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## PROFILE OF PEDIATRIC MALIGNANCIES AT A RURAL CENTRE - A TEN YEAR STUDY

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### ABSTRACT

**Introduction:** Pediatric malignancies represent a significant cause of morbidity and mortality in children worldwide, with variations in incidence and spectrum between urban and rural populations. Data from rural centers in developing countries remain limited.

**Aims and Objectives:** This study aimed to evaluate the clinicopathological profile of pediatric malignancies over a ten-year period at a rural tertiary care center.

**Materials and Methods:** This retrospective observational study was conducted over one year at Mahatma Gandhi Institute of Medical Sciences, Sevagram, Dist. Wardha, Maharashtra including 142 pediatric patients (0–18 years) with malignancies. Data were analyzed for age, gender, type of malignancy, clinical features, and stage at presentation to assess the pattern of pediatric cancers.

**Results:** The study showed that pediatric malignancies were most common in the 6–10 years age group with male predominance. Hematological malignancies, especially ALL, were most frequent, with fever and pallor as common symptoms. Most patients presented at an advanced stage, indicating delayed diagnosis and need for early detection.

**Conclusion:** The study highlights that pediatric malignancies in rural settings are predominantly hematological in nature, with acute leukemias being the most frequent. Early recognition of symptoms and improved diagnostic facilities at rural centers can aid in timely diagnosis and management. Strengthening awareness and healthcare infrastructure is essential to improve outcomes in pediatric oncology in resource-limited settings.

**Keywords:** Pediatric Malignancies, Rural Healthcare, Childhood Cancer, Hematological Malignancies, Epidemiology.

### INTRODUCTION

Pediatric malignancies constitute a significant global health concern and are among the leading causes of disease-related mortality in children and adolescents. Unlike adult cancers, childhood malignancies are relatively rare but often have distinct biological behavior, rapid progression, and different patterns of distribution. According to global estimates, childhood cancer accounts for a considerable proportion of non-communicable diseases in the pediatric age group, with nearly 300,000 new cases diagnosed annually worldwide [1]. Despite advances in diagnosis and treatment, survival outcomes vary significantly between high-income and low- and middle-income countries, largely due to differences in healthcare access, awareness, and infrastructure [2].

The spectrum of pediatric cancers differs from that seen in adults. Hematological malignancies, particularly acute leukemias and lymphomas, are the most common, followed by central nervous system tumors and various solid tumors such as neuroblastoma, Wilms tumor, and bone tumors [3]. Acute lymphoblastic leukemia (ALL) alone accounts for nearly one-third of all childhood cancers globally, making it the most frequent pediatric malignancy [4]. The distribution of these malignancies varies with geographic, socioeconomic, and environmental factors, which may influence both incidence and outcomes [5]. In developing countries, including India, pediatric malignancies pose a greater challenge due to late presentation, lack of awareness, and limited access to specialized healthcare facilities [6]. A significant number of cases are diagnosed at advanced stages, leading to poorer prognoses compared to developed nations. Rural populations, in particular, face additional barriers such as limited access to diagnostic modalities, scarcity of pediatric oncology centers, financial constraints, and lack of trained healthcare professionals [7]. These factors



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contribute to delayed diagnosis and suboptimal treatment outcomes. India, with its vast population and diverse demographic profile, contributes substantially to the global burden of pediatric cancers. However, data from rural regions remain sparse, and most available studies are from urban tertiary care centers. Rural healthcare centers often serve as the first point of contact for a large proportion of the population, making them critical in early detection and referral of pediatric malignancies [8]. Understanding the pattern of childhood cancers in such settings is essential for planning healthcare strategies, improving diagnostic pathways, and allocating resources effectively. Another important aspect is the variation in clinical presentation of pediatric malignancies. Symptoms are often nonspecific, such as fever, pallor, fatigue, weight loss, or pain, which may lead to misdiagnosis or delayed recognition [9]. In rural settings, these symptoms are frequently attributed to common infections or nutritional deficiencies, further contributing to diagnostic delays. Therefore, increasing awareness among primary healthcare providers and caregivers is crucial for early suspicion and timely referral. Over the years, advancements in pediatric oncology, including improved chemotherapy protocols, supportive care, and multidisciplinary approaches, have significantly enhanced survival rates, especially in hematological malignancies. However, access to such advancements remains uneven across different regions. Rural centers often lack the infrastructure required for advanced diagnostic tools such as immunohistochemistry, cytogenetics, and molecular diagnostics, which are essential for accurate classification and risk stratification [10]. This gap highlights the need for strengthening healthcare systems in rural areas. In this context, studying the profile of pediatric malignancies in a rural center over an extended period provides valuable insights into disease patterns, demographic characteristics, and trends over time. A ten-year study allows for a comprehensive evaluation of incidence, types of malignancies, and changes in presentation and diagnosis. Such data can help identify gaps in healthcare delivery and guide future interventions aimed at improving pediatric cancer care in resource-limited settings. This study aimed to evaluate the clinicopathological profile of pediatric malignancies over a ten-year period at a rural tertiary care center.

## MATERIALS AND METHODS

### RESULT

Table 1: Age-wise Distribution of Pediatric Malignancies

Age Group (years)	No. of Patients (n)	Percentage (%)	p-value
0–5	38	26.8	0.042
6–10	45	31.7	
11–15	41	28.9	

**Study Design:** Retrospective observational study.

**Study Place:** Mahatma Gandhi Institute of Medical Sciences, Sevagram, Dist. Wardha, Maharashtra

**Study duration:** 1 year

**Sample size:** 142 Pediatric patients (0–18 years) diagnosed with malignancies.

**Study variables:**

- Age Group
- Gender
- Type of Malignancy
- Lymphoma
- Acute myeloid leukemia
- Acute lymphoblastic leukemia
- Pallor
- Fever
- Lymphadenopathy
- Abdominal mass
- Weight loss
- Early stage
- Advanced stage

**Inclusion Criteria**

- Pediatric patients aged 0–18 years.
- Diagnosed cases of malignancy confirmed by histopathology/cytology.
- Patients registered or treated at the rural tertiary care center.
- Cases within the study period (10 years).
- Complete medical records available for analysis.

**Exclusion Criteria**

- Patients above 18 years of age.
- Cases without confirmed diagnosis of malignancy.
- Patients with incomplete or missing clinical records.
- Benign tumors or non-neoplastic conditions.
- Patients lost to follow-up or with insufficient data for analysis.

**Statistical Analysis**

Statistical analysis was performed using appropriate statistical software, and data were expressed as mean  $\pm$  standard deviation for continuous variables and as frequencies and percentages for categorical variables. Descriptive statistics were used to summarize the demographic and clinical characteristics, while inferential tests such as the chi-square test and Student's t-test were applied to assess associations and differences between groups. A p-value of less than 0.05 was considered statistically significant.

16–18	18	12.6	
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Table 2: Gender Distribution

Gender	No. of Patients (n)	Percentage (%)	p-value
Male	92	64.8	0.001
Female	50	35.2	

Table 3: Type of Malignancies

Type of Malignancy	No. of Patients (n)	Percentage (%)	p-value
Hematological malignancies	84	59.2	0.021
Solid tumors	58	40.8	

Table 4: Subtypes of Hematological Malignancies

Subtype	No. of Patients (n)	Percentage (%)	p-value
Acute lymphoblastic leukemia	52	61.9	0.008
Acute myeloid leukemia	18	21.4	
Lymphoma	14	16.7	

Table 5: Clinical Presentation

Clinical Feature	No. of Patients (n)	Percentage (%)	p-value
Fever	96	67.6	0.032
Pallor	82	57.7	
Lymphadenopathy	48	33.8	
Abdominal mass	36	25.4	
Weight loss	54	38	

Table 6: Stage at Presentation

Stage at Diagnosis	No. of Patients (n)	Percentage (%)	p-value
Early stage	46	32.4	0.004
Advanced stage	96	67.6	

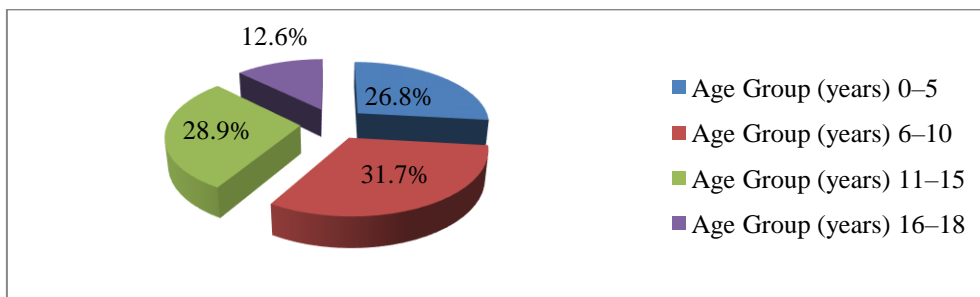


Figure 1: Age-wise Distribution of Pediatric Malignancies

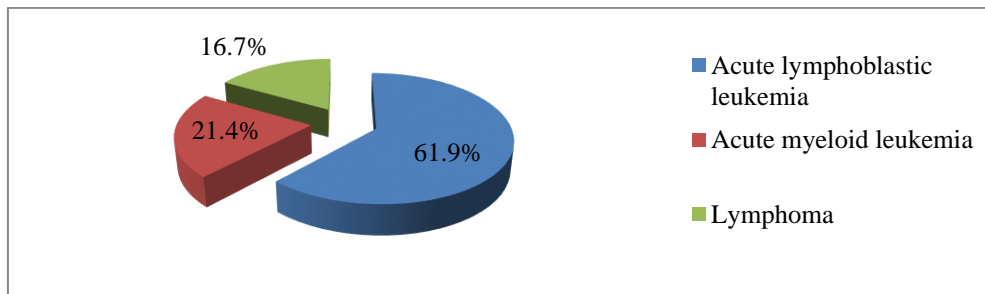


Figure 2: Subtypes of Hematological Malignancies

## RESULTS AND INTERPRETATION

### Age-wise Distribution of Pediatric Malignancies

The study included 142 pediatric patients with malignancies, among which the highest proportion was observed in the 6–10 years age group (n=45,

31.7%), followed by 11–15 years (n=41, 28.9%), 0–5 years (n=38, 26.8%), and the least in the 16–18 years age group (n=18, 12.6%), with a statistically significant difference (p=0.042).

### Interpretation:

The results indicate that pediatric malignancies are more commonly seen in the middle childhood age group, particularly between 6–10 years. The statistically significant p-value suggests a meaningful variation in age distribution, highlighting the importance of age-specific screening and clinical suspicion in this group.

#### **Gender Distribution**

Out of 142 patients, 92 were males (64.8%) and 50 were females (35.2%), showing a clear male predominance with a statistically significant p-value ( $p=0.001$ ).

#### **Interpretation:**

The findings demonstrate a higher incidence of pediatric malignancies among males compared to females. This male predominance may be due to biological, genetic, or environmental factors, and the significant p-value indicates a strong association between gender and disease occurrence.

#### **Type of Malignancies**

Among the 142 patients, hematological malignancies were more common ( $n=84$ , 59.2%) compared to solid tumors ( $n=58$ , 40.8%), with a statistically significant difference ( $p=0.021$ ).

#### **Interpretation:**

Hematological malignancies were the predominant type in this study, reflecting global trends in pediatric oncology. The significant p-value suggests a strong predominance of blood-related cancers in the pediatric population, emphasizing the need for early hematological evaluation in suspected cases.

#### **Subtypes of Hematological Malignancies**

Among hematological malignancies, acute lymphoblastic leukemia ( $n=52$ , 61.9%) was the most common subtype, followed by acute myeloid leukemia ( $n=18$ , 21.4%) and lymphoma ( $n=14$ , 16.7%), with a statistically significant p-value ( $p=0.008$ ).

#### **Interpretation:**

Acute lymphoblastic leukemia was the most frequent hematological malignancy, consistent with established epidemiological patterns. The significant p-value indicates a strong dominance of ALL among hematological cancers, highlighting its importance in pediatric oncology diagnosis and management.

#### **Clinical Presentation**

The most common clinical feature was fever ( $n=96$ , 67.6%), followed by pallor ( $n=82$ , 57.7%), weight loss ( $n=54$ , 38%), lymphadenopathy ( $n=48$ , 33.8%), and abdominal mass ( $n=36$ , 25.4%), with a statistically significant p-value ( $p=0.032$ ).

#### **Interpretation:**

The clinical presentation of pediatric malignancies is often nonspecific, with fever and pallor being the most common symptoms. The significant p-value indicates that these clinical features are strongly associated with malignancy, emphasizing the need for high clinical suspicion in children presenting with such symptoms.

#### **Stage at Presentation**

A majority of patients presented at an advanced stage ( $n=96$ , 67.6%), while only 46 patients (32.4%) were diagnosed at an early stage, with a statistically significant p-value ( $p=0.004$ ).

#### **Interpretation:**

Most patients were diagnosed at an advanced stage, indicating delayed diagnosis and referral, which is common in rural settings. The significant p-value highlights a strong association between stage at presentation and disease burden, underscoring the need for early detection and improved healthcare access.

## **DISCUSSION**

The present study provides a comprehensive overview of the clinicodemographic profile of pediatric malignancies in a rural tertiary care center over a ten-year period. The findings demonstrate that the highest burden of malignancies was observed in the 6–10 years age group, with a clear male predominance. This age distribution is consistent with global pediatric oncology trends, where certain malignancies, particularly acute lymphoblastic leukemia, peak during early and middle childhood [11,12]. The observed male predominance in our study is also in agreement with several reports, which suggest a slightly higher incidence of childhood cancers in males, possibly due to genetic susceptibility, hormonal factors, or environmental exposure differences [13,14]. In the present study, hematological malignancies accounted for the majority of cases, with acute lymphoblastic leukemia being the most common subtype. This finding aligns with existing literature indicating that hematological cancers represent approximately 50–60% of all pediatric malignancies worldwide [15]. The predominance of ALL in particular is well-documented and reflects its high incidence in childhood cancer registries across both developed and developing countries [16]. The lower proportion of solid tumors in this study may be attributed to referral bias, underdiagnosis, or limited access to advanced imaging and diagnostic modalities in rural settings [17]. The clinical presentation observed in this study was predominantly nonspecific, with fever and pallor being the most common symptoms. Such presentations are frequently encountered in pediatric malignancies and often overlap with common infectious and nutritional conditions, leading to diagnostic delays [18]. Similar findings have been reported in previous studies, where nonspecific symptoms were identified as a major factor contributing to delayed diagnosis and advanced disease presentation [19]. This highlights the critical need for increased awareness among primary healthcare providers and caregivers regarding early warning signs of malignancy in children. One of the most significant findings of this study is that a

majority of patients presented at an advanced stage of disease. This pattern is commonly observed in resource-limited and rural settings, where access to specialized healthcare services is limited and diagnostic delays are common [20]. Late presentation adversely affects treatment outcomes and survival rates, emphasizing the importance of early detection, timely referral, and improved healthcare infrastructure. Strengthening primary healthcare systems and implementing awareness programs can play a crucial role in reducing delays in diagnosis and improving prognosis. Overall, the findings of this study highlight important epidemiological trends and challenges associated with pediatric malignancies in rural settings. The predominance of hematological malignancies, the nonspecific nature of clinical presentation, and the high proportion of advanced-stage disease underscore the need for early recognition, better diagnostic facilities, and improved referral systems. These measures are essential to enhance survival outcomes and reduce the burden of pediatric cancers in rural populations.

## CONCLUSION

The present study demonstrates that pediatric malignancies in a rural setting are predominantly hematological in nature, with acute lymphoblastic leukemia being the most common subtype, and are more frequent in males and in the 6–10 years age group. The majority of patients presented with nonspecific symptoms such as fever and pallor, and most cases were diagnosed at an advanced stage, indicating delayed diagnosis and limited awareness. These findings highlight the need for early detection, improved diagnostic facilities, and increased awareness among healthcare providers and the community to enhance early diagnosis and improve outcomes in pediatric malignancies.

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