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Original Article

Identification and management of seizures in children. A retrospective cross-sectional study at a tertiary care hospital.

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Abstract

Background:

Seizures are among the most common neurological emergencies in children and significantly contribute to pediatric hospital admissions. Early identification and appropriate management are crucial for improving outcomes.

Methodology:

This retrospective cross-sectional study was conducted at a tertiary care hospital in Bihar, India, over an eight-month period (Month Year–Month Year). Medical records of 100 pediatric patients aged 1 month to 14 years diagnosed with seizures were analyzed. Data regarding demographic profile, seizure types, etiologies, and treatment modalities were collected and analyzed using SPSS version 25.

Results:

The majority of patients were in the 1–5 years age group (45%), with a male predominance (60%). Febrile seizures were the most common type (38%), followed by generalized tonic–clonic seizures (30%). Febrile illness was the leading etiological factor (40%). Diazepam and phenytoin were the most commonly used antiepileptic drugs. A statistically significant association was observed between age group and febrile seizures ($\chi^2 = 9.21$, $p = 0.027$).

Conclusion:

Febrile seizures remain the most frequent seizure type in children, especially in younger age groups.

Recommendations:

Early identification and prompt management of febrile illnesses, parental education, and adherence to standardized seizure management protocols can significantly reduce morbidity and improve outcomes.

Keywords: Pediatric seizures, febrile seizures, epilepsy, antiepileptic drugs, retrospective study

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Introduction

Seizures are transient episodes of neurological dysfunction caused by abnormal electrical activity in the brain. They are among the most frequent neurological conditions encountered in pediatric clinical practice and often require urgent medical evaluation¹.

The global burden of seizure disorders in children remains substantial. Epidemiological studies suggest that nearly 4–10% of children experience at least one seizure episode during childhood². The incidence is particularly high in infants and young children due to the increased excitability of the developing brain.³

The immature nervous system in early childhood is more susceptible to various internal and external triggers that may precipitate seizure activity. These triggers include fever, infections, metabolic abnormalities, and structural brain lesions⁴.

Seizures in pediatric patients can occur due to a wide range of etiological factors such as febrile illnesses, epilepsy, central nervous system infections, metabolic disturbances, trauma, and congenital neurological disorders⁵. Identification of the underlying cause is essential for determining appropriate treatment and preventing recurrence⁶.



Among the different seizure types, febrile seizures are the most commonly encountered in pediatric practice. They usually occur between the ages of six months and five years and are associated with fever without evidence of intracranial infection⁷. Although febrile seizures are generally benign, they can cause significant anxiety among parents and caregivers⁸.

Epilepsy is another important cause of recurrent seizures in children and is defined by the occurrence of two or more unprovoked seizures. It affects approximately 0.5–1% of the pediatric population worldwide⁹. Early diagnosis and appropriate therapy are crucial to minimize long-term neurological complications¹⁰.

Central nervous system infections such as meningitis, encephalitis, and neurocysticercosis are major causes of seizures in developing countries. These infections may lead to acute symptomatic seizures and long-term neurological sequelae if not treated promptly¹¹.

Metabolic abnormalities including hypoglycemia, hypocalcemia, and electrolyte imbalance can also trigger seizures in children. Early recognition and correction of these metabolic disturbances are essential to prevent neurological damage¹².

The management of seizures in children involves rapid stabilization of the patient, identification of the underlying cause, and administration of appropriate antiepileptic medications. Benzodiazepines such as diazepam and lorazepam are commonly used as first-line drugs for acute seizure control¹³.

In addition to pharmacological therapy, diagnostic investigations such as electroencephalography and neuroimaging play an important role in evaluating seizure disorders and identifying structural abnormalities of the brain¹⁴.

Understanding the clinical characteristics and management patterns of pediatric seizures is essential for improving treatment strategies. Therefore, the present study was conducted to evaluate the identification and management of seizures in children at a tertiary care hospital.

Methodology

Study Design

The present investigation was designed as a **retrospective observational study** to evaluate the clinical characteristics, etiological factors, and management patterns of seizures in pediatric patients.

The study aimed to assess demographic variables, seizure types, etiological factors, and pharmacological management strategies among children diagnosed with seizures at a tertiary care hospital.

Study Setting

The study was conducted in the **Department of Pediatrics at Government Medical College & Hospital, Purnea, Bihar, India**, which functions as a tertiary care referral center providing specialized pediatric medical services to a large population from surrounding districts and rural areas.

The pediatric department receives both **outpatient and inpatient cases of neurological emergencies**, including seizures, epilepsy, febrile convulsions, and central nervous system infections. Medical records maintained in the hospital database were used as the primary source of information for the present study.

Study Duration

The study was conducted over a period of **eight months**, during which the medical records of pediatric patients diagnosed with seizures were reviewed.

All eligible cases recorded during the study period were included in the analysis to ensure comprehensive evaluation of seizure patterns and management practices.

Study Population

The study population consisted of **pediatric patients aged between 1 month and 14 years** who were diagnosed with seizures and received treatment at the study hospital.

A total of **100 patient records** that fulfilled the eligibility criteria were included in the final analysis. These records contained detailed clinical documentation including



demographic characteristics, diagnosis, treatment details, and investigation reports.

Sample Size

A sample size of 100 pediatric seizure cases was selected based on the availability of complete medical records during the study period.

All eligible records meeting the inclusion criteria within the defined timeframe were included in order to minimize selection bias and ensure a representative dataset for analysis.

The sample size was considered adequate to evaluate seizure patterns, demographic characteristics, and treatment practices in the study population.

Eligibility Criteria

Inclusion Criteria

Medical records were included in the study if they met the following criteria:

- Pediatric patients aged **1 month to 14 years**
- Diagnosed with **seizures based on clinical documentation by pediatricians**
- Patients who received treatment at **Government Medical College & Hospital, Purnea**
- Availability of **complete medical records including demographic data, diagnosis, and treatment information**

Exclusion Criteria

Medical records were excluded from the study under the following conditions:

- Neonatal seizures occurring **within the first 28 days of life**
- Patients with **non-epileptic events** such as syncope or breath-holding spells
- Patients with **incomplete or insufficient clinical documentation**
- Cases where seizure diagnosis was **not clearly documented**

Data Collection Procedure

Data were collected through a **systematic review of hospital medical records**, admission registers, and prescription records maintained by the pediatric department.

A **structured data collection format** was developed to ensure uniform extraction of information from all patient records.

The following variables were recorded for each patient:

Demographic Variables

- Age of the patient
- Gender of the patient

Clinical Characteristics

- Type of seizure diagnosed
- Presence of fever at the time of seizure
- Etiological factors associated with seizures

Treatment Details

- Antiepileptic drugs administered
- Acute seizure management medications
- Additional supportive therapy if documented

All collected data were compiled into a database for further statistical analysis.

Classification of Age Groups

For analytical purposes, the study population was divided into four age groups:

- **Less than 1 year**
- **1–5 years**
- **6–10 years**
- **11–14 years**

This classification enabled evaluation of seizure occurrence across different developmental stages of childhood.



Classification of Seizure Types

Seizures were categorized based on clinical diagnosis recorded in the patient medical records. The following seizure types were included in the analysis:

- Febrile seizures
- Generalized tonic-clonic seizures
- Focal seizures
- Absence seizures
- Myoclonic seizures

These categories were used to analyze the distribution of seizure types among the pediatric population.

Etiological Classification

The underlying causes of seizures were categorized into the following groups based on clinical documentation and laboratory findings:

- Febrile illness
- Epilepsy
- Central nervous system infections
- Metabolic disturbances (such as hypoglycemia or electrolyte imbalance)
- Trauma

This classification helped in identifying the major etiological contributors to seizure occurrence in the study population.

Evaluation of Treatment Patterns

The pharmacological management of seizures was evaluated by analyzing the medications prescribed to patients.

The following antiepileptic drugs were recorded:

- Diazepam
- Phenytoin
- Levetiracetam
- Phenobarbital

The frequency and percentage of each medication used in seizure management were calculated.

Outcome Measures

The primary outcomes evaluated in the study included:

- Distribution of seizures according to **age and gender**
- Frequency of different **seizure types**
- Identification of **etiological factors** associated with seizures
- Pattern of **antiepileptic drug utilization**

Statistical Analysis

All collected data were entered into **Statistical Package for the Social Sciences (SPSS) version 25** for analysis.

Both descriptive and inferential statistical methods were applied.

Descriptive Statistics

Descriptive statistical methods were used to summarize the demographic and clinical characteristics of the study population.

The following statistical measures were calculated:

- Frequencies
- Percentages
- Distribution tables

Age distribution, gender distribution, seizure types, etiological factors, and treatment patterns were expressed as **number of patients and percentage values**.

Inferential Statistics

To examine the relationship between **age group and** the occurrence of febrile seizures, the **Chi-square test** was applied.

The statistical parameters used in the analysis included:

- Chi-square value (χ^2)
- Degrees of freedom (df)
- p-value

A **p-value less than 0.05** was considered statistically significant.



Ethical Considerations

The study protocol was reviewed and approved by the **Institutional Ethics Committee of Government Medical College & Hospital, Purnea, Bihar, India.**

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As the study involved **retrospective analysis of anonymized medical records**, the requirement for informed consent from patients or guardians was waived.

All patient information was handled confidentially, and personal identifiers were not recorded during data collection to maintain privacy and confidentiality.

Results

A total of **100 pediatric patients diagnosed with seizures** were included in the present retrospective study conducted at Government Medical College & Hospital, Purnea over a period of eight months. The collected data were analyzed to evaluate demographic characteristics, types of seizures, etiological factors, and treatment patterns.

Demographic Characteristics of Study Population

Age Distribution

The age distribution of the study participants is presented in **Table 1**. The majority of seizure cases were observed in the **1–5 years age group (45%)**, followed by infants less than one year of age (20%). Children aged **6–10 years accounted for 20%**, while **15% of cases were observed in the 11–14 years age group.**

This distribution indicates that seizure episodes were more commonly observed among younger children, particularly in early childhood.

Table 1: Age Distribution of Pediatric Seizure Patients (n = 100)

Age Group (Years)	Number of Patients	Percentage (%)
<1 year	20	20
1–5 years	45	45
6–10 years	20	20
11–14 years	15	15
Total	100	100

The predominance of seizure cases in the **1–5 years age group** is illustrated in **Figure 1**, which presents the age-wise distribution of the study population.

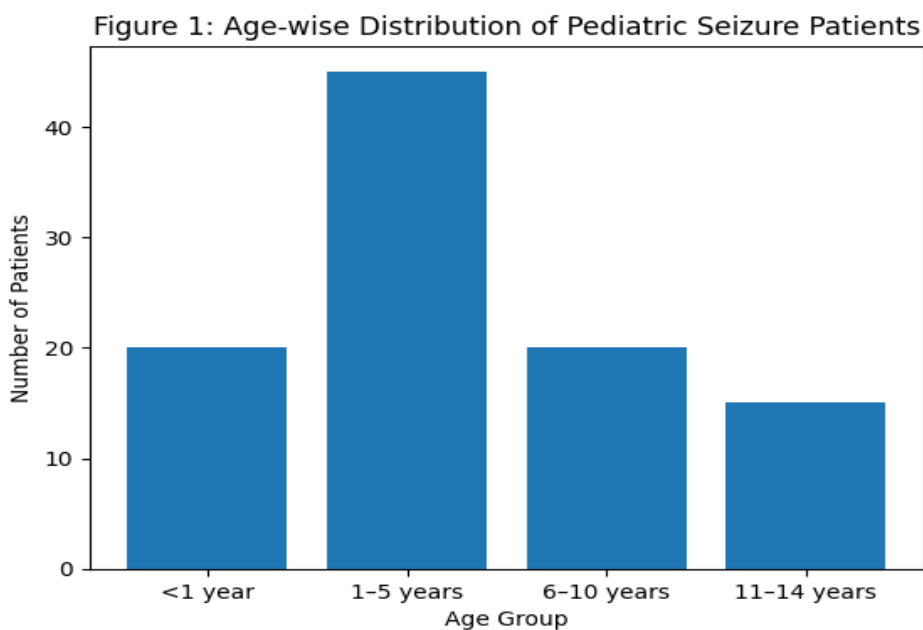


Figure 1: Age-wise Distribution of Pediatric Seizure Patients

Gender Distribution

The gender distribution among the pediatric patients is summarized in **Table 2**. Out of the total 100 patients, **60 (60%) were male** and **40 (40%) were female**.

The findings indicate a **higher prevalence of seizures among male children**, with a male-to-female ratio of **1.5:1**.

Table 2: Gender Distribution of Study Participants (n = 100)

Gender	Number of Patients	Percentage (%)
Male	60	60
Female	40	40
Total	100	100

The relative proportion of male and female patients is graphically represented in **Figure 2**.

Figure 2: Gender Distribution of Pediatric Seizure Patients

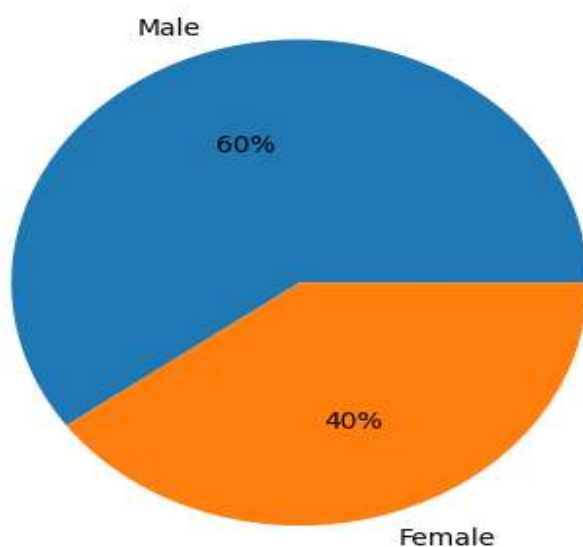


Figure 2: Gender Distribution of Pediatric Seizure Patients

Distribution of Seizure Types

The various types of seizures observed among the study population are summarized in **Table 3**. Febrile seizures were the most common seizure type, accounting for **38% of cases**, followed by **generalized tonic-clonic seizures (30%)**.

Focal seizures constituted **18% of cases**, while **absence seizures and myoclonic seizures accounted for 8% and 6% respectively**.

Table 3: Distribution of Seizure Types (n = 100)

Type of Seizure	Number of Patients	Percentage (%)
Febrile seizures	38	38
Generalized tonic-clonic seizures	30	30
Focal seizures	18	18
Absence seizures	8	8
Myoclonic seizures	6	6
Total	100	100

The distribution of seizure types among pediatric patients is shown in **Figure 3**.

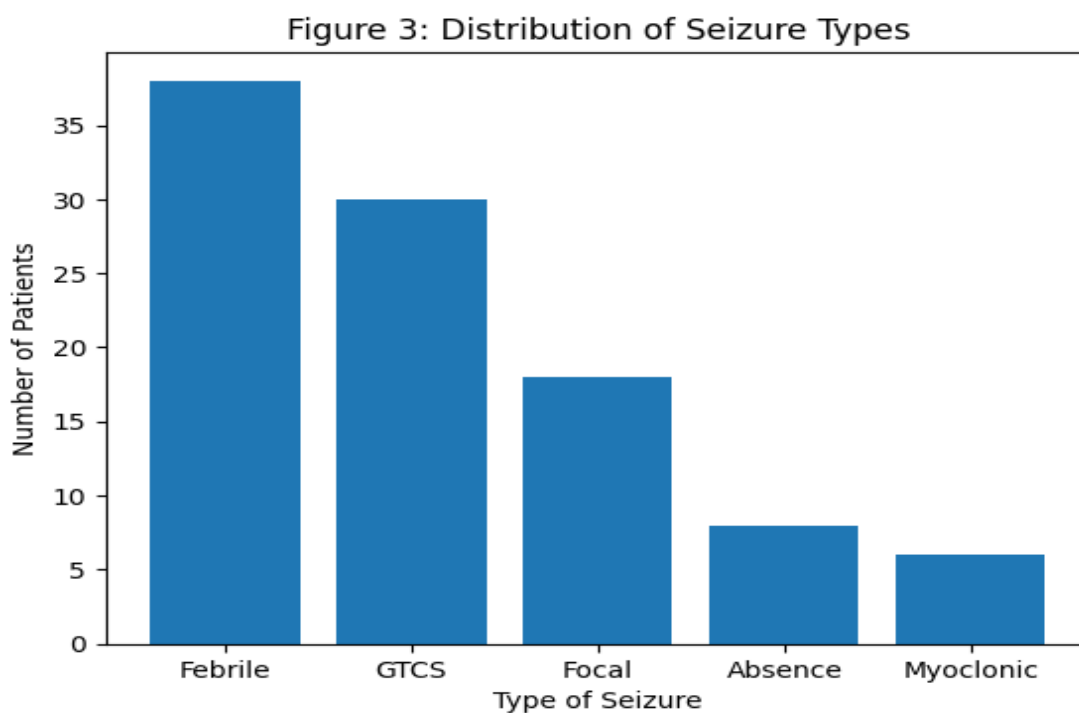


Figure 3: Distribution of Seizure Types

Etiological Factors Associated with Seizures

The etiological factors responsible for seizures in the study population are presented in **Table 4**.

Febrile illness was identified as the **leading cause (40%)**, followed by **epilepsy (24%)** and **central nervous system infections (16%)**. Metabolic disturbances such as hypoglycemia and electrolyte imbalance accounted for **12% of cases**, while **trauma contributed to 8% of cases**.

Table 4: Etiology of Seizures Among Study Participants (n = 100)

Etiological Factor	Number of Patients	Percentage (%)
Febrile illness	40	40
Epilepsy	24	24
CNS infections	16	16
Metabolic disturbances	12	12
Trauma	8	8
Total	100	100

These findings demonstrate that **infectious and febrile conditions were the most common triggers of seizures in children**.

Pharmacological Management of Seizures

The antiepileptic drugs used in the management of seizures among the study population are summarized in **Table 5**.

The most frequently used medication was **diazepam (40%)**, primarily administered for acute seizure control. **Phenytoin (30%)** was commonly used as a second-line therapy for persistent seizures.

Other medications included **levetiracetam (18%)** and **phenobarbital (12%)**, which were used depending on seizure type and patient condition.

Table 5: Antiepileptic Drugs Used in Pediatric Seizure Management

Drug	Number of Patients	Percentage (%)
Diazepam	40	40
Phenytoin	30	30
Levetiracetam	18	18
Phenobarbital	12	12

The distribution of antiepileptic drug usage among the patients is illustrated in **Figure 4**.

Figure 4: Distribution of Antiepileptic Drugs Used

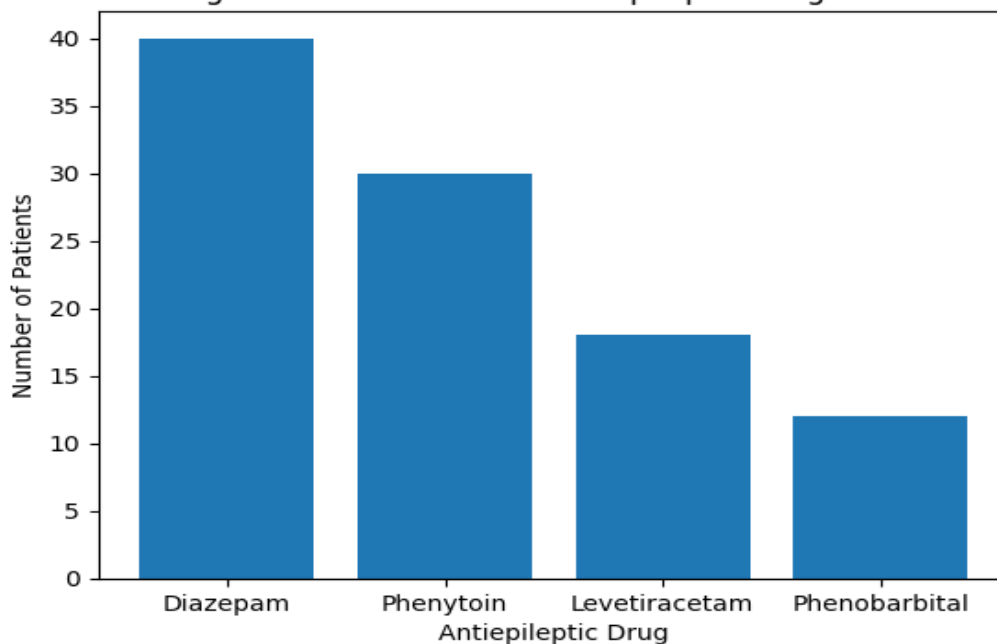


Figure 4: Distribution of Antiepileptic Drugs Used

$\chi^2 = 9.21$
 $df = 3$
 $p = 0.027$

Statistical Analysis

To evaluate the association between age group and occurrence of febrile seizures, a Chi-square test was performed. The analysis demonstrated a statistically significant association between age group and febrile seizures.

Since the p-value was less than 0.05, the association between younger age groups and febrile seizures was statistically significant. Febrile seizures were predominantly observed among children aged 1–5 years.



Summary of Key Findings

The analysis of the study population revealed several important observations. The majority of seizure cases occurred in the **1–5-year age group**, indicating a higher vulnerability of younger children to seizure episodes. A **male predominance** was observed among the patients.

Febrile seizures were identified as the **most common seizure type**, followed by generalized tonic-clonic seizures. Febrile illnesses were the **leading etiological factor**, highlighting the importance of infection control and early fever management.

In terms of treatment, **diazepam and phenytoin were the most frequently used antiepileptic drugs** for seizure management. Statistical analysis in the present study demonstrated a significant association between age group and the occurrence of febrile seizures.

Discussion

The present study evaluated the clinical characteristics and management of seizures among pediatric patients admitted to a tertiary care hospital.

The majority of patients in this study were between 1 and 5 years of age. Similar findings have been reported in previous studies where seizures were more common in early childhood due to increased neuronal excitability and immature brain development¹⁵.

Male predominance observed in the present study is consistent with earlier epidemiological research that reported higher seizure incidence among male children¹⁶.

Febrile seizures were the most frequently observed seizure type in this study. Previous studies have reported that febrile seizures account for a large proportion of seizure episodes in children below five years of age¹⁷.

Generalized tonic-clonic seizures were the second most common seizure type observed. These seizures involve both cerebral hemispheres and are characterized by tonic muscle contraction followed by clonic jerking movements¹⁸.

Central nervous system infections such as meningitis and encephalitis were identified as important etiological factors in pediatric seizures. These infections may cause inflammation of brain tissue leading to abnormal neuronal activity¹⁹.

Metabolic disturbances including hypoglycemia and electrolyte imbalance were also observed in several cases. Early detection and correction of these abnormalities are essential to prevent recurrence of seizures²⁰.

Benzodiazepines such as diazepam were commonly used as first-line therapy for seizure control in the present study. These drugs act by enhancing the inhibitory effects of gamma-aminobutyric acid in the brain²¹.

Phenytoin and levetiracetam were used as second-line antiepileptic medications for patients with persistent seizures. These drugs help stabilize neuronal membranes and prevent abnormal electrical discharge²².

Statistical analysis in the present study demonstrated a significant association between age group and the occurrence of febrile seizures, indicating that febrile seizures are more commonly observed in younger pediatric age groups²³.

Early diagnosis and timely initiation of treatment are crucial to prevent complications such as status epilepticus and neurological impairment²⁴.

Hospital-based retrospective studies like the present one are useful in understanding real-world patterns of pediatric seizure disorders and improving clinical management strategies²⁵.

Conclusion

Seizures remain a common neurological problem in children. Febrile seizures and generalized tonic-clonic seizures were the most frequently observed seizure types in the present study. Early identification of the underlying cause and prompt administration of appropriate antiepileptic medications are essential for effective management and improved patient outcomes.

Recommendations:

Early diagnosis and management of febrile illnesses

Awareness among parents regarding seizure first aid

Standard treatment protocols in emergency settings

Strengthening pediatric emergency services



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Abbreviations:

GTCS – Generalized Tonic-Clonic Seizure

SPSS – Statistical Package for Social Sciences

CNS – Central Nervous System

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No funding was received for this study.

Conflict of Interest:

The authors declare no conflict of interest.

Data Availability:

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions:

Shakeb Ahmad: Concept, data collection, manuscript drafting

Erum Yasmin: Data analysis, interpretation

Prem Prakash: Supervision, critical revision

Author Biography:

Shakeb Ahmad is a Senior Resident in Pediatrics with interest in pediatric neurology.

Erum Yasmin specializes in community medicine and epidemiology.

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