthening:

- Improve 24-hour pediatric emergency services
- Establish telemedicine networks for remote consultation
- Develop healthcare financing mechanisms to reduce out-of-pocket expenses
- Create integrated health information systems for better monitoring and evaluation

These recommendations require coordinated efforts from healthcare providers, policymakers, and communities to achieve meaningful improvements in pediatric healthcare outcomes.

CONCLUSION

This comprehensive study reveals that neonatal conditions constitute the largest burden of pediatric admissions in our tertiary care setting, followed by respiratory and gastrointestinal disorders. The pattern reflects both the biological vulnerability of newborns and the ongoing burden of infectious diseases in older children. The demographic profile shows a predominance of rural, economically disadvantaged populations, highlighting the critical role of tertiary care centers in serving underserved communities. The identified risk factors for adverse outcomes - neonatal age, rural residence, delayed presentation, malnutrition, and nighttime presentation - provide clear targets for intervention. The seasonal variations in admission patterns offer opportunities for proactive healthcare planning and resource allocation. The study underscores the complex interplay between neonatal vulnerability, socioeconomic factors, nutritional status, and healthcare access in determining pediatric admission patterns and outcomes. These findings provide an evidence base for developing targeted interventions to improve pediatric and neonatal healthcare delivery in similar settings.

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