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Original Article

Wilm's Tumor in Children of Pediatric Age Group: A Single Centre Experience

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ABSTRACT

Background: Wilms Tumor (WT) is the most common malignant renal tumor in children and remains a significant contributor to pediatric cancer morbidity and mortality. Early diagnosis and appropriate multimodal treatment are essential for improving survival outcomes. This study aimed to evaluate the demographic profile, disease characteristics, treatment modalities, and outcomes of children diagnosed with Wilms Tumor at a tertiary care center.
Methods: A prospective observational study was conducted in the Department of Pediatric Surgery, Gauhati Medical College and Hospital, from January 2023 to June 2024. Forty pediatric patients (0–14 years) with pathologically confirmed Wilms Tumor were enrolled. Data regarding age, sex, tumor laterality, stage at presentation, treatment modality, and follow-up outcomes were collected and analyzed using descriptive and inferential statistics. Associations between clinicodemographic variables and disease stage were assessed using the Chi-square test.
Results: The majority of patients belonged to the 3–5 years age group (42.5%), and females constituted 70% of cases. Left-sided tumors were more common (72.5%) than right-sided tumors (27.5%). Most patients presented with Stage I (37.5%) or Stage II disease (35.0%), while Stage III and Stage IV accounted for 22.5% and 5.0%, respectively. No significant association was observed between age, sex, or tumor laterality and stage at presentation ($p > 0.05$). Treatment modality showed a significant association with disease stage ($\chi^2 = 57.907$, $p < 0.001$), with surgery alone predominantly used for Stage I disease and surgery combined with chemotherapy for advanced stages. Follow-up outcomes were favorable, with 87.5% of patients recovering. Disease stage was significantly associated with outcome ($\chi^2 = 36.489$, $p < 0.001$).
Conclusion: Early-stage presentation and multimodal management resulted in favorable outcomes in most patients. Disease stage at diagnosis remained the most important determinant of treatment outcome, emphasizing the need for early detection, timely referral, and comprehensive multidisciplinary care.

Keywords: Wilms Tumor, Nephroblastoma, Pediatric Renal Tumor, Chemotherapy, Treatment Outcome.

INTRODUCTION

Wilm's tumor, also known as nephroblastoma, is the most common malignant renal tumor in children, accounting for approximately 6-8% of all pediatric cancers [1]. It typically arises from embryonal renal cells and is most frequently diagnosed in children under the age of five. The incidence of Wilm's tumor is estimated at about 1 in 10,000 children worldwide, with slight variations across ethnic groups and geographic locations [2]. The tumor is named after Max Wilms, a German surgeon who first described the condition in 1899.

The tumor predominantly affects children between the ages of two and five years and exhibits a slight female predominance [3]. Bilateral involvement occurs in about 5-10% of cases and is often associated with syndromic presentations such as WAGR (Wilm's tumor, Aniridia, Genitourinary anomalies, and mental Retardation), Denys-Drash

syndrome, and BeckwithWiedemann syndrome [4]. These syndromes are linked to mutations in tumor suppressor genes such as WT1 and WT2 located on chromosome 11p, which play a pivotal role in renal development and oncogenesis [5]. Clinically, Wilm's tumor often presents as an asymptomatic abdominal mass noticed incidentally by parents or caregivers. Other associated symptoms include abdominal pain, hematuria, hypertension, fever, and in some cases, anemia or constipation due to mass effect [6]. The tumor is characteristically large but well encapsulated, allowing for favorable surgical outcomes if detected early. However, metastasis, especially to the lungs and liver, may occur in advanced stages, necessitating comprehensive diagnostic and staging protocols[7].

Radiological evaluation, primarily through ultrasonography and contrast-enhanced CT or MRI, plays a critical role in the diagnosis, staging, and surgical planning of Wilm's tumor. Histologically, the tumor is characterized by a triphasic pattern consisting of blastemal, epithelial, and stromal elements. This histopathological diversity significantly influences the prognosis and therapeutic decisions [8]. Favorable histology accounts for the majority of cases and is associated with excellent outcomes when managed appropriately with multimodal therapy.

Management of Wilm's tumor has evolved significantly over the past few decades, with the advent of multimodal therapy incorporating surgery, chemotherapy, and in some cases, radiotherapy. The two principal treatment protocols are those developed by the National Wilms Tumor Study Group (NWTSG) in North America and the International Society of Pediatric Oncology (SIOP) in Europe [9]. The NWTSG recommends primary surgical resection followed by risk-adapted chemotherapy, whereas the SIOP approach emphasizes preoperative chemotherapy to shrink the tumor and reduce intraoperative complications. Both protocols have demonstrated survival rates exceeding 90% for localized disease, highlighting the importance of timely diagnosis and institution of therapy.

Despite the remarkable progress in the treatment of Wilm's tumor globally, outcomes in lowresource settings remain suboptimal. Contributing factors include late presentation, limited access to specialized pediatric oncology services, financial constraints, and poor compliance with follow-up and treatment protocols [10]. These challenges underscore the need for institution-based studies to analyze regional disease patterns, clinical presentations, and treatment outcomes. Such data are essential for optimizing context-specific treatment strategies and improving survival rates.

In India, the burden of Wilm's tumor remains significant, though national data on incidence and outcomes remain sparse. Single-centre experiences play a pivotal role in bridging this gap by documenting local case trends, treatment practices, and patient outcomes. They also offer valuable insights into the feasibility and effectiveness of existing treatment protocols in real-world scenarios. This is particularly relevant in tertiary care settings, where a wide demographic of patients from diverse socioeconomic backgrounds receive care. Understanding institutional outcomes can thus contribute meaningfully to the formulation of regionally tailored guidelines.

This study aims to present the single-centre experience of managing Wilm's tumor in children of the pediatric age group. It seeks to analyze the demographic profile, clinical presentation, imaging findings, histopathological spectrum, treatment modalities, and outcomes of children diagnosed with Wilm's tumor at our institution. By documenting these parameters, we aim to contribute to the growing body of literature on Wilm's tumor and provide evidence that can guide future practice, particularly in similar healthcare environments.

METHODOLOGY

Study Design

This was a single-centre prospective observational study conducted to evaluate clinical, radiological, histological, and treatment outcomes in pediatric patients with Wilm's tumor, without applying any interventions.

Study Setting

The study was conducted in the Department of Pediatric Surgery at Gauhati Medical College and Hospital, a tertiary care center in Northeast India with access to multidisciplinary pediatric oncology services.

Study Duration

The study was carried out over an 18-month period, from January 2023 to June 2024, allowing prospective data collection and follow-up of enrolled pediatric patients diagnosed with Wilm's tumor.

Participants – Inclusion and Exclusion Criteria

Inclusion Criteria:

- Pathologically confirmed Wilm's tumor
- Pediatric age group (0–14 years)
- Informed parental consent

Exclusion Criteria:

- Non-Wilm's abdominal/retroperitoneal tumors
- Synchronous neoplastic lesions
- Refusal of consent

Study Sampling
All eligible and consenting cases were included consecutively using purposive sampling. This ensured inclusion of every diagnosed Wilm's tumor case during the study period without randomization.

Study Sample Size
A total of 40 pediatric patients fulfilling the inclusion criteria were enrolled during the study period. The sample size was based on feasibility and patient inflow to the department.

Study Groups
No experimental or control groups were formed. Patients were categorized based on age, sex, tumor laterality, histopathology, and disease stage for descriptive subgroup analysis.

Study Parameters
Data collected included age, gender, symptoms, laterality, imaging results, histological subtype, disease stage, treatment modalities, complications, response to therapy, recurrence, and final outcome.

Study Procedure
After consent, patients underwent clinical evaluation, imaging, surgery, histopathological diagnosis, and chemotherapy. Postoperative outcomes and complications were recorded and patients were followed up regularly.

Study Data Collection
Data were prospectively collected using structured proformas. Information was taken from clinical assessments, investigation reports, operative records, and follow-ups, ensuring data accuracy and confidentiality.

Data Analysis
Data were entered in Microsoft Excel and analyzed using SPSS. Descriptive and inferential statistics were used. Results were presented in textual, tabular, and graphical formats.

Ethical Considerations
Ethical approval was obtained from the Institutional Ethics Committee. Informed consent was taken. Confidentiality was maintained, and no deviation from standard treatment protocols occurred. Study was self-funded.

RESULTS

Table 1. Association between Age Group and Stage at Presentation

Age group	Stage 1	Stage 2	Stage 3	Stage 4	Total
< 1 year	2	1	0	1	4
1–2 years	5	6	0	0	11
3–5 years	6	4	6	1	17
> 10 years	2	3	3	0	8
Total	**15**	**14**	**9**	**2**	**40**
Pearson chi-square = 12.264, df = 9, ***p = 0.199***					

The majority of respondents were in the **3–5 years age group (42.5%)**, followed by **1–2 years (27.5%)**, **>10 years (20.0%)**, and **<1 year (10.0%)**. Stage 1 (37.5%) and Stage 2

(35.0%) presentations were the most common. Although Stage 3 cases were more frequently observed in the 3–5 years and >10 years age groups, the association between age group and stage at presentation was **not statistically significant** (**$\chi^2 = 12.264$, df = 9, p = 0.199**). This indicates that stage at presentation was comparable across different age groups.

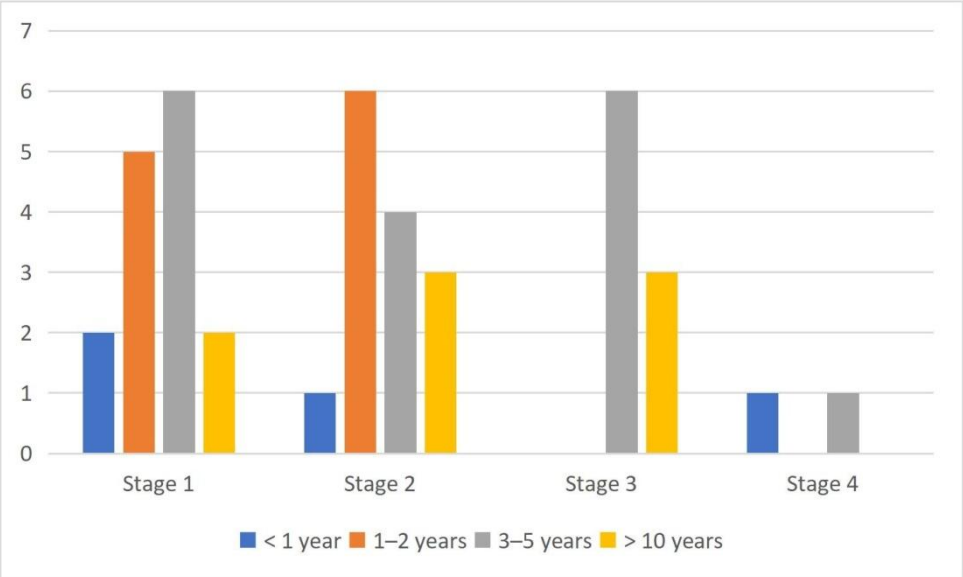


Table 2. Association between Sex and Stage at Presentation

Sex	Stage 1	Stage 2	Stage 3	Stage 4	Total
Female	14	8	5	1	28
Male	1	6	4	1	12
Total	**15**	**14**	**9**	**2**	**40**
Pearson chi-square = 6.266, df = 3, ***p = 0.099***					

Females constituted the majority of the study population (**70.0%**) compared to males (**30.0%**). Stage 1 presentation was more common among females (**14 cases**) than males (**1 case**), while Stage 2 and Stage 3 cases were distributed across both sexes. However, the association between sex and stage at presentation was **not statistically significant** ($\chi^2 = 6.266$, **df = 3, p = 0.099**), indicating no significant difference in stage distribution between males and females.

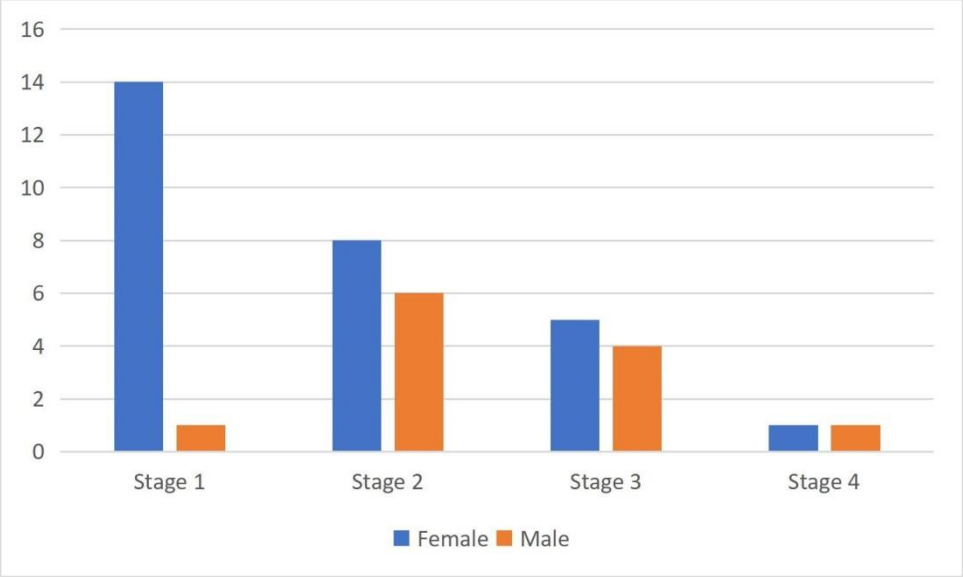


Table 3. Association between Tumor Laterality and Stage at Presentation

Laterality	Stage 1	Stage 2	Stage 3	Stage 4	Total
Left	10	11	6	2	29
Right	5	3	3	0	11
Total	**15**	**14**	**9**	**2**	**40**
Pearson chi-square = 1.427, df = 3, ***p = 0.699***					

The majority of tumors were **left-sided (72.5%)**, while **27.5%** were right-sided. Stage 1 and Stage 2 presentations were more common among patients with left-sided tumors. However, there was **no statistically significant association** between tumor laterality and stage at presentation ($\chi^2 = 1.427$, **df = 3, p = 0.699**), indicating that disease stage was comparable irrespective of tumor laterality.

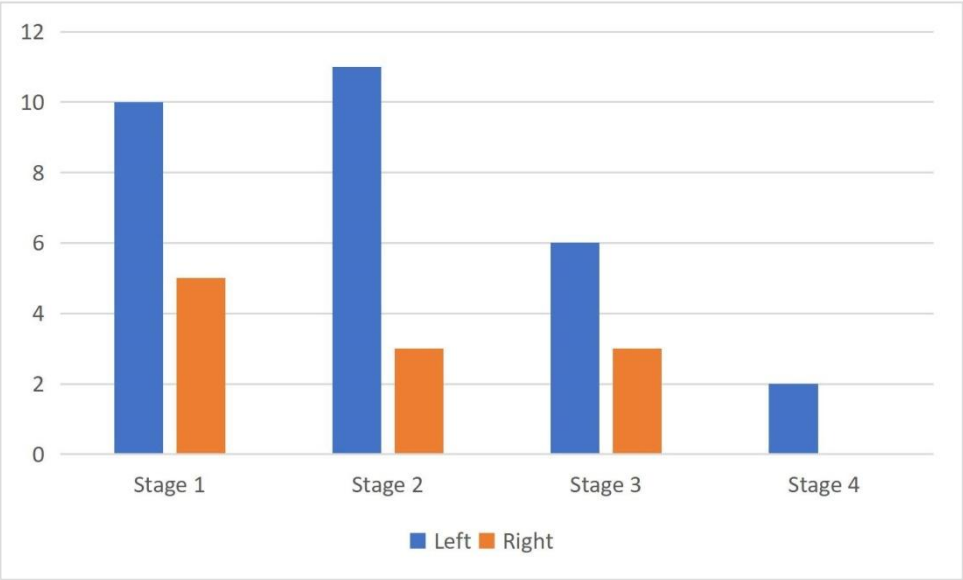


Table 4. Association between Treatment Group and Stage at Presentation

Treatment group	Stage 1	Stage 2	Stage 3	Stage 4	Total
Upfront surgery	1	0	0	0	1
Surgery only	13	0	0	0	13
Surgery + chemotherapy	1	14	8	1	24
Neo-adjuvant + surgery	0	0	1	0	1
Chemotherapy only	0	0	0	1	1
Total	**15**	**14**	**9**	**2**	**40**
Pearson chi-square = 57.907, df = 12, ***p < 0.001***					

Most patients received **surgery with chemotherapy (60.0%)**, followed by **surgery only (32.5%)**. All **Stage 1** patients were managed primarily with surgery, whereas **Stage 2, Stage 3, and Stage 4** patients predominantly received combined surgery and chemotherapy. A **highly significant association** was observed between treatment group and stage at presentation ($\chi^2 = 57.907$, **df = 12, p < 0.001**), indicating that treatment modality varied significantly according to disease stage.

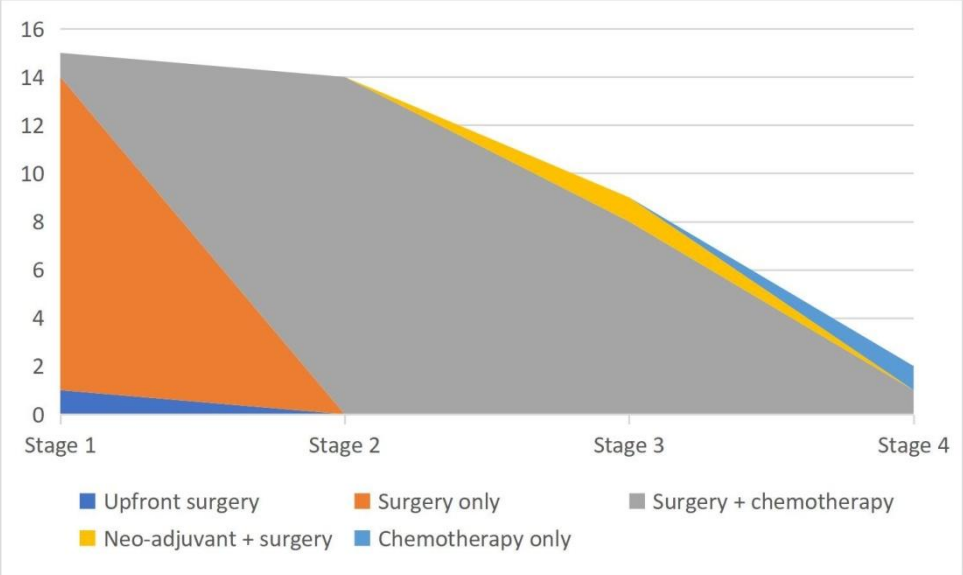
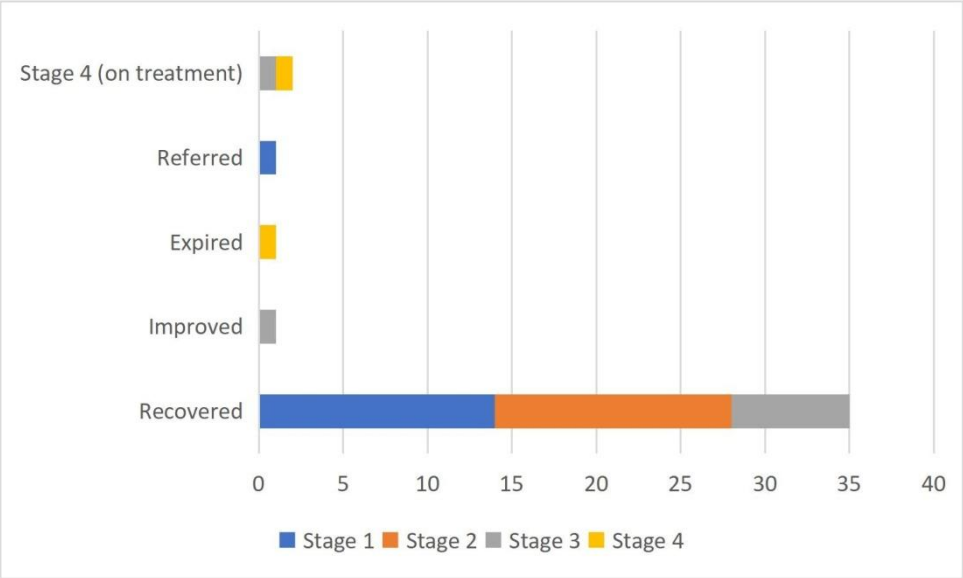


Table 5. Association between Follow-up Status and Stage at Presentation

Follow-up status	Stage 1	Stage 2	Stage 3	Stage 4	Total
Recovered	14	14	7	0	35
Improved	0	0	1	0	1
Expired	0	0	0	1	1
Referred	1	0	0	0	1
Stage 4 (on treatment)	0	0	1	1	2
Total	**15**	**14**	**9**	**2**	**40**
Pearson chi-square = 36.489, df = 12, ***p < 0.001***					

The majority of patients **recovered (87.5%)**, including most Stage 1 (**14/15**) and all Stage 2 (**14/14**) cases. One Stage 3 patient showed improvement, while mortality was observed in one Stage 4 patient. A **highly significant association** was found between follow-up status and stage at presentation ($\chi^2 = 36.489$, **df = 12, p < 0.001**), indicating that patient outcomes varied significantly according to disease stage.



DISCUSSION

The present study evaluated the demographic profile, disease characteristics, treatment patterns, and outcomes among 40 patients with Wilms Tumor (WT). The majority of patients belonged to the 3–5 years age group (42.5%), followed by 1–2 years (27.5%), while only 10% were below 1 year of age. Most patients presented in Stage 1 (37.5%) and Stage 2.

(35.0%) disease, with fewer patients in Stage 3 (22.5%) and Stage 4 (5.0%). Although Stage 3 disease was more frequently observed among children aged 3–5 years, no statistically significant association was found between age group and stage at presentation ($\chi^2 = 12.264$, $p = 0.199$). Similar age distributions have been reported by Ghafoor et al. [11], where 81% of patients were below 5 years of age with a mean diagnostic age of 38.87 ± 28.66 months. Mohajerzadeh et al. [14] also reported mean ages of 45.2 and 36 months in two study cohorts, while Nasir et al. [13] documented a median age of 36 months at diagnosis. These findings confirm that WT predominantly affects young children, particularly those under five years of age.

Female children constituted the majority of patients in the present study (70.0%), whereas males accounted for 30.0%. Stage 1 disease was observed predominantly among females (14 cases), but the association between sex and disease stage was not statistically significant ($\chi^2 = 6.266$, $p = 0.099$). This female predominance is comparable to studies by Ghafoor et al. [11], who reported 52.4% females, Elayadi et al. [12], who observed 55% females, and Nasir et al. [13], who documented 62.9% females. In contrast, Alakaloko et al. [16] reported a male predominance with a male-to-female ratio of 1.6:1. These variations suggest that sex distribution may differ across populations, although gender does not appear to significantly influence disease stage or outcomes.

Regarding tumor laterality, left-sided tumors were more common in the present study (72.5%) compared to right-sided tumors (27.5%). However, no significant association was observed between tumor laterality and stage at presentation ($\chi^2 = 1.427$, $p = 0.699$). This finding differs from previous studies where right-sided involvement was slightly more frequent. Ghafoor et al. [11] reported right kidney involvement in 51.2% of cases, Nasir et al. [13] observed rightsided tumors in 51.4% and left-sided tumors in 42.9%, while Alakaloko et al. [16] reported right kidney involvement in 57.5% of patients.

Despite differences in laterality distribution, most studies indicate that tumor side has limited prognostic significance compared with disease stage.

Treatment modalities varied significantly according to disease stage in the present study ($\chi^2 = 57.907$, $p < 0.001$). Surgery alone was the predominant treatment for Stage 1 disease, accounting for 13 of 15 Stage 1 patients, whereas surgery combined with chemotherapy was administered to most Stage 2, Stage 3, and Stage 4 patients. Overall, 60% of patients received surgery with chemotherapy. These findings are consistent with established treatment protocols reported in previous studies. Ghafoor et al. [11] administered preoperative chemotherapy followed by nephrectomy and stage-based postoperative chemotherapy according to the SIOP Wilms Tumor 2001 protocol. Elayadi et al. [12] reported that 50 of 51 patients received neoadjuvant chemotherapy followed by radical nephrectomy and thrombectomy. Nasir et al. [13] documented preoperative chemotherapy in 62.9% of cases, while Mohajerzadeh et al. [14] managed patients according to National Wilms Tumor Study protocols. These observations highlight the importance of multimodal treatment approaches, particularly in advanced-stage disease.

The follow-up outcomes demonstrated encouraging results, with 87.5% of patients achieving recovery. Recovery was observed in 14 of 15 Stage 1 patients, all 14 Stage 2 patients, and 7 of 9 Stage 3 patients. Only one patient expired, while two Stage 4 patients remained on treatment. A highly significant association was found between follow-up status and disease stage ($\chi^2 = 36.489$, $p < 0.001$), indicating that outcomes were strongly influenced by stage at presentation. This finding closely aligns with previous literature emphasizing disease stage as the most important prognostic factor in WT. Ghafoor et al. [11] reported that overall survival decreased dramatically from 92.6% in Stage I disease to 47.1% in Stage IV disease ($p < 0.001$), while event-free survival declined from 92.6% to 43.8%. Nasir et al. [13] similarly observed that survival significantly decreased with advancing disease stage ($p = 0.002$). Mohajerzadeh et al. [14] reported 4-year survival rates of 86% and 90% across two decades of management, whereas Elayadi et al. [12] documented 5-year overall survival and eventfree survival rates of 75.9% and 71.1%, respectively. Alakaloko et al. [16] reported a 5-year survival rate of 75% following implementation of a multidisciplinary treatment approach.

The favorable outcomes observed in the present study may be attributed to earlier stage distribution, prompt treatment initiation, and adherence to multimodal management strategies. Unlike many studies from developing countries that reported high proportions of advancedstage disease, the present study had a greater proportion of Stage 1 and Stage 2 cases (72.5%), which likely contributed to the high recovery rate. Overall, the findings reinforce the importance of early diagnosis, accurate staging, timely surgical intervention, and appropriate chemotherapy in improving survival outcomes among children with Wilms Tumor. Consistent with previous studies, disease stage emerged as the most important determinant of treatment outcome, highlighting the need for increased awareness, early referral, and multidisciplinary management to optimize prognosis.

CONCLUSION

The present study evaluated the demographic characteristics, treatment patterns, and outcomes of 40 children diagnosed with Wilms Tumor. The majority of patients were aged 3–5 years, with females constituting the larger proportion of cases. Most patients presented with Stage I and Stage II disease, while advanced-stage disease was less common. Tumor laterality showed no significant association with disease stage. Treatment modality varied significantly according to stage, with surgery alone being the preferred treatment for earlystage disease and combined surgery with chemotherapy being commonly used for advanced stages. Follow-up outcomes were favorable, with 87.5% of patients achieving recovery. A significant association was observed between disease stage and treatment outcome, confirming that stage at presentation remains the most important prognostic factor. The high recovery rate observed in this study highlights the benefits of early diagnosis, appropriate staging, and multidisciplinary management. Strengthening awareness, early referral, and timely treatment may further improve survival and clinical outcomes in children with Wilms Tumor.

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