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RESEARCH ARTICLE

Clinical and epidemiological characteristics of pediatric solid tumours at sultan agung islamic hospital (2018-2023)

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ABSTRACT

A tumour is an abnormal mass of tissue that does not contain cysts or fluid. According to the Global Cancer Statistics, approximately 275,000 children worldwide were diagnosed with cancer in 2022. Among pediatric solid tumours, the most common types include neuroblastoma, rhabdomyosarcoma, retinoblastoma, osteosarcoma, and Ewing sarcoma. This study aims to analyse the prevalence and characteristics of solid tumours in children treated at Sultan Agung Islamic Hospital in Semarang. A descriptive quantitative approach was employed, utilising retrospective data from medical records. The study population comprised pediatric inpatients and outpatients aged 0 to 17 years who underwent pathological or radiological examinations between 2018 and 2024. Data analysed included demographic details (age, gender), presenting symptoms, and blood test results. The study identified 22 pediatric patients with solid tumours, with Rhabdomyosarcoma and Teratoma being the most common types. The gender distribution was evenly split between males and females. Notably, 73% of the patients showed recovery. Common presenting symptoms included palpable lumps (45%) and pain (41%). Blood tests revealed that haemoglobin levels in children aged 2-9 years were below the usual lower limit (8.21 ± 4.88 g/dL). White blood cell counts in the same age group were abnormal, averaging 11.20 ± 8.36 x 10^3/µL. Platelet counts across the age span of 1 month to 17 years were elevated, with a mean of 412.33 ± 224.11 x 10^3/µL. In conclusion, the supporting laboratory examinations frequently indicated anaemia, leukocytosis, and thrombocytosis among pediatric tumour patients. These findings underscore the importance of comprehensive diagnostic assessments in managing pediatric solid tumours.

1. Introduction

Cancer remains a significant public health challenge worldwide, characterised by the uncontrolled proliferation of abnormal cells. Among its various forms, solid tumours—whether benign or malignant—are classified based on the originating cell type (Kew, 2016). In the pediatric population, particularly children under 15 years of age, solid tumours constitute approximately 50% of all malignant neoplasms. The most commonly encountered pediatric solid tumours include neuroblastoma, lymphoma, Wilms tumour, renal cell carcinoma, rhabdomyosarcoma, retinoblastoma, hepatoblastoma, osteosarcoma, Ewing sarcoma, adrenocortical carcinoma, and germ cell tumors (Brown *et al.*, 2023).

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Globally, the burden of pediatric cancer is substantial. According to GLOBOCAN 2022, over 275,000 new cases of cancer were diagnosed in children and adolescents, resulting in more than 105,000 deaths (Bray *et al.*, 2024). In Indonesia, the 2023 Indonesian Health Survey reported a total of 877,531 cancer cases nationwide, of which 209,236 occurred in children aged 0–14 years. Within Central Java Province alone, 21,824 pediatric cancer cases have been documented, highlighting the regional impact of this disease (Riskesdas, 2018).

Epidemiological patterns reveal notable disparities in the distribution of pediatric tumours across countries with varying levels of development. In high-Human Development Index (HDI) nations, tumours such as neuroblastoma, central nervous system (CNS) malignancies, leukaemia, and germ cell tumours are more prevalent. Conversely, low-HDI countries tend to report higher incidences of soft tissue sarcomas, lymphoma, and retinoblastoma (Johnston *et al.*, 2021). Previous studies in Indonesia have also indicated a predominance of male patients in pediatric cancer cases, especially in retinoblastoma (Fithriyah, 2020; Adinatha, 2020). While some pediatric malignancies present with distinctive clinical features facilitating early diagnosis, others manifest with nonspecific symptoms, which can delay diagnosis and intervention (Lipsick, 2020; Escobar *et al.*, 2019; Allen-Rhoades *et al.*, 2018).

Given these observations, it is crucial to investigate further the clinical and epidemiological characteristics of pediatric solid tumours, particularly within institutional referral settings. Sultan Agung Islamic Hospital in Semarang serves as a regional referral centre for pediatric oncology in Central Java, making it an appropriate setting for such an investigation. This study aims to describe the prevalence and clinical profiles of pediatric patients diagnosed with solid tumours at this hospital between 2018 and 2023.

2. Materials and Methods

This study employed a descriptive quantitative design with retrospective cohort data collection based on medical records. The objective was to describe the prevalence and characteristics of pediatric solid tumour cases among inpatients and outpatients at Sultan Agung Islamic Hospital, Semarang. The research was conducted from June to August 2024, utilising medical records from the period 2018 to 2023.

Sampling was performed using predefined inclusion and exclusion criteria until the minimum required sample size was reached. The inclusion criteria encompassed pediatric patients aged 0 to 17 years who received inpatient or outpatient care and had records of anatomical or radiological pathology examinations. Exclusion criteria included records with incomplete data. All collected data were analysed using descriptive statistics with SPSS version 25.0.

3. Results

This study involved 22 pediatric patients diagnosed with solid tumours at Sultan Agung Islamic Hospital, Semarang, from June to August 2024. Table 1 describes the demographic and clinical features of the

Table 1. Characteristics of Research Subjects

Characteristics	Total (n)	Percentage (%)
Age		
• Neonate (0 days – 28 days)	1	4.5
• Infant (29 days – 11 months)	1	4.5
• Toddler-preschool (12 months– 59 months)	8	36.4
• School-age (5 years – 10 years)	6	27.3
• Adolescent (11 years – 17 years)	6	27.3
Gender		
• Male	11	50
• Female	11	50
Average Treatment Duration (days)	4.22	
Hospitalization Status		
• Inpatients	20	91
• Outpatients	2	9
Health Status		
• Recover	16	73
• Referred to	4	18
• Died	2	9
Therapy		
• Supportive	14	64
• Definitive	8	36
Symptoms		
• Hump	10	45
• Fever	1	4.5
• Cough	1	4.5
• Fatigue	5	22.7
• Shortness of breath	3	13.6
• Headache	2	9
• Nausea	1	4.5
• Vomit	2	9
• Pain	9	41
Supporting Examination Resul		
• Radiology only	12	54.5
• Anatomical Pathology only	4	18.2
• Both	6	27.3

Table 2. Haematological Parameters Across Pediatric Age Groups

Parameters	Value (Mean ± SD)
Haemoglobin (g/dL)	
• Neonate (≤ 30 days)	16.2
• Infant (1 months – 23 months)	11.03 ± 2.78
• Children (2 years – 9 years)	8.21 ± 4.88
• Teen boys (10 years– 17 years)	12.08 ± 1.98
• Teen girls (10 years – 17 years)	13.30 ± 0.28
Haematocrit (%)	
• Neonate (≤ 30 days)	46
• Infant (1 months – 23 months)	34.78 ± 8.54
• Children (2 years – 9 years)	26.53 ± 15.64
• Teen boys (10 years– 17 years)	37.18 ± 5.95
• Teen girls (10 years – 17 years)	42.30 ± 1.70
Leukocytes ($\times 10^3/\mu L$ **/µL)**	
• Neonate (≤ 30 days)	10.16
• Infant (1 months – 23 months)	12.60 ± 3.55
• Children (2 years – 9 years)	11.20 ± 8.36
• Adolescent (10 years – 17 years)	14.76 ± 7.53
Thrombocyte ($\times 10^3/\mu L$ **/µL)**	
• Neonate (≤ 30 days)	368
• Infant (1 months) – Adolescent (17 years)	412.33 ± 224.11

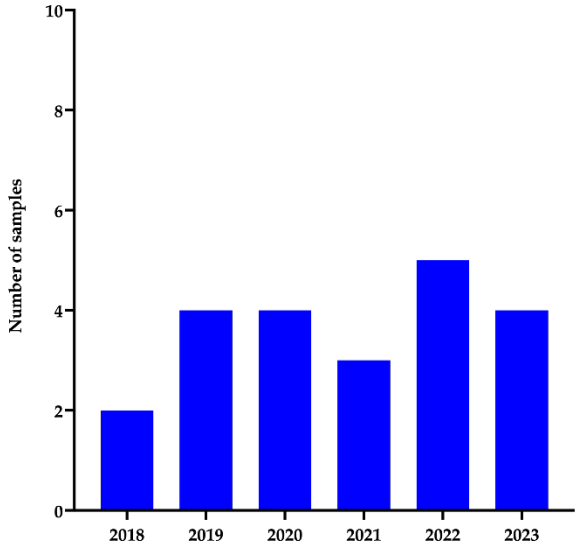

Figure 1. Annual Distribution of Pediatric Solid Tumour Cases at Sultan Agung Islamic Hospital (2018–2023).

patients, including age distribution, gender, treatment duration, hospitalisation status, health outcomes, therapy types, and presenting symptoms.

The laboratory results (Table 2) reveal variations in haematological parameters across different age groups of children diagnosed with solid tumours. Haemoglobin levels tend to be lower in children aged 2–9 years, indicating a higher prevalence of anaemia in this group. Hematocrit values follow a similar pattern, with some groups falling below normal ranges, suggesting possible anaemia or blood loss. Leukocyte

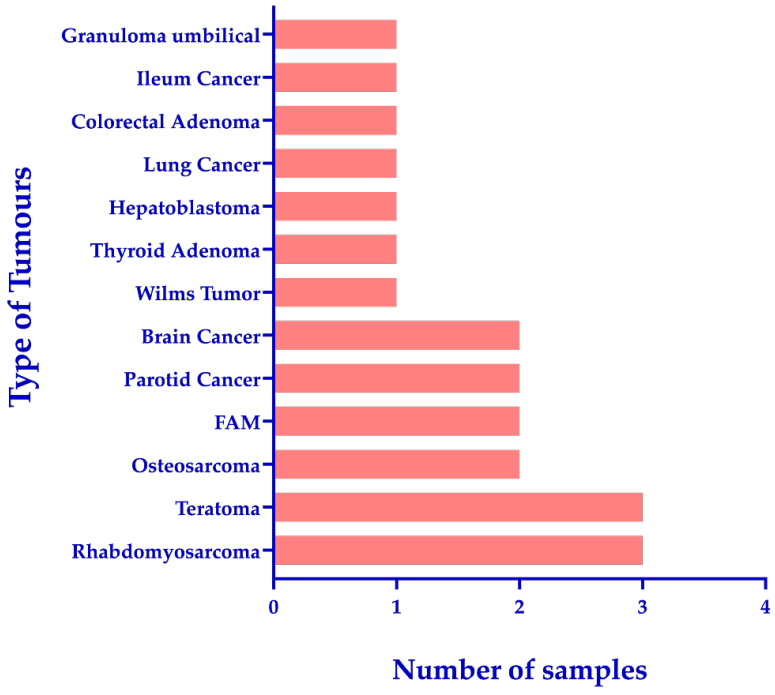

Figure 2. Distribution of Pediatric Solid Tumour Types at Sultan Agung Islamic Hospital (2018–2023).

counts varied among the patients, with some exceeding normal thresholds, indicative of immune responses or infection. Platelet counts remained within normal limits for neonates, while the broader age group had elevated mean counts, which may reflect reactive thrombocytosis.

The bar chart (Figure 1) displays the annual distribution of pediatric solid tumour cases at Sultan Agung Islamic Hospital from 2018 to 2023. The average number of pediatric solid tumour cases per year over this period was approximately 3.7. The number of cases varies yearly, ranging from a low in 2018 to a peak in 2022, with a relatively consistent trend across other years. This data helps visualise the incidence rate of pediatric solid tumours over the observed period.

Figure 2 illustrates the distribution of pediatric solid tumour types at Sultan Agung Islamic Hospital from 2018 to 2023. Rhabdomyosarcoma and teratoma are the most common, each accounting for three cases. Other tumour types, such as granuloma umbilical and hepatoblastoma, are less common, with one case each.

4. Discussion

The World Health Organisation (WHO) reports that approximately 400,000 children and adolescents aged 0–19 years are diagnosed with cancer annually worldwide (World Health Organization, 2018). In Indonesia, the Indonesian Pediatric Cancer Registry (IP-CAR) estimates an average of about 11,000 new pediatric cancer cases each year, with around 650 cases reported locally each year. A study conducted at RSUD Dr. Soetomo, Surabaya, in 2016 documented 252 cases of pediatric cancer (Supriyadi *et al.*, 2023). In this study, 22 children diagnosed with solid tumours were treated at Sultan Agung Islamic Hospital in Semarang between 2018 and 2023.

Most pediatric solid tumours in this study were observed in the toddler age group (12–59 months). Males and females were equally affected, with 11 patients each, aligning with Sarbay (2020) findings that solid tumours are most common in children under 10 years old and tend to be more prevalent in males (68% male vs. 32% female). The overall recovery rate was 73%, with an average hospitalisation duration of about 4 days. Supportive therapy was provided to 64% of patients, while 36% underwent definitive treatment, such as tumour removal surgery. Globally, the survival rate for childhood solid tumours is approximately 80% (Garniasih *et al.*, 2016).

Regarding diagnostic methods, 54.5% of patients received diagnoses supported primarily by radiology, 18.2% through histopathology, and 27.3% based on combined assessments. Suwananta (2021) reported that in Sanglah Denpasar Hospital, 47% of pediatric solid tumour diagnoses were confirmed by radiology, while 42% were confirmed by histopathology, showing comparable diagnostic approaches.

The most common tumour types in this study were rhabdomyosarcoma and teratoma, each accounting for 13% of cases. Supriyadi (2023) reported that rhabdomyosarcoma represented 5% of cases, affecting 71 patients, while teratoma affected 33 patients (2%). The most frequent clinical symptoms reported were palpable lumps or masses (45%) and pain associated with these masses (41%), consistent with findings by Suwananta (2021), who observed that 77.2% of children with solid tumours presented with a palpable mass, and 29.3% had lymphadenopathy.

Haematological abnormalities were evident in this cohort. The low haemoglobin level in children aged 2-9 years was 8.21 g/dL, and the hematocrit level was 26.53 ± 15.64%, both of which were below the normal ranges, indicating anaemia. Haematological anaemia in pediatric cancer patients can result from direct infiltration of tumour cells into the bone marrow, leading to destruction and replacement of marrow cells (Misra, 2016). Additionally, haemoglobin levels can decrease by up to 1.0 g/dL per week in such cases (Madeddu *et al.*, 2018).

Leukocytosis was observed in children aged 2-9 years, with an average of 11.20 ± 8.36x10^3/µL, and in adolescents aged 10–17 years, with an average of 14.76 ± 7.53 x10^3/µL. Leukocytosis can have multiple etiologies, including malignancies and infectious or inflammatory processes. As reported by Tomáš *et al*. (2017), non-malignant causes include bacterial infections, trauma, and chronic inflammation, while leukocytosis in malignancy may be accompanied by symptoms such as fever, weight loss, and fatigue (Dome *et al.*, 2019).

Platelet counts in neonates showed no abnormalities, with an average of 368 thousand/µL within the normal reference range of 84–478x10^3/µL (Mulatsih, 2016). For later age groups, the average platelet count was 412.33 ± 224.11x10^3/µL, within the normal limits of 150–450x10^3/µL, although some cases demonstrated thrombocytosis. Thrombocytosis has been associated with tumour metastasis and may play a role in protecting tumour cells from immune responses (Rosdiana, 2016).

This study has several limitations. First, the absence of comprehensive clinical examination data restricted the analysis of key clinical signs such as bleeding, lymphadenopathy, hepatomegaly, and splenomegaly, which are essential for staging and monitoring pediatric tumours. Second, not all cases had histopathological confirmation; many diagnoses

were based solely on radiologic findings. Although imaging techniques are valuable and practical, they may not achieve the same diagnostic accuracy as definitive pathological analysis. Future research should incorporate thorough clinical assessments, coupled with histopathological evaluations, to enhance diagnostic precision and improve the validity of the findings.

5. Conclusions

The incidence of solid tumours in children at Sultan Agung Islamic Hospital, Semarang, was 22 cases, with an equal distribution between males and females. The most frequently identified tumour types were rhabdomyosarcoma and teratoma, each comprising three instances. Supporting examinations revealed that many pediatric patients exhibited haematological abnormalities, including anaemia, leukocytosis, and thrombocytosis. These findings highlight the importance of comprehensive diagnostic assessments in managing pediatric solid tumours.

Conflict of interest

All authors have no conflict of interest in this article.

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