Original Article

Factors Leading to Delay in Diagnosis of Childhood Cancer in Pakistan

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ABSTRACT

Objective: To evaluate the factors leading to the delay in diagnosis of childhood cancers.

Methodology: This prospective cross-sectional study was conducted at the pediatric Hematology/Oncology Department of Indus Hospital & Health Network (IHHN) Karachi Pakistan. All children aged 4 months to 14 years diagnosed with malignancy were included. Parents were interviewed for reasons of delay in the diagnosis of their children. Delay in the diagnosis was defined as the patient not diagnosed on the primary health facilities, delaying diagnostic history will be considered as responsible factor. For hematological malignancy 4 weeks is considered as delay and in solid tumors 6 weeks is considered as delay. Data was entered and analyzed using SPSS version 26.0.

Results: The average age of the participants was approximately 7.45+4.10 years. 67.5% children were male, 70.2% children had an intermediate nutritional status and 4.3% had poor nutritional status. The most common malignant diagnoses among the children were leukemia, accounting for 45.5% of cases, followed by lymphoma at 17.6%, and bone tumors at 7.5%. Regarding the reasons behind the delay in diagnosis, 22.4% of cases were postponed due to living away from healthcare facilities, 28.6% of cases were held up due to poor socioeconomic status. Moreover, 33.3% of cases faced delays resulting from misdiagnosis, 13.3% were impeded by transportation issues, and 19.6% encountered delays due to ignorance.

Conclusion: Delay in childhood cancer diagnosis is a multifaceted problem involving various interconnected factors, like limited access to healthcare facilities, socioeconomic disadvantages, misdiagnosis, and transportation barriers. Cultural beliefs and preference for alternative treatments can further delay early interventions.

Key words: Malignancies, delay in diagnosis, factors.

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Introduction

Childhood cancer is largely curable, with a survival rate of over 80% in high-income countries (HICs).[1,2] However, survival in low- and middle-income countries (LMICs) lags behind, with survival rates in some settings as low as under 10%.[3,4] More than 80% of children who die from cancer worldwide do so in LMICs.[4] 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]

Malignancies in pediatric populations differ from those common in adults in whom the influence of modifiable risk factors such as tobacco smoking, alcohol, obesity and certain infections dominates. Such factors are poorly defined and understood in the context of childhood cancers.[9] Therefore, primary cancer prevention initiatives have had little impact at reducing childhood cancer incidence. Instead, interventions aimed at addressing the timelines of diagnosis and treatment, i.e., secondary prevention, are likely to provide opportunities for substantial improvement. It is well established that timing of cancer diagnosis can be an indicator of cancer outcome, with evidence of this relationship seen in some malignancies common to children and adolescents.[13,14]

Few international studies showed different factors like one study performed in Nigeria Department of Pediatrics of the University College Hospital, Ibadan, Nigeria. Showed factors contributing to delayed diagnosis included delayed referral by doctors, seeking health care from alternate sources and financial constraints.[15] The delay in diagnosing childhood cancer can be attributed to a complex interplay of various factors. Although no such studies have been found at a local level. This study has been conducted to evaluate the factors leading to the delay in diagnosis of childhood cancers, to explore recent knowledge regarding factors responsible for the delay to develop the management strategies to provide early access for arrival, diagnosis and treatment.

Methodology

This is a prospective cross-sectional study conducted at the Pediatric Hematology/Oncology Department of Indus Hospital &Health network (IHHN), Karachi Pakistan. Sample was selected through non-probability consecutive sampling technique. Data was collected following approval from the Institutional Review Board (IRB) of IHHN.

Pediatric oncology patients aged between 4 months and 14 years with a new diagnosis of malignancy were included in the study, while patients not diagnosed with malignancy during the workup, parents who did not consent to participate, and patients returning after a long gap with new registration of a previously diagnosed illness were excluded from the study. Interval of time measured in days that elapsed between the onset of cancer-related symptoms and the patient's first visit to a physician. Time of referral defined as the time it took to complete the administrative paperwork for a patient's transfer from a primary or secondary care center to this health facility. After taking informed consent all the parents or caregivers were interviewed. Regarding their socioeconomic status, residential status, parental educational status. Parents or caregivers were also interviewed leading reasons of delaying in the diagnosis 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 administrative paperwork 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 4 weeks is considered as delay and in solid tumors 6 weeks is considered as delay. All the data was record via study Performa. Data was entered and analyzed using SPSS version 26.0.

Results

A study was conducted on 255 children with malignancies to investigate the factors contributing to delayed diagnosis. The average age of the participants was approximately 7.45 years with a standard deviation of 4.10 years. Among the participants, 67.5% were male, 64.7%, were uneducated, whereas the remaining had received some level of formal education. Approximately, 70.2% of children had an intermediate nutritional status and 4.3% had poor nutritional status with 60.4% of them residing more than 100 kilometers away from the medical facility. The most common malignant diagnoses among the children were leukemia, accounting for 45.5% of cases, followed by lymphoma at 17.6%, and bone tumors at 7.5%, as detailed in Table I.

Regarding the reasons behind the delay in diagnosis, the most common causative factor selected by 33.3% of cases was misdiagnosis, followed by poor SES (28.6%) and distance (22.4%).

Delay in diagnosis was experienced by a total of 171(67.1%) of the families who were included in the study. As seen in Table II, significant associations were found with income group and causative factors including missed diagnosis ($p<0.001$), lack of awareness ($p<0.005$) and financial difficulty ($p<0.03$). Table III describes associations of education level of the caregiver with causative factors showing significant values in stigma ($p<0.0001$), no effect of treatment ($p<0.03$) and having other children at home to take care of ($p<0.01$). When analyzed according to distance of the caregiver and patient's residence from the center, positive association was seen with missed diagnosis ($p<0.005$), lack of public transport availability ($p<0.0003$), stigma of disease ($p<0.0002$) and other children to take care of ($p<0.0003$).

Table I: Descriptive statistics of demographic and clinical characteristics (n=255)

Variables		**Statistics**	
Age	(Mean±SD)	7.45±4.10 years	
		N(%)	
Gender	Male	172	67.5%
	Female	83	32.5%
Educational level	Graduate Degree	05	2.0%
	Undergraduate Degree	29	11.3%
	High School	55	21.5%
	Primary School	01	0.4%
	Uneducated	166	64.8%
Nutritional status of children	Poor	11	4.3%
	Good	65	25.5%
	Intermediate	179	70.2%
Distance	<50KM	93	36.5%
	50-100KM	08	03.1%
	>100KM	154	60.4%
Alternative treatment given	No	185	72.5%
	Yes	13	05.1%
	No	06	02.4%
	Yes	51	20.0%
Diagnosis	Leukemia	114	44.5%
	Solid Tumor	47	18.4%
	Abdominal Tumor	28	11.0%
	Hodgkins Lymphoma	26	10.2%
	Non-Hodgkins Lymphoma	23	9.0%
	Brain Tumor	18	7.0%
Causative Factors	Distance	57	22.4%
	Poor SES	73	28.6%
	Missed Diagnosis	85	33.3%
	Transport	34	13.3%
	Ignorance	50	19.6%

Discussion

Childhood cancer is a devastating and potentially life-threatening disease that requires early detection for successful treatment. Regrettably, there are various factors that can lead to delayed diagnosis in pediatric cancer cases. This study aims to explore the various elements and situations that contribute to the delay in diagnosing cancer in children. In this study participants had an average age of around 7.45 years, 67.5% were males, and 32.5% were females. Consistently Gardie Y et al[16] reported that the approximately 65.5% individuals were males and reaming 35.5% were females, with median age of 7 years. On the other hand, Berhane A et al[17] also demonstrated that the overall mean age of the study was 10 years and males were 68%. However, in certain studies or datasets, there may be a higher representation of males among childhood cancer cases, but this doesn't indicate dominance. Such variations can occur due to a range of factors, including genetic predisposition or differences in exposure to risk factors.

In this study the most common malignant diagnoses among the children were leukemia, accounting for 45.5% of cases, followed by lymphoma at 17.6%, and bone tumors at 7.5% and other represented in table above. These were supported by the Abdelkhalek ER et al[18] and Koç BŞ et al[19]. In this study regarding the reasons behind the delay in diagnosis, 22.4% of cases were postponed because of their remote proximity to healthcare facilities, while 28.6% of cases were held up due to their disadvantaged socioeconomic status. Additionally, 33.3% of cases experienced delays because of misdiagnosis, 13.3% were hindered by transportation difficulties, and 19.6% faced delays due to the guardians' lack of awareness. In the comparison of this study Gardie Y et al[16] reported that the living in rural areas, lacking health insurance coverage, having Hodgkin lymphoma or Retinoblastoma, not receiving referrals, and not having coexisting medical conditions were identified as significant factors linked to the delay in diagnosing childhood cancer.

In another study by Berhane A et al[17] reported that the primary causes of delayed medical presentation included the utilization of alternative medicine in 47 cases (46.1%), constrained resources in 33 cases (32.3%), misconceptions about cancer in 32 cases (31.4%), and 11 cases (10.8%) involving painless lumps. Parents resorted to various forms of alternative treatments, such as holy water in 25 cases (24.5%), engaging in prayer ceremonies in 4 cases (3.9%), consulting herbalists in 12 cases (11.7%), using over-the-counter drugs in 3 cases (2.9%), and other methods.

In this study majority of the parents, 64.7% were uneducated, whereas the remaining had received some level of formal education, including a few who were graduates. Furthermore, most of the study subjects had

Table II: Cross-tabulation of income group with causative factors.

Causative factors		INCOME GROUP			P-Value
		Very Low Income	Low Income	Middle Income	
Missed Diagnosis	No	58	89	2	0.001138*
	Yes	21	41	9	
Public transport	no	64	116	10	0.220786
	yes	15	14	1	
Awareness	no	33	64	11	0.005529*
	yes	46	66	0	
Stigma	no	79	127	11	0.30384
	yes	0	3	0	
No Treatment Effects	no	75	123	9	0.207433
	yes	4	7	2	
Negative Treatment effects	no	61	100	9	0.933042
	yes	18	30	2	
Care of children	no	44	83	10	0.066177
	yes	35	47	1	
Delay in diagnosis	no	21	48	5	0.214551
	yes	58	82	6	

Table III: Cross tabulations of Education level with causative factors.

		Education Level					P-value
		Graduate	**High School**	**Primary School**	**Undergraduate**	**Uneducated**	
Missed Diagnosis	No	1	36	0	16	117	0.092
	Yes	4	19	1	13	49	
Awareness	no	5	26	1	18	69	0.101
	yes	0	29	0	11	97	
Stigma	no	5	54	1	28	165	0.0001*
	yes	0	1	0	1	1	
No treatment effects	no	4	55	1	26	155	0.034*
	yes	1	1	1	3	11	
Negative treatment effect	no	4	41	1	21	132	0.740
	yes	1	14	0	8	34	
Care of children	no	5	41	1	23	90	0.011
	yes	0	14	0	6	76	
Delay in diagnosis	no	3	20	1	13	48	0.260
	yes	2	35	0	16	118	

poor socioeconomic status and formal nutrition level. These findings were almost similar Abdelkhalek ER et al[19] as the parental education and socioeconomic status, which are closely intertwined, emerged as crucial factors in recognizing and interpreting the symptoms and signs of malignancies. Parental illiteracy and poor socioeconomic status can indeed be significant factors contributing to the delay in the diagnosis of childhood malignancies. Illiterate parents may have limited access to health information and resources, making them less aware of the early signs and symptoms of childhood malignancies. Families with low socioeconomic status often face financial barriers to accessing healthcare services. They may lack health insurance or the means to afford medical consultations, diagnostic tests, or transportation to healthcare facilities. As a result, they may delay seeking medical attention for their children. Furthermore, in some cultures, there is a strong belief in traditional or alternative healing methods. Families may initially seek these treatments, assuming that they will address the child's symptoms. This can lead to delays in seeking medical attention from conventional healthcare providers. Due to several limitations, relatively small sample size, which can affect the generalizability of the findings and lack of a control group for comparison makes it challenging to assess the true impact of the identified factors. However further larger scale comprehensive case control studied would provide a more representative picture of the factors influencing diagnosis delays.

Conclusion

Delay in diagnosing childhood cancer is a complex issue influenced by several interconnected factors. limitations in access to healthcare facilities, poor socioeconomic status, misdiagnosis, and transportation difficulties make it challenging for families to seekek timely medical care for their children. Furthermore, alternative treatments, driven by cultural beliefs or mistrust in conventional medicine, can divert children away from essential early interventions. Addressing these multifaceted issues is paramount in the collective effort to improve the early detection of childhood cancer. Initiatives aimed at improving healthcare infrastructure and accessibility, especially in underserved areas, can help mitigate geographic barriers.

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