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EVALUATION OF DELAY IN DIAGNOSIS AND MANAGEMENT OF COMMON CHILDHOOD MALIGNANCIES IN PAKISTAN

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Abstract

Objective: *To evaluate the barriers causing undue delay in diagnosis and management of common childhood malignancies in low to middle income country (LMIC).*

Place and Duration: *CMH Rawalpindi, 1 year from Jan 2024 to dec 2024*

Methodology: *This prospective cross-sectional research was carried out at the child Oncology department CMH Rwp, Pakistan. All children aged 2 months to 18 years confirmed with any type of malignancy were included. Parents were asked about for explanations of interruptions faced in the management path of their kids. Delay in the diagnosis and management was defined as the extra time taken before reaching the diagnosis and starting treatment by the patient and health care facilities after onset of symptoms. Four weeks were counted as a delay for hematological malignancy while 6 weeks were counted as a delay for solid tumors after onset of symptoms. Data was compiled and analyzed using SPSS version 25*

Results: *The average age of our study group participants was 06 years. 63.9% children were male, 36.1% were female. The most common malignancies diagnosed among the children were leukemia, accounting for 55.8% of cases, followed by lymphoma 12.1%, and renal tumors at 6.6% %. 7.2% of the cohort had not received formal education, while the remaining participants exhibited varying degrees of educational attainment. Nutritional assessments revealed that approximately 45.7% of the children had an intermediate nutritional status, whereas 8.1% were classified as having poor nutritional status.*

Conclusion: *Timeliness of diagnosis and management of childhood cancer is a multifaceted challenge involving various barriers. It needs to be addressed at various levels starting from easy access to basic medical services, socioeconomic challenges and accuracy of diagnostic workup. Screening and education-based program can enhance timeliness of diagnosis.*

INTRODUCTION

Most of the childhood malignancies are largely curable. However, long delays in picking up the right disease and starting treatment late can lead to poor outcome and associated complications in children.

There is a survival rate of over 80% in high-income countries (HICs).[1,2] Comparatively, survival rate in low to middle-income countries (LMICs) is lower, with survival rates in some regions at about 10%.[3,4] There is about 80% mortality due to childhood malignancies in these LMICs.[4] This much high mortality can be reduced by understanding and overcoming common barriers faced leading to delay in management of childhood malignancies in these regions. Emerging evidence suggests that this survival gap can be diminished through both targeted childhood cancer program development and broader health system strengthening.[5,6] Moreover, current evidence indicates that childhood cancer treatment in LMIC settings is cost-effective.[7,8] Improved childhood cancer outcomes in LMICs will require overcoming multiple barriers that presently compromise care delivery and impact survival.[5,6,9] As modifiable risk factors for childhood cancer are unknown, efforts to increase timely diagnosis and access to effective treatment are crucial. A lack of both professional and public awareness of the early warning signs and symptoms (EWSS) of childhood cancer is a fundamental barrier in many LMICs.[3,10-12] An increased awareness of EWSS would contribute to more timely recognition of childhood cancers, referral for specialized care, diagnosis, and treatment initiation. This in turn holds the possibility of less advanced stage disease and lower disease- and treatment-related mortality.[3,6,10-12,17]

Preventive measures like quitting smoking, alcohol, reducing obesity and improving lifestyle and dietary habits are not that significant in controlling childhood malignancies.[9] Instead, well in time diagnosis and management according to type of cancer are the best intervention strategies in paediatric population. As accuracy of timing of diagnosis can be an indicator of its outcome.[13,14]

This study has been carried out to assess the common barriers faced by the patients of childhood malignancies in our setup and to focus on early management strategies to deliver long term better outcome to paediatric population.

Methodology

This is a prospective cross-sectional study carried out at the Paediatric Oncology Department of CMH Rawalpindi, Pakistan. Non-probability consecutive sampling technique was used. Data was collected after approval of Institutional Ethical Review Committee (ERC). A sample size of 346 participants was calculated using WHO sample size calculator, keeping CI 95% and margin of error 5%. Informed consent was taken from the guardian/parents. Pediatric oncology patients aged between 2 months and 18 years were included in our study once a diagnosis of malignancy was confirmed. A gap in days between the onset of cancer-related symptoms and the child first visit to a physician was defined as a delay. Time of referral defined as the time it took to complete the medical documents for a patient's transfer from a primary or secondary care center to this health facility. Guardian and parents were asked about details of factors causing delaying in the diagnosis of their children. The term patient interval referred to the interval of time measured in days that elapsed between the onset of cancer-related symptoms and the patient's first visit to a physician. The term diagnostic interval was defined as the interval of time that elapsed between the patient's first contact with a physician and the cancer diagnosis. Latency to diagnosis is the sum of the patient interval and the diagnostic interval. The term time of referral was defined as the time it took to complete the medical documents for a patient's transfer from a primary or secondary care center to this health facility. Delay in the diagnosis was defined as the patient was not diagnosed on the primary health facilities, delaying diagnostic history was considered as responsible factor. For haematological malignancy like leukemias 4 weeks is counted as a delay and in solid tumors six weeks is counted as a delay. All the data was recorded via study Performa. Data was entered and analyzed using SPSS version 25.

Results:

This research involved a cohort of 346 pediatric patients diagnosed with malignancies, aimed at exploring the various factors that lead to delays in diagnosis. The participants exhibited a median age of approximately 6 years, accompanied by a standard deviation of 4.06 years. In terms of gender distribution, 63.9% of the participants identified as male. In addition, it was observed that 7.2% of the cohort had not received formal education, while the remaining participants exhibited varying degrees of

educational attainment . Nutritional assessments revealed that approximately 45.7% of the children had an intermediate nutritional status, whereas 8.1% were classified as having poor nutritional status. Notably, 27.2% of these children resided within a radius of less than 50 kilometres from the medical facility, while 47.8% lived more than 150 kilometres away. In the pediatric population, leukemia represented the predominant diagnosis, comprising 55.8% of all cases. Lymphoma followed at 12.1%, while renal tumors accounted for 6.6%. Miscellaneous tumors included Hepatoblastomas, Retinoblastomas, Germ Cell Tumor, JMML, outlined in Table 1. A delay in diagnosis was observed in 21.7% of cases, with misdiagnosis identified as the most prevalent contributing factor, accounting for 44% of these delays.

Table 1: Descriptive Statistics of Demographic and Clinical Characteristics (N=346)

Characteristics		Count(n)	Percentage (%)
Gender	M	221	63.90
	F	125	36.10
Education	Uneducated	25	7.20
	Primary	22	6.40
	High school	72	20.80
	UG degree	163	47.10
	Graduation	64	18.50
Distance			
	<50km	94	27.20
	<100km	2	0.60
	<150km	49	14.20
	>150km	200	57.80
Status	VLIC	44	12.70
	LMIC	254	73.40
	MIC	48	13.90
Nutritional Status	Good	158	45.70
	Intermediate	160	46.20
	Poor	28	8.10
Disease	ALL	152	43.90
	Infant ALL	4	1.20
	AML	37	10.60
	HLH	20	5.80
	LCH	2	0.60
	Brain tumor	11	3.20
	Hodgkin Lymphoma	27	7.80
	Non-Hodgkin	15	4.30
	Sarcoma	29	8.30
	Neuroblastoma	8	2.30
	Renal Tumor	23	6.60
	Miscellaneous	18	5.20
Missed diagnosis	Yes	33	9.50
	No	313	90.50

Care of Children	Yes	337	97.40
	No	9	2.60
Negative effects of chemo	Yes	18	5.20
	No	328	94.80
Awareness	Yes	279	80.60
	No	67	19.40

As illustrated in Table 2, there were no statistically significant associations identified between income groups and the causative factors. Conversely, Table 3 highlights significant associations between the caregiver's education level and the factors contributing to diagnostic delays ($p<0.05$). However, no significant correlations were observed with missed diagnoses ($p=0.86$), the awareness levels of the caregivers ($p=0.89$), the quality of care provided to the child ($p=0.172$), or the adverse effects related to treatment ($p=0.418$).

Table 2: Correlation of Income Group with Causative Factors

Causative Factor	Economic Status	VLIC N (%)	LIC N (%)	MIC N (%)	P-Value
Delay in diagnosis	Yes	5(11.4)	60(23.6)	10(20.8)	0.188
	No	39(88.6)	194(76.4)	38(79.2)	
Missed diagnosis	Yes	1(2.3)	24(9.4)	8(16.7)	0.063
	No	43(97.7)	230(90.6)	40(83.3)	
Care of Children	Yes	44(100)	248(97.6)	45(93.8)	0.153
	No	0(0)	6(2.4)	3(6.2)	
Awareness	Yes	34(77.3)	203(79.9)	42(87.5)	0.396
	No	10(22.7)	51(20.1)	6(12.5)	
Negative effects of chemo	Yes	0(0)	15(5.9)	3(6.2)	0.25
	No	44(100)	239(94.1)	45(93.8)	

Table 3: Correlation Of Education Level with Causative Factors.

Causative Factor	Education	Uneducated n (%)	Primary n(%)	High school n(%)	UG degree n(%)	Graduation n(%)	P-Value
Delay in diagnosis	Yes	5(20)	4(18.2)	25(34.7)	26(16.0)	15(23.4)	0.03
	No	20(80)	18(81.8)	47(65.3)	137(84.0)	49(76.6)	
Missed diagnosis	Yes	2(8)	3(13.6)	8(11.1)	13(8.0)	7(10.9)	0.86
	No	23(92)	19(86.4)	64(88.9)	150(92.0)	57(89.1)	
Care of Children	Yes	25(100)	21(95.5)	70(97.2)	159(97.5)	62(96.9)	0.89
	No	0(0)	1(4.5)	2(2.8)	4(2.5)	2(3.1)	
Awareness	Yes	17(68)	19(86.4)	56(77.8)	130(79.8)	57(89.1)	0.172
	No	8(32)	3(13.6)	16(22.2)	33(20.2)	7(10.9)	
Negative effects of chemo	Yes	1(4)	1(4.5)	6(8.3)	5(3.1)	5(7.8)	0.418
	No	24(96)	21(95.5)	66(91.7)	158(96.9)	59(92.2)	

Discussion

Timeliness of diagnosis has impact on morbidity and survival outcome of children in any kind of illness. It has great significance in prognosis of childhood malignancies. Late diagnosis and treatment has grave complications in paediatric oncology. By understanding these common barriers we can help enhance our screening and early detection strategies

leading to improved patients outcome and decrease in burden of said malignancy.

A study conducted by T. Dang-Tan showed the following factors related to diagnosis delay: the child's age at diagnosis, parent level of education, type of cancer, presentation of symptoms, tumor site, cancer stage and first medical specialty consulted [15].

A similar study conducted by Begum M. *et al* in Bangladesh on a total of 171 patients in 2016. They were divided into four age groups. In aggregate, about 70% of the cases had to wait for more than 90 days for the treatment. About 15% had to wait for 31–60 days. Negligible percentage of patients got treatment before 30 days. Among the three components of delay, patients delay was influenced by age of the child, economic status of the family, parental education, and awareness of the parents about malignancy. More than one-third of the pediatric patients had to wait three months or more for treatment to start for various reasons[16].

Another study done by Sarah Bano *et al* in Pakistan in 2023 on 255 children with malignancies to investigate the factors contributing to delayed diagnosis. Most common barrier selected by 33.3% of cases was misdiagnosis, followed by poor socioeconomic status (28.6%) and distance (22.4%)[1].

Our study demonstrates that pediatric malignancy diagnostic delay is determined by a mix of clinical, demographic and systemic factors. Overall the average age was 7.81 years and the cases were most prominent in the age groups 2–8 and 8–18 years where delays occurred the most. Gender did not significantly influence delay ($p = 0.848$) although males were slightly more represented. Females in the age group ranging from 2 to 8 years (mean 31.24 days) and males in the age group ranging from 8 to 18 years (mean 31.28 days) had the highest delays, suggesting age as opposed to gender specific diagnostic challenges. There were no statistically significant associations between delay and parental education ($p > 0.87$), health access ($p > 0.19$), income level ($p > 0.24$) and beliefs about malignancy ($p > 0.09$) implying that these demographic factors taken in isolation do not determine early diagnosis. However, key contributors to prolonged delay were identified including misdiagnosis, poor healthcare access and lack of awareness, all of which were significantly linked with a marked difference in mean delay (ANOVA $p < 0.001$), ignorance and misdiagnosis alone accounting for an average delay exceeding 31 days. Delay was also affected by the type of cancer; kids with kidney tumors had the shortest delay (mean 26.03 days) and those with bone tumors had the longest delay (mean 32.07 days) which was statistically significant ($p> .001$). These results emphasize the need to enhance the responsiveness of pediatric cancer health systems and caregivers' education to minimize delayed diagnosis.

Conclusion

By addressing these commonly faced barriers in our setup we can improve screening program and develop intervention strategies at basic health care level in order to improve childhood morbidity and survival from these malignancies thus decreasing the disease burden and improving the outcome.

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Conflicts of interest:

There are no conflicts of interest.

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