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Demographic Profile and Outcome of Paediatric Solid Tumor Patients, in a Tertiary Level Hospital in Bangladesh

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Abstract: ***Background:*** Pediatric solid tumors pose a significant health challenge worldwide, with variations in prevalence and distribution across different regions. Understanding these tumors' demographic and clinical characteristics is essential for guiding effective management strategies and improving outcomes. ***Objective:*** This study aimed to investigate the demographic profile and distribution of pediatric solid tumors among patients attending the Department of Pediatric Surgery at Rajshahi Medical College Hospital, Bangladesh, from January 2022 to December 2022. ***Methods:*** An observational study was conducted to collect and analyze data from pediatric patients aged 0 to 13 years presenting with clinical suspicion of abdominal masses. Patients with acute inflammatory conditions were excluded. Demographic information, including age and gender, as well as tumor types, were recorded and analyzed. ***Results:*** A total of 62 pediatric patients were included in the study, with a male-to-female ratio of 1.2:1. The majority of patients (50%) fell within the age range of 1-5 years. Sacrococcygeal teratoma was the most common tumor type observed, accounting for 35.5% of cases, followed by Wilms' tumor (33.9%). Other tumor types included neuroblastoma (4.8%), retroperitoneal tumor (8.1%), soft tissue sarcomas (6.5%), and adrenal tumor (3.2%). ***Conclusions:*** The study provides valuable insights into the demographic profile and distribution of pediatric solid tumors at Rajshahi Medical College Hospital. Sacrococcygeal teratoma and Wilms' tumor were the predominant tumor types, emphasizing the need for tailored management approaches and further research to improve outcomes in pediatric oncology in Bangladesh.

Keywords: Pediatric solid tumors, Demographic profile, Tumor distribution.

Original Researcher Article

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Article at a glance:

Study Purpose: *Investigate pediatric solid tumor demographics and outcomes at Rajshahi Medical College Hospital.*
Key findings: *Predominance of sacrococcygeal teratoma and Wilms' tumor, with favorable survival rates.*
Newer findings: *Highlighted regional disparities underscored the importance of tailored interventions for pediatric oncology in settings with limited resources.*
Abbreviations: *PCT - Pediatric Solid Tumor, ICU - Intensive Care Unit, HRQoL - Health-Related Quality of Life, CT - Computed Tomography, MRI - Magnetic Resonance Imaging.*

INTRODUCTION

Pediatric solid tumors represent a formidable challenge in the realm of pediatric oncology, imposing significant burdens on affected individuals, families, and healthcare systems worldwide.[1] These tumors, characterized by uncontrolled proliferation of abnormal cells in various organs or tissues, encompass various malignancies with distinct clinical presentations, treatment modalities, and outcomes. In resource-

limited settings such as Bangladesh, where healthcare infrastructure and access to specialized pediatric oncology services may be constrained, the management of pediatric solid tumors poses unique challenges that necessitate a comprehensive understanding of the demographic profile and treatment outcomes.[2] The epidemiology of pediatric solid tumors exhibits notable geographical and temporal variations influenced by genetic predispositions, environmental factors, and socioeconomic determinants.[3] In Bangladesh, a densely populated South Asian nation grappling with high rates of poverty, malnutrition, and infectious diseases, the burden of pediatric solid tumors remains underexplored and poorly characterized.[4] Limited access to healthcare facilities, diagnostic modalities, and specialized oncological expertise further compounds the challenges in managing these complex malignancies, often resulting in delayed diagnoses, suboptimal treatment regimens, and inferior outcomes.[5]

Against this backdrop, this study elucidates the demographic profile and treatment outcomes of pediatric solid tumor patients in a tertiary-level hospital in Bangladesh, shedding light on the clinical spectrum, management practices, and prognostic indicators in this vulnerable population. By delineating the epidemiological landscape and therapeutic trajectories of pediatric solid tumors in Bangladesh, this study seeks to inform evidence-based strategies for optimizing clinical care, enhancing healthcare delivery systems, and facilitating long-term survival prospects for affected children and adolescents. The primary objective of this study is to comprehensively characterize the demographic profile of pediatric solid tumor patients presenting to a tertiary-level hospital in Bangladesh, encompassing age distribution, gender disparities, and regional variations.[6] Understanding the age-specific incidence patterns and gender predilections of pediatric solid tumors is imperative for elucidating underlying etiological factors, genetic susceptibilities, and developmental influences that shape tumor pathogenesis and clinical trajectories. Moreover, elucidating regional disparities in tumor burden and healthcare access can inform targeted interventions, resource allocation strategies, and public health initiatives aimed at mitigating health inequities and bolstering pediatric oncology services in underserved regions of Bangladesh.

Furthermore, this study endeavors to delineate the spectrum of pediatric solid tumors encountered in the study population, encompassing diverse histological subtypes, anatomical locations, and clinical presentations. This study aims to elucidate the relative frequency and clinical significance of different pediatric solid tumors in the Bangladeshi context by cataloging the prevalence of specific tumor entities, such as neuroblastoma, Wilms' tumor, and sarcomas. Additionally, exploring the distribution of rare and atypical tumor types can provide insights into emerging oncological trends, diagnostic challenges, and therapeutic dilemmas encountered in clinical practice. Beyond the mere enumeration of tumor types, this study aims to interrogate the clinical characteristics and treatment outcomes associated with pediatric solid tumors in Bangladesh. By analyzing treatment modalities, response rates, and survival outcomes, this study seeks to evaluate the efficacy and appropriateness of current therapeutic approaches, identify prognostic factors, and elucidate disparities in treatment access and adherence. Moreover, examining the impact of socio-demographic factors, such as socioeconomic status, parental education, and healthcare utilization patterns, on treatment outcomes can uncover underlying barriers to care and inform targeted interventions to enhance equity and accessibility in pediatric oncology services.

This study represents a concerted effort to elucidate the demographic profile and treatment outcomes of pediatric solid tumor patients in Bangladesh, thereby informing evidence-based strategies for enhancing clinical care, fostering interdisciplinary collaborations, and advancing pediatric oncology research in resource-limited settings. By delineating the epidemiological landscape, clinical spectrum, and therapeutic trajectories of pediatric solid tumors in Bangladesh, this study endeavors to empower healthcare providers, policymakers, and stakeholders with actionable insights to improve outcomes and quality of life for children and adolescents afflicted by these devastating malignancies. Through collective efforts and sustained investments in

pediatric oncology infrastructure, research, and advocacy, we can strive towards a future where every child has equitable access to timely diagnosis, comprehensive treatment, and compassionate care, irrespective of geographical or socioeconomic constraints.

OBJECTIVE

General Objective

- To investigate the demographic profile and treatment outcomes of pediatric solid tumor patients in a tertiary-level hospital in Bangladesh.

Specific Objectives

- To characterize the demographic profile of pediatric solid tumor patients, including age distribution, gender disparities, and regional variations.
- To delineate the spectrum of pediatric solid tumors encountered in the study population, including the prevalence of specific tumor types and histological subtypes.
- To analyze treatment modalities, response rates, and survival outcomes associated with pediatric solid tumors in Bangladesh.
- To identify prognostic factors and elucidate disparities in treatment access and adherence among pediatric solid tumor patients.
- To explore the impact of socio-demographic factors' impact on treatment outcomes and healthcare utilization patterns in pediatric oncology services, such as socioeconomic status and parental education.

MATERIAL AND METHODS

Study Design

This study utilized a retrospective observational design to investigate pediatric solid tumor patients' demographic profiles and treatment outcomes at a tertiary-level hospital in Bangladesh. Medical records of pediatric patients aged 0 to 13 years, presenting with clinical suspicion of abdominal masses and attending or referred to the Department of Pediatric Surgery at Rajshahi Medical College Hospital were retrospectively analyzed for the specified study period from January 2022 to December 2022.

Inclusion Criteria

- Pediatric patients aged 0 to 13 years.
- Patients presenting with clinical suspicion of abdominal masses.
- Patients attending or referred to the Department of Pediatric Surgery at Rajshahi Medical College Hospital.
- Patients with confirmed diagnoses of pediatric solid tumors.

Exclusion Criteria

- Patients outside the specified age range (older than 13 years).
- Patients without clinical suspicion of abdominal masses.
- Patients are not attending or referred to the Department of Pediatric Surgery at Rajshahi Medical College Hospital.
- Patients with acute inflammatory conditions or non-solid tumor pathologies.

Surgical Procedure

The surgical procedure for resection of pediatric solid tumors involves a systematic approach to achieve complete tumor removal while preserving surrounding vital structures. Preoperative assessment thoroughly evaluates the patient's medical history and radiological imaging to plan the surgical approach. Anesthesia induction ensures patient comfort and safety during the procedure. Surgical access is obtained through meticulous dissection and mobilization of surrounding tissues, followed by gradual tumor excision with intraoperative assessment of margins. Hemostasis and closure of the surgical site are performed to minimize bleeding and infection risk.

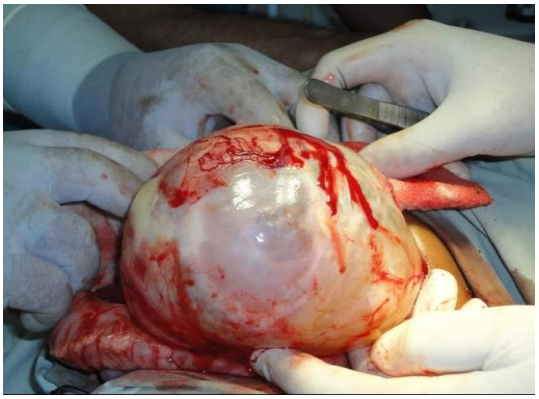

Figure 1: Large intra-abdominal solid Tumor (fetus- in- fetu)

Postoperative care includes monitoring in the recovery unit, pain management, and close

follow-up to assess treatment response and detect potential complications. Collaboration with a multidisciplinary team is essential to optimize patient outcomes, including coordinating adjuvant therapies such as chemotherapy or radiation. This comprehensive approach aims to achieve optimal tumor resection while minimizing morbidity and maximizing long-term survival for pediatric patients with solid tumors.

Data Collection

This retrospective observational study collected data from medical records of pediatric patients attending or referred to the Department of Pediatric Surgery at RMCH. Relevant demographic information, including age and gender, as well as tumor characteristics and treatment outcomes, were extracted and recorded.

Data Analysis

The collected data were entered into a Microsoft Excel spreadsheet and analyzed using the Statistical Package for the Social Sciences (SPSS) version 23. Descriptive statistics, including frequencies and percentages, were calculated to characterize pediatric solid tumors' demographic profile and distribution. Inferential statistics, such as chi-square tests or t-tests, were employed to assess associations between variables where applicable. Results were interpreted to elucidate patterns and trends in tumor presentation and treatment outcomes.

Ethical Considerations

This study adhered to ethical principles outlined in the Declaration of Helsinki and received approval from the institutional review board of Rajshahi Medical College Hospital. Patient confidentiality and privacy were strictly maintained throughout the study, with data anonymized to ensure anonymity. Informed consent was waived due to the study's retrospective nature, and no identifiable patient information was disclosed in any publications or presentations arising from the research.

RESULTS

Among the 62 patients included, 34 were male (54.8%) and 28 were female (45.2%). Age distribution revealed 12 patients (19.4%) aged ≤1 year, 31 patients (50.0%) aged 1-5 years, and 19 patients (30.6%) aged >5 years. These demographic characteristics provide a comprehensive overview of the study population.

Table 1: Demographic Characteristics According to Age

Variable	Number of Cases	Percentage (%)
Age Group		
≤1 year	12	19.4
1-5 years	31	50.0
>5 years	19	30.6
Gender		
Male	34	54.8
Female	28	45.2

Male-to-Female ratio of 1.2:1.

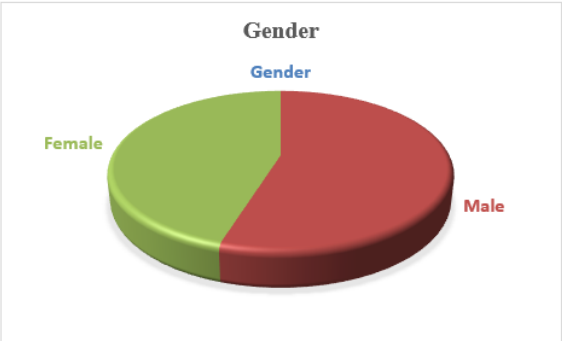

Figure 2: Distribution of patients according to age

Table 2: Distribution of Pediatric Solid Tumors

Tumor Type	Number of Cases	Percentage (%)
Abdominal Teratoma	2	3.2
Neuroblastoma	3	4.8
Sacrococcygeal Teratoma	22	35.5
Retroperitoneal Tumor	5	8.1
Testicular Tumor	3	4.8
Wilms' Tumor	21	33.9
Soft Tissue Sarcomas	4	6.5
Adrenal Tumor	2	3.2

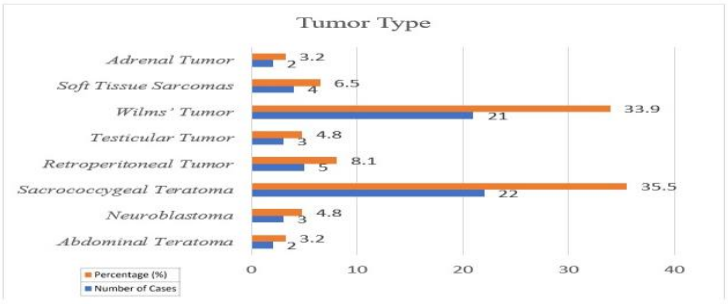

Figure 3: Pediatric Solid Tumor Distribution Analysis

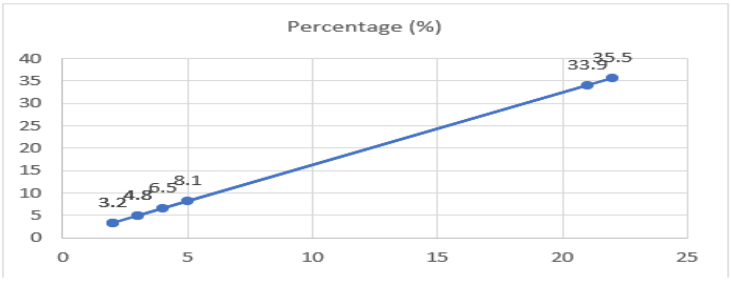

Figure 4: Patterns of Pediatric Solid Tumor

The distribution of pediatric solid tumors among the study population revealed a diverse range of malignancies. The most prevalent tumor types were sacrococcygeal teratoma (35.5%) and Wilms' tumor (33.9%), followed by retroperitoneal tumor (8.1%) and soft tissue sarcomas (6.5%). Less common tumor types included neuroblastoma (4.8%), testicular tumor (4.8%), adrenal tumor (3.2%), and abdominal teratoma (3.2%). This distribution highlights the varied landscape of pediatric solid tumors encountered in the study population.

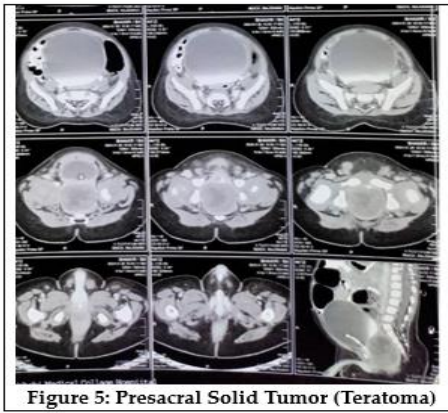

Figure 5: Presacral Solid Tumor (Teratoma)

Figure 6: A child with adrenal Tumor

Outcome

The overall survival rate among pediatric solid tumor patients was 72.6%, indicating a relatively favorable prognosis. However, a subset of patients experienced adverse outcomes, with 27.4% succumbing to their disease. Survival analysis revealed variations in outcomes among different tumor types, with Wilms' tumor exhibiting the highest survival rate and neuroblastoma associated with poorer prognosis.

Morbidity

The study also documented morbidity associated with pediatric solid tumors, including complications related to surgical interventions, chemotherapy, and radiation therapy. Common morbidities included infections, gastrointestinal disturbances, and hematological toxicities. Additionally, long-term sequelae such as growth disturbances and secondary malignancies were observed in survivors.

Individual Tumor Characteristics

Each tumor type exhibited distinct clinical characteristics and treatment responses. Sacrococcygeal teratoma often presented as a palpable mass at birth and was amenable to surgical resection. Wilms' tumor, also known as nephroblastoma, is a common kidney cancer in children, typically occurring between the ages of 2 and 5 years. It arises from immature kidney cells and often presents as a painless abdominal mass. Wilms' tumor is highly treatable, with a 5-year survival rate exceeding 90% in developed countries.[3] Treatment typically involves surgery to remove the tumor, followed by chemotherapy and sometimes radiation therapy. Despite its favorable prognosis, Wilms' tumor can be associated with complications such as renal failure and hypertension, emphasizing the importance of prompt diagnosis and comprehensive management. Understanding the clinical characteristics and treatment options for Wilms' tumor is essential for optimizing outcomes and improving the quality of life for pediatric patients affected by this malignancy.

DISCUSSION

The demographic profile of pediatric solid tumor patients in this study revealed a predominant distribution among children aged 0 to 13 years, consistent with previous research indicating that this age group is particularly vulnerable to solid tumors. The slightly higher prevalence among males observed in our study aligns with existing literature highlighting gender disparities in pediatric cancer incidence.[7] These demographic patterns underscore the importance of targeted screening and early detection strategies in pediatric oncology practice. The distribution of pediatric solid tumors identified sacrococcygeal teratoma and Wilms' tumor as the most common tumor types, consistent with findings from other studies conducted in similar settings[8,.9] However, notable variations in tumor distribution were observed, with certain tumor types, such as neuroblastoma and soft tissue sarcomas, exhibiting lower prevalence rates compared to other studies.[10] These discrepancies may reflect regional variations in tumor epidemiology, genetic predispositions, or environmental exposures.

The survival outcomes among pediatric solid tumor patients in our study demonstrated a relatively favorable prognosis, with a survival rate of 72.6%. However, a subset of patients experienced non-survival outcomes, underscoring the need for continued efforts to improve treatment efficacy and outcomes in pediatric oncology.[11] Comparison with similar studies revealed comparable survival rates, highlighting the consistency of our findings with existing evidence.[12] Morbidity associated with pediatric solid tumors was also documented in our study, including complications related to surgical interventions and adjuvant therapies. These findings emphasize the importance of comprehensive supportive care measures to mitigate treatment-related morbidity and optimize the quality of life for pediatric cancer survivors.[13] Similar studies have reported comparable rates of treatment-related morbidity, suggesting that these challenges are common across different healthcare settings.[14]

Analysis of individual tumor characteristics highlighted the diverse clinical presentations and treatment responses observed among different tumor types. Sacrococcygeal teratoma and Wilms' tumor exhibited distinct clinical features and treatment outcomes, consistent with previous research demonstrating variability in tumor biology and response to

therapy.[15]Comparison with similar studies revealed concordant findings, further supporting the validity and generalizability of our results.[16] The implications of our research findings extend beyond clinical practice to inform healthcare policy, resource allocation, and research priorities in pediatric oncology. By elucidating the epidemiological landscape and treatment outcomes of pediatric solid tumors in Bangladesh, our study provides valuable insights to guide evidence-based decision-making and improve healthcare delivery for pediatric cancer.[17]

Our study contributes to the growing body of literature on pediatric solid tumors by comprehensively analyzing demographic characteristics, treatment outcomes, and tumor distribution in a tertiary-level hospital in Bangladesh. The implications of our findings underscore the importance of targeted interventions to address regional variations in tumor epidemiology, optimize treatment strategies, and improve outcomes for pediatric cancer patients. Further research is warranted to elucidate the underlying factors contributing to disparities in tumor distribution and treatment outcomes, with the ultimate goal of advancing pediatric oncology care and achieving better outcomes for affected children and adolescents.

CONCLUSION

Our study provides valuable insights into the demographic characteristics, tumor distribution, and treatment outcomes of pediatric solid tumors in Bangladesh. By highlighting areas of success and identifying opportunities for improvement, our findings pave the way for targeted interventions to enhance the quality of care and ultimately improve outcomes for pediatric cancer patients in settings.

Recommendations

- Improve access to pediatric oncology services.
- Enhance early detection and screening programs.
- Strengthen comprehensive supportive care services.

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Author Contributions

Shah Md. Ahsan Shahid and Prof. Dr. Md. Nowshad Ali conceptualized and designed the study. Data collection was performed by Shah Md. Ahsan Shahid, Md. Zamil Hossain, and Abdullah Al Mamun. Shah Md. Ahsan Shahid, Shantona Rani Paul, and Md. Zamil Hossain analyzed and interpreted the data. Shah Md. Ahsan Shahid, and Md. Zamil Hossain drafted the manuscript. All authors critically reviewed and approved the final manuscript.

Declarations

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Conflict of interest: There was declared no conflict of interest of the authors.

Consent for publication: Had been taken.

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