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Presentation, management and outcome of pediatric solid tumors at a tertiary care centre in Chhattisgarh, India

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Abstract:
Pediatric solid tumors comprise diverse neoplasms with variable clinical presentation and outcomes, making early diagnosis and appropriate management essential. This retrospective observational study evaluated 162 pediatric patients with solid tumors at Dr. BRAM Hospital and D.K.S. Hospital, Raipur, between January 2015 and January 2020, assessing tumor types, management strategies and outcomes. Osteosarcoma and Ewing's sarcoma were the most common tumors across higher education groups, while consanguineous marriage was rare (1.2%; p=0.7365), genetic or family history was significantly associated with tumor type (p<0.0001) and metastasis showed no significant association (p=0.1339). Genetic predisposition appeared to have a greater influence on the pattern of pediatric solid tumors than demographic or marital factors in the studied population. Thus, data shows the importance of recognizing hereditary factors alongside timely diagnosis and appropriate management in children with solid tumors.

Keywords: Pediatric solid tumors, neuroblastoma, Wilms'tumor, management, outcome, tertiary care centre

Background:
Pediatric tumors constitute 6–8% of all cancers and solid tumors account for approximately 30% of all pediatric malignancies **[1].** The most common solid tumors in children include brain tumors, neuroblastoma, rhabdomyosarcoma, Wilms' tumor, hepatoblastoma, malignant germ cell tumors and osteosarcoma **[2].** Neuroblastoma is the most common extracranial solid tumor in childhood in developed countries and accounts for about 10% of all pediatric cancers, with relatively poor outcomes due to late diagnosis, malnutrition and treatment abandonment **[3].** Rhabdomyosarcoma is the most common soft tissue sarcoma in childhood, representing approximately 3.5% of cancers in the 0–14 year's age group, with more than half of cases occurring in the first decade of life **[4].** Wilms' tumor is the most common renal tumor of childhood, with a 5-year survival rate exceeding 90% in developed countries, although it remains lower in developing countries due to delayed diagnosis and limited access to care **[5].** Hepatoblastoma is the most common primary liver tumor in children, usually diagnosed in the first three years of life, but often presents late in low-resource settings **[6].** Malignant germ cell tumors account for about 3% of pediatric cancers and show a bimodal age distribution, with varying histological patterns in adolescents and adults **[7].** Survival rates for childhood cancers have improved significantly over the last 50 years due to advances in multimodal therapy, supportive care and early diagnosis **[8].** A multidisciplinary approach involving pediatric surgeons, oncologists and radiotherapists has improved outcomes in solid tumors **[9].** Advances in molecular genetics, imaging techniques and targeted therapies have further enhanced diagnostic accuracy and treatment outcomes. Despite these improvements, childhood cancer remains a major cause of disease-related mortality, particularly in developing countries where over 80% of cases occur **[10].** Therefore, it is of interest to evaluate the clinical presentation, management and outcomes of pediatric solid tumors in a tertiary care centre in Chhattisgarh, including tumor types, treatment approaches and patient outcomes.

Materials and Methods:

Study design:
Retrospective observational study

Study setting:
Dr. BRAM Hospital & D.K.S. Hospital, Raipur

Period of study:
January 2015 - January 2020

Study population:
The study population comprised 162 patients diagnosed with various pediatric solid tumors, including CNS tumor, Ewing's sarcoma, germ cell tumor, hepatoblastoma, nasopharyngeal carcinoma, neuroblastoma, NRSTS, osteosarcoma, retinoblastoma, rhabdomyosarcoma, Wilms tumor and other rare tumors, admitted or evaluated during the study period.

Sample size: 162

Inclusion criteria:
[1] All cases within 18 years of age
[2] Cases reported within last 5 years

Exclusion criteria:
[1] Incomplete data
[2] Treatment defaulters

Statistical analysis:
For statistical analysis data were entered into a Microsoft Excel spreadsheet and then analyzed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Z-test (Standard Normal Deviate) was used to test the significant difference of proportions. Once a t-value is determined, a p-value can be found using a table of values from Student's t-distribution. If the calculated p-value is below the threshold chosen for statistical significance (usually the 0.10, the 0.05, or 0.01 level), then the null hypothesis is rejected in favor of the

alternative hypothesis. P-value ≤ 0.05 was considered for statistically significant.

Results:

In this study, educational status showed variation across different solid tumor types. Osteosarcoma was more frequent among patients with secondary (31.9%) and higher secondary education (34.2%). Ewing's sarcoma also showed higher occurrence in the secondary education group (26.1%). Neuroblastoma was predominantly seen among primary educated patients (27.3%). Hepatoblastoma and retinoblastoma were mainly observed among illiterate patients (9.1% and 6.1%, respectively). There was variation in tumor distribution across educational levels, with osteosarcoma and Ewing's sarcoma being more common in higher educational groups, while some tumors like hepatoblastoma were confined to lower education levels. This suggested heterogeneity in distribution, though no statistical test was reported for this association **(Table 1 and Figure 1).** Most participants (98.8%) had no history of consanguineous marriage, while only 1.2% had such history. Regarding genetic/family history, 45.7% had no history, 50.6% had unknown status and 3.7% had a positive history. Metastasis status showed 27.2% absent cases, 27.8% local-regional metastasis, 16.0% distant metastasis and 29.0% unknown status. Consanguineous marriage was rare in the study population. A large proportion of patients had unknown genetic/family history, indicating incomplete family background data. Metastasis status was distributed across all categories with a considerable proportion of unknown cases, suggesting variability in clinical staging documentation **(Table 2 and Figure 2).** Consanguineous marriage was present only in CNS tumor (50%) and rhabdomyosarcoma (50%). All other tumor types showed absence of consanguineous marriage history. Statistical analysis showed no significant association between consanguineous marriage and solid tumor type (p = 0.7365). Consanguineous marriage was very rare and showed no meaningful distribution pattern across tumor types. The lack of statistical significance indicated no association between consanguinity and type of solid tumor in this study **(Table 3).** Germ cell tumor and hepatoblastoma showed higher proportions of positive family history (33.3% each). Osteosarcoma had the highest proportion of "not known" history (28.0%). Most tumors had predominance of either no or unknown family history. A statistically significant association was observed between genetic/family history and solid tumor type (p < 0.0001). There was a significant association between genetic/family history and tumor type, suggesting possible hereditary or familial influence in certain malignancies such as germ cell tumor and hepatoblastoma. This indicated that genetic predisposition may have played a role in tumor development **(Table 4).** Osteosarcoma showed the highest local-regional (28.9%) and distant metastasis (23.1%). Ewing's sarcoma also showed notable metastatic spread. CNS tumors had relatively higher unknown metastasis status (10.6%). No statistically significant association was observed between metastasis status and tumor type (p = 0.1339). Metastasis patterns varied across tumor types, with osteosarcoma and Ewing's sarcoma showing higher metastatic involvement. However, the lack of statistical significance indicated no strong association between tumor type and metastasis status **(Table 5).**

Table 1: Solid tumors by educational status (illiterate vs primary vs secondary vs higher secondary)

Solid Tumors	Illiterate	Primary	Secondary	Higher Secondary
CNS tumor	2 (6.1%)	2 (9.1%)	7 (10.1%)	3 (7.9%)
Ewings sarcoma	2 (6.1%)	2 (9.1%)	18 (26.1%)	6 (15.8%)
Germ cell tumor	4 (12.1%)	0 (0.0%)	6 (8.7%)	5 (13.2%)
Hepatoblastoma	3 (9.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Nasopharyngeal ca	0 (0.0%)	1 (4.5%)	2 (2.9%)	1 (2.6%)
Neuroblastoma	0 (0.0%)	6 (27.3%)	2 (2.9%)	0 (0.0%)
NRSTS	3 (9.1%)	0 (0.0%)	5 (7.2%)	3 (7.9%)
Osteosarcoma	1 (3.0%)	3 (13.6%)	22 (31.9%)	13 (34.2%)
Others	2 (6.1%)	2 (9.1%)	1 (1.4%)	3 (7.9%)
Retinoblastoma	2 (6.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Rhabdomyosarcoma	7 (21.2%)	5 (22.7%)	6 (8.7%)	3 (7.9%)
Wilms tumor	7 (21.2%)	1 (4.5%)	0 (0.0%)	1 (2.6%)

Table 2: Distribution of study participants according to consanguineous marriage, genetic/family history and metastasis status

		Frequency	Percent
Response	No	160	98.80%
	Yes	2	1.20%
Category	No	74	45.70%
	Not known	82	50.60%
	Present	6	3.70%
	Absent	44	27.20%
	Distant metastasis present	26	16.00%
	Local-regional metastasis present	45	27.80%
	Unknown	47	29.00%

Table 3: Consanguineous marriage status according to solid tumor type

Solid Tumors	No	Yes
CNS tumor	13 (8.1%)	1 (50.0%)
Ewings sarcoma	28 (17.5%)	0 (0.0%)
Germ cell tumor	15 (9.4%)	0 (0.0%)
Hepatoblastoma	3 (1.9%)	0 (0.0%)
Nasopharyngeal ca	4 (2.5%)	0 (0.0%)
Neuroblastoma	8 (5.0%)	0 (0.0%)
NRSTS	11 (6.9%)	0 (0.0%)
Osteosarcoma	39 (24.4%)	0 (0.0%)
Others	8 (5.0%)	0 (0.0%)
Retinoblastoma	2 (1.3%)	0 (0.0%)
Rhabdomyosarcoma	20 (12.5%)	1 (50.0%)
Wilms tumor	9 (5.6%)	0 (0.0%)

Table 4: Genetic/family history status according to solid tumor type

Solid Tumors	No	Not known	Present
CNS tumor	10 (13.5%)	3 (3.7%)	1 (16.7%)
Ewing's sarcoma	11 (14.9%)	16 (19.5%)	1 (16.7%)
Germ cell tumor	9 (12.2%)	4 (4.9%)	2 (33.3%)
Hepatoblastoma	1 (1.4%)	0 (0.0%)	2 (33.3%)
Nasopharyngeal ca	1 (1.4%)	3 (3.7%)	0 (0.0%)
Neuroblastoma	7 (9.5%)	1 (1.2%)	0 (0.0%)
NRSTS	0 (0.0%)	11 (13.4%)	0 (0.0%)
Osteosarcoma	16 (21.6%)	23 (28.0%)	0 (0.0%)
Others	6 (8.1%)	2 (2.4%)	0 (0.0%)
Retinoblastoma	2 (2.7%)	0 (0.0%)	0 (0.0%)
Rhabdomyosarcoma	11 (14.9%)	10 (12.2%)	0 (0.0%)
Wilms tumor	0 (0.0%)	9 (11.0%)	0 (0.0%)

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Table 5: Metastasis status according to solid tumor type

Solid Tumors	Absent	Distant metastasis	Local-regional metastasis	Unknown
CNS tumor	7 (15.9%)	0 (0.0%)	2 (4.4%)	5 (10.6%)
Ewing's sarcoma	7 (15.9%)	5 (19.2%)	9 (20.0%)	7 (14.9%)
Germ cell tumor	6 (13.6%)	2 (7.7%)	3 (6.7%)	4 (8.5%)
Hepatoblastoma	1 (2.3%)	1 (3.8%)	0 (0.0%)	1 (2.1%)
Nasopharyngeal ca	2 (4.5%)	1 (3.8%)	0 (0.0%)	1 (2.1%)
Neuroblastoma	1 (2.3%)	1 (3.8%)	2 (4.4%)	4 (8.5%)
NRSTS	1 (2.3%)	0 (0.0%)	3 (6.7%)	7 (14.9%)
Osteosarcoma	5 (11.4%)	6 (23.1%)	13 (28.9%)	15 (31.9%)
Others	3 (6.8%)	2 (7.7%)	2 (4.4%)	1 (2.1%)
Retinoblastoma	0 (0.0%)	0 (0.0%)	2 (4.4%)	0 (0.0%)
Rhabdomyosarcoma	9 (20.5%)	5 (19.2%)	6 (13.3%)	1 (2.1%)
Wilms tumor	2 (4.5%)	3 (11.5%)	3 (6.7%)	1 (2.1%)

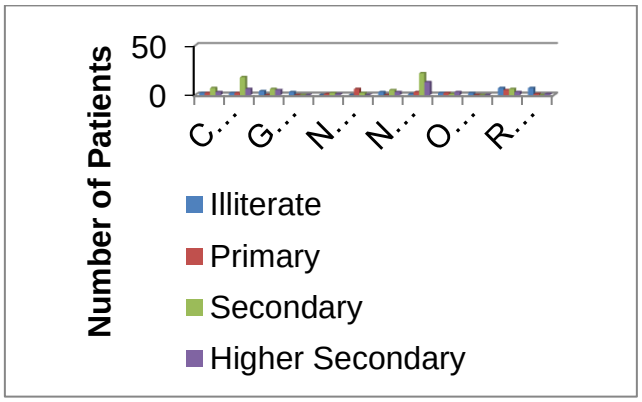


Figure 1: Solid tumors by educational status (illiterate vs primary vs secondary vs higher secondary)

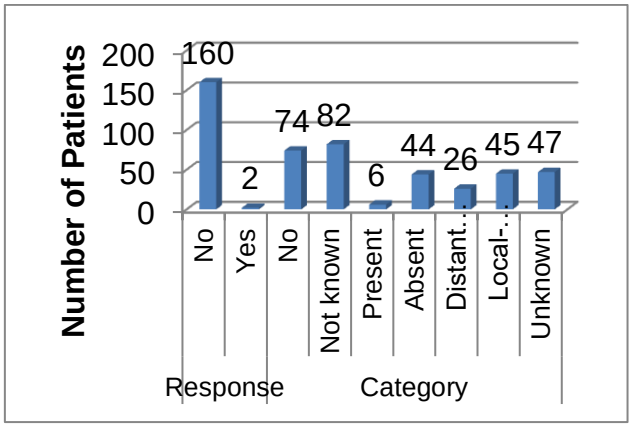


Figure 2: Distribution of study participants according to consanguineous marriage, genetic/family history and metastasis status

Discussion:

In the present study, solid tumor distribution showed variation across educational status, with osteosarcoma and Ewing's sarcoma being more common among patients with secondary and higher secondary education, while neuroblastoma was more frequent among primary educated patients and hepatoblastoma and retinoblastoma were mainly seen among illiterate patients. Although no direct statistical comparison was performed for education, these findings suggest possible sociocultural and healthcare access influences on tumor detection and diagnosis. Similar observations have been reported in pediatric oncology settings where parental education and awareness significantly influence early detection and referral patterns, thereby affecting the observed distribution of malignancies **[11].** Delayed diagnosis in lower educational groups has been associated with more advanced disease presentation in several pediatric cancer studies. Consanguineous marriage was found to be rare in this study population (1.2%) and showed no statistically significant association with solid tumor types ($p = 0.7365$). Although CNS tumor and rhabdomyosarcoma contributed to the few cases with consanguinity, this finding is not sufficient to suggest a causal relationship. Previous literature has suggested a possible association between consanguinity and increased risk of autosomal recessive disorders and certain childhood malignancies due to increased homozygosity of deleterious genes. However, large population-based studies have showed inconsistent associations between consanguinity and pediatric solid tumors, supporting the lack of significant relationship observed in the present study. Genetic and family history showed a statistically significant association with tumor type ($p < 0.0001$), indicating a potential role of hereditary predisposition in certain malignancies. Germ cell tumors and hepatoblastoma showed relatively higher proportions of positive family history, while osteosarcoma had the highest proportion of unknown family history. Familial clustering and germline mutations have been well documented in pediatric cancers such as retinoblastoma (RB1 mutation), Wilms tumor (WT1 gene alterations) and certain germ cell tumors. Osteosarcoma has also been associated with genetic syndromes such as Li-Fraumeni syndrome and hereditary retinoblastoma, highlighting the role of tumor suppressor gene mutations in sarcomagenesis. The significant association observed in this study aligns with previous evidence suggesting a genetic contribution in pediatric solid tumors. Metastasis status showed heterogeneous distribution across tumor types, with osteosarcoma and Ewing's sarcoma showing higher proportions of local-regional and distant metastasis. However, no statistically significant association was observed between metastasis and tumor type ($p = 0.1339$). Osteosarcoma is well known for early hematogenous spread, particularly to the lungs and Ewing's sarcoma is also associated with aggressive metastatic behavior at presentation in a significant proportion of cases **[11, 12]**. CNS tumors and

neuroblastoma showed relatively higher unknown metastatic status, which may reflect incomplete staging or diagnostic limitations in resource-constrained settings. Previous studies have highlighted that metastatic burden at diagnosis varies widely depending on tumor biology and healthcare accessibility **[13, 14].** Overall, the present study highlights that while demographic factors such as education and consanguinity did not show strong statistical associations with tumor type, genetic/family history showed a significant relationship, emphasizing the importance of hereditary factors in pediatric solid tumors. The lack of significant association with metastasis further suggests that tumor biology rather than demographic variables may primarily influence disease spread patterns. Evidence from Ethiopia and India further highlights the burden and heterogeneous distribution of pediatric solid tumors in resource-constrained settings **[15, 16].** The Ethiopian study also documented ongoing treatment needs, mortality and loss to follow-up, emphasizing the importance of timely diagnosis, treatment access and continuity of care **[15].** These findings are consistent with existing literature indicating that pediatric solid tumors are multifactorial in origin, involving complex interactions between genetic susceptibility and environmental influences.

Conclusion:

Genetic or family history was significantly associated with pediatric solid-tumor type ($p<0.0001$), highlighting a potential link between familial predisposition and tumor distribution. Consanguinity was uncommon and showed no significant association with tumor type, while metastasis was also not significantly associated ($p=0.1339$). These findings emphasize the relevance of familial history in characterizing pediatric solid tumors, while further studies are needed to clarify the contribution of hereditary factors to tumor development.

References:

[1] Bhutani N *et al. Ann Med Surg (Lond).* 2021 **64**:102202. [PMID: 33747498]
[2] Joseph LL *et al. Pediatr Blood Cancer.* 2022 **69**:e29454. [PMID: 34811921]
[3] Agrawal V *et al. J Indian Assoc Pediatr Surg.* 2022 **27**:42. [PMID: 35261513]
[4] Rahiman EA *et al. Pediatr Blood Cancer.* 2022 **69**:e29880. [PMID: 35841309]
[5] Theilen TM *et al. Front Pediatr.* 2022 **10**:852185. [PMID: 35911825]
[6] Singh P *et al. South Asian J Cancer.* 2022 **11**:260. [PMID: 36588612]
[7] Ortiz MV *et al. Pediatr Blood Cancer.* 2023 **70**:e30342. [PMID: 37096797]
[8] Srinivasan S *et al. South Asian J Cancer.* 2023 **12**:206. [PMID: 37969674]
[9] Vujanić GM & Mifsud W. *Pediatr Blood Cancer.* 2024 **71**:e31000. [PMID: 38605554]
[10] Smith V *et al. Pediatr Rev.* 2025 **46**:206. [PMID: 40164220]
[11] Siddaiahgari SR *et al. Pediatr Blood Cancer.* 2025 **72**:e31871. [PMID: 40611538]
[12] Espinoza AF *et al. Cancer Med.* 2025 **14**:e70598. [PMID: 39928531]
[13] Bull EC *et al. Mol Cancer.* 2025 **24**:153. [PMID: 40442778]
[14] Pater L *et al. Pediatr Blood Cancer.* 2021 **68**:e28257. [PMID: 32893998]
[15] Dinkiye M *et al. Cancer Rep (Hoboken).* 2025 **8**:e70222. [PMID: 40344343]
[16] Patole MM. *Int J Contemp Pediatr.* 2019 **6**:2522. [DOI: 10.18203/2349-3291.ijcp20194728]

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