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ORIGINAL RESEARCH ARTICLE

Investigating Factors Associated with Delays in Referral, Diagnosis, and Treatment of Patients with Cancer in Reference Oncology Hospitals in West Azerbaijan Province

Sahar Mehranfar[1], **Atefeh Parvishi**[2], **Mohammad Heidari**[3], **Leila Ravanyar**[4]

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Abstract

Background Cancer is a complex condition that requires a multidisciplinary approach to achieve timely diagnosis and treatment. Early initiation of treatment is essential for improving clinical outcomes. This study aimed to identify and analyze the factors associated with delays across the cancer care pathway in reference oncology hospitals in West Azerbaijan Province.

Methods This cross-sectional study included 74 parents of pediatric patients and 212 adult patients diagnosed with different types of cancer. Data were collected through structured questionnaires and in-person interviews after obtaining informed consent.

Results The main factors contributing to delays in initiating treatment were high treatment costs, poor perceived prognosis, fear of treatment, religious or superstitious beliefs, limited family support, preference for herbal or traditional remedies, and prolonged turnaround time for pathology reports.

Conclusion Improving public education regarding early cancer symptoms, strengthening communication and collaboration between healthcare providers and the health system, and ensuring patients receive adequate and comprehensible information may enhance timely care-seeking and support patients' long-term adherence to treatment.

Keywords Cancer, Delayed diagnosis, Early diagnosis, Neoplasms, Treatment delay

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✉ Sahar Mehranfar
dr_ sahar21@yahoo.com

1. Department of Immunology and Genetics, Faculty of Medicine, Urmia University of Medical Sciences, Urmia, Iran
2. Student Research Committee, Faculty of Medicine, Urmia University of Medical Sciences, Urmia, Iran
3. Department of Epidemiology and Biostatistics, Urmia University of Medical Sciences, Urmia, Iran
4. Social Determinants of Health Research Center, Clinical Research Institute, Urmia University of Medical Sciences, Urmia, Iran

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1 Introduction

Cancer is one of the leading causes of morbidity and mortality worldwide, and timely diagnosis and treatment are critical for improving patient outcomes. In 2022, approximately 20 million new cases and 9.7 million cancer-related deaths were reported globally.[1] The growing burden of cancer is largely driven by population aging, population growth, and the increased prevalence of modifiable risk factors associated with lifestyle-related diseases.[2-4] In Iran, the estimated cancer incidence in 2020 was 152.7 per 100,000 population, placing the country among intermediate-risk regions.[5,6] Cancer is currently the third leading cause of death in Iran, after cardiovascular diseases and injuries, similar to many countries where it follows only cardiovascular diseases.[7, 8]

Cancer imposes substantial psychological, social, and economic burdens on patients and their families, often resulting in disability and placing significant pressure on healthcare systems. Although advances in screening have facilitated earlier detection and improved survival, many patients continue to present at advanced stages due to delays occurring at different points along the care pathway. These delays generally arise from two main categories of barriers: patient-related factors, such as limited awareness of early symptoms and postponement of medical consultation, and healthcare system factors, including challenges in making timely diagnoses due to nonspecific symptoms or restricted diagnostic capacity.[9-12]

Given these challenges, the present study focuses on reference oncology hospitals in West Azerbaijan Province to identify factors contributing to delays across the cancer care continuum. By examining referral patterns, diagnostic processes, and the time to treatment initiation, this study aims to highlight actionable bottlenecks that impede timely care. Our approach integrates patient demographics, healthcare access characteristics, and system-level inefficiencies to provide a comprehensive regional assessment.

Although delays in cancer care have been investigated both globally and within Iran, evidence from West Azerbaijan, considering its unique sociodemographic profile and distribution of oncology services, remains limited. To address this gap, the present study offers, to our knowledge, the first systematic assessment in the province to concurrently examine patient- and system-level determinants of delays at all three stages: referral, diagnosis, and treatment. The findings are expected to support policymakers and healthcare providers in streamlining cancer care pathways and improving patient outcomes in the region.

2 Methods

Study Design and Participants

This cross-sectional study was conducted from 2019 to 2023 and included patients, as well as parents of pediatric patients, referred for cancer diagnosis or treatment at Imam Khomeini, Omid, and Shahid Motahari hospitals in Urmia. A total of 400 individuals were enrolled, comprising 200 adult patients and 200 pediatric patients (represented by their parents).

Inclusion and Exclusion Criteria

Eligible participants were individuals who had been referred to, or instructed to visit, the participating hospitals for initial cancer diagnosis or treatment. Patients who were unwilling to participate in interviews or who had received diagnosis or treatment outside the country were excluded. Parents who declined participation or provided incomplete or inaccurate information were also excluded.

Sampling Method and Sample Size

Participants were selected using a convenience sampling method from patients attending the three oncology hospitals during the study period. The final sample size of 400 individuals was determined based on preliminary calculations assuming a 95 percent confidence level, 80 percent statistical power, and an expected prevalence of delays of approximately 50 percent.

Data Collection

Data were collected using structured questionnaires administered through in-person interviews. The questionnaire included items on demographic characteristics, socioeconomic status, referral patterns, and reasons for delays. Content validity was confirmed by a panel of oncology and epidemiology experts, and reliability was assessed in a pilot study of 30 participants, yielding a Cronbach's alpha of 0.82. All interviews were conducted by trained research assistants with healthcare backgrounds. Each interview lasted approximately 20 to 30 minutes.

Delays in the cancer care pathway were defined using standardized operational criteria. A referral delay was considered to have occurred when more than 30 days elapsed between the onset of symptoms and the patient's first visit to a physician. A diagnostic delay was defined as an interval exceeding 30 days between the initial physician visit and the establishment of a confirmed diagnosis. A treatment delay was recorded when more than 14 days passed between the confirmed diagnosis and the initiation of treatment.

The collected data were used to examine factors associated with delays across the cancer care pathway.

Variables analyzed included age, sex, occupation, place of residence, income, distance to healthcare facilities, insurance status, education level, number of children, and reported reasons for delay.

Statistical Analysis

Data were analyzed using SPSS software version 19.0 (IBM Corporation, Armonk, NY, USA). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic characteristics. Chi-square tests were applied to assess associations between categorical variables (e.g., sex, residence, occupation) and delays in referral, diagnosis, or treatment. Independent-samples t-tests were used to compare continuous variables, such as age, between groups with and without delays.

3 Results

Participants

Of the 400 patients initially recruited, 286 were included in the final analysis. Exclusions resulted from incomplete questionnaires (n = 45), refusal to continue participation (n = 39), and missing clinical data (n = 30). The analytic sample consisted of 212 adults and 74 children.

Baseline Characteristics

The mean age of adult participants was 57.7 years (range 14 to 91), while the mean age of pediatric participants was 7.6 years (range 1 to 16). Among adults, 53 percent were female, and nearly all participants were insured. Table 1 presents the demographic distribution of adults and children.

Most participants had insurance coverage, and a larger proportion of children lived in urban areas and closer to oncology centers compared with adults. These differences may partly explain the shorter referral delays observed in the pediatric group. Among adults who identified a primary reason for delay (N = 174), treatment phobia was the most frequently reported factor at 59.8 percent (104/174; 95 percent CI, 52.3 to 66.8), followed by lack of family support at 19.5 percent (34/174; 95 percent CI, 14.3 to 26.1) and high treatment costs at 8.0 percent (14/174; 95 percent CI, 4.9 to 13.1). Among children (N = 13), delayed pathology results were predominant at 84.6 percent (11/13; 95 percent CI, 57.8 to 95.7), while lack of family support and high treatment costs were each reported by 7.7 percent (1/13; 95 percent CI, 1.4 to 33.3).

Adult-specific characteristics

Table 2 summarizes the socioeconomic and reproductive characteristics of adult participants. Nearly half of adults were illiterate, and more than half of families had four or more children. Among women, early marriage was common, with the majority reporting marriage before the age of 20, reflecting cultural norms in the region. These findings suggest that low educational attainment and early marriage may influence health-seeking behavior and contribute to delays in accessing cancer care.

Table 1 Demographic characteristics of participants

Characteristics		**Adult** **N(%)**	**Children** **N(%)**
Gender	Male	92 (43.4)	42 (56.8)
	Female	120 (56.6)	32 (43.2)
Insurance	Yes	205(97.6)	71(100)
	No	5(2.4)	0
Living place	Rural	89(42)	22(29.7)
	Urban	123(58)	52(70.3)
Distance	5 km<	106(50)	53(71.6)
	5-15 km	31(14.6)	11(14.9)
	>5 km	75(35.4)	9(12.2)
Household income status	Yes	164(77.4)	21(80.7)
	No	37(22.6)	5(19.23)
Visit	Before Diagnosis	210(54.1)	74(50)
	After Diagnosis	208(45.9)	74(50)
Referral Delay	< 2 weeks	45(21.3)	45(60.8)
	> 2 weeks	74(35.1)	12(16.2)
	> 1 month	70(33.2)	14(18.9)
	> 3 months	22(10.4)	3(4.1)
Diagnosis Delay	< 2 weeks	23(10.9)	38(51.4)
	> 2 weeks	56(26.5)	17(23)
	> 1 month	79(37.4)	14(18.9)
	> 3 months	53(25.1)	5(6.8)
Treatment Delay	< 2 weeks	50(23.9)	58(78.4)
	> 2 weeks	20(9.6)	7(9.5)
	> 1 month	89(42.6)	8(10.8)
	> 3 months	50(23.9)	1(1.4)
Delay Reason	Lack of family support	34(19.5)	1(7.7)
	High treatment costS	14(8)	1(7.7)
	Delay in Pathology results	5(28.7)	11(84.6)
	Treatment phobia	104(59.8)	-
	Poor PrognosiS	6(3.4)	-
	Religious or Superstitious BeliefS	2(1.1)	-
	Use of Herbal Medicines	9(5.2)	-

Percentages and 95% CIs are calculated among respondents who reported a primary reason for delay; totals may not equal 100% due to rounding or missing data

Table 2 Adult participants: demographic and reproductive characteristics

Parameter	Category	Number (%)
Education level	Illiterate	98 (46.2)
	High-school	74 (34.9)
	College education	39 (18.4)
Number of children	No child	4 (2.1)
	1 to 3 children	82 (38.7)
	>3 children	126 (59.4)
Occupation	Unemployed	107 (51.2)
	Employee	28 (13.4)
	Farmer	35 (16.7)
	Others	42 (19.8)
Age at menarche	<20	47 (44.8)
	20-40	58 (55.2)
Age at marriage	Single	0
	< 20	69 (55.6)
	20-30	52 (41.9)
	> 30	3 (2.4)

Variables only applicable to female participants. Some totals may not equal 212 due to missing data.

Delays in referral, diagnosis, and treatment

Overall, treatment phobia was the most frequently reported cause of delay among adults, whereas delayed pathology results were the predominant cause of delay among children. Table 3 presents associations between demographic factors and delays at different stages of the cancer care pathway.

In adults, sex and occupation were significantly associated with treatment delays, and both age and number of children were related to reported reasons for delay. Among children, place of residence and parental occupation were significantly associated with referral and diagnostic delays. These findings indicate that the determinants of delay differ between adults and children, highlighting the need for age-specific and context-specific interventions to improve timely cancer care.

4 Discussion

The findings of this study demonstrate substantial delays in the referral, diagnosis, and treatment of cancer patients in West Azerbaijan Province, Iran. These delays have important implications for patient outcomes and are influenced by a combination of demographic, cultural, and systemic factors. While consistent with global evidence, the results also highlight region-specific challenges in cancer care, underscoring the need for tailored interventions within West Azerbaijan.

Delays in cancer diagnosis and treatment often result in late-stage presentation, limiting therapeutic options and reducing survival rates. Consistent with studies conducted in Ethiopia and Malaysia, adults in this study were more likely than children to experience prolonged diagnostic delays. This pattern may be explained by socioeconomic constraints, occupational responsibilities, and limited awareness of early cancer symptoms. In contrast, children are more promptly brought to care due to parental vigilance, emphasizing the role of both patient- and system-related factors in shaping delays.[13-15]

Previous research, including Neal et al., has highlighted patient-related barriers such as poor symptom recognition, delayed healthcare-seeking behavior, and socioeconomic limitations, alongside systemic barriers including restricted access and inefficient referral processes. Our findings align with these observations, but extend the discussion by identifying treatment phobia and lack of family support as particularly prominent factors among adults in West Azerbaijan. Additionally, cultural reliance on herbal remedies emerged as a unique regional contributor to delays, suggesting that psychological and cultural factors can be as influential as structural barriers and should be addressed in intervention strategies.[16]

Similarly, Khaliq et al. reported that low awareness, misinformation, cultural stigma, and reliance on non-specialist providers contributed to delayed care in Pakistan. Our findings reflect a similar pattern, particularly

Table 3 Association between demographic factors and delays in cancer care (adults and children)

Parameters	Delay in Adults (χ^2 test, p)				Delay in Children (χ^2 test, p)			
	Referral	Diagnosis	Treatment	Cause	Referral	Diagnosis	Treatment	Cause
Age	0.468	0.073	0.374	*0.027	0.157	0.204	0.297	0.495
Sex	0.328	0.159	*> 0.001	*0.006	0.135	0.621	0.823	0.478
Occupation	0.964	0.122	0.054	*0.001	*0.044	*0.023	0.756	0.225
Living Place	0.564	0.575	0.21	0.144	*0.006	0.363	0.2	0.252
Income	0.402	0.341	0.083	0.084	0.632	0.083	0.635	0.386
Distance	0.873	0.535	0.107	0.281	0.476	0.49	0.615	0.252
Insurance	0.607	0.152	0.218	0.154	-	-	-	-
Education	0.29	0.859	0.289	0.454	-	-	-	-
Number of children	0.959	0.297	0.594	*0.037	-	-	-	-

Values marked with a star (*) indicate statistically significant associations ($p < 0.05$).
"–" indicates variables not applicable or not assessed in children.

regarding the use of herbal medicine prior to seeking formal oncological care. These results emphasize the importance of public health initiatives aimed at raising cancer awareness, reducing stigma, and strengthening referral pathways in the province.[17]

Systemic barriers also played a significant role in delaying care. In children, delayed pathology results were the most critical factor, whereas limited access to specialized care affected both adults and children, especially those residing in rural areas. Comparable challenges have been documented in India and Nigeria, where limited healthcare infrastructure and reliance on traditional medicine prolonged the cancer care pathway. These findings highlight the urgent need to improve diagnostic infrastructure and ensure equitable access to specialized oncology services in West Azerbaijan.[18,19]

Comparison between adults and children reveals distinct patterns of delay. Adults are primarily affected by psychological barriers, including denial, fear of treatment, and lack of family support, often compounded by financial and occupational pressures. Children benefit from parental vigilance, which reduces referral delays, but they remain vulnerable to systemic barriers such as misdiagnosis and delays in pathology reporting. Cultural reliance on alternative medicine affects both groups, though adults are more likely to postpone formal treatment because of these beliefs. These observations underscore the need for age-specific interventions, including psychosocial support and counseling for adults, and improved diagnostic accuracy and pathology services for children.[20,21]

The adverse consequences of delays in cancer care are profound, leading to reduced survival, limited treatment options, and diminished quality of life. In our study, adults frequently presented at more advanced stages, consistent with evidence that late diagnosis reduces the effectiveness of surgery, radiation, and chemotherapy. Among children, delays in pathology reporting can postpone the initiation of treatment, which is particularly detrimental in rapidly progressing pediatric cancers. These findings align with Dang-Tan et al., who reported that prolonged diagnostic delays significantly reduce treatment success in pediatric oncology.[22]

5 Conclusion

This study highlights the multi-dimensional nature of delays in cancer care in West Azerbaijan. Adults are primarily affected by psychological barriers such as treatment phobia and lack of family support, whereas children are mainly impacted by systemic delays, particularly pathology reporting. Interventions should prioritize psychosocial support and counseling for adults and enhanced diagnostic and laboratory infrastructure for children. Broader strategies, including public awareness campaigns, streamlined referral pathways, and strengthened healthcare infrastructure, are essential to reduce delays and improve cancer outcomes in the region.

Declarations

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Artificial Intelligence Disclosure

Artificial intelligence was not used in this research project.

Authors' Contributions

Sahar Mehranfar contributed to conceptualization, methodology, validation, data analysis, project management, and writing, review, and editing. Atefeh Parvishi was involved in conceptualization, methodology, validation, analysis, investigation, and writing, review, and editing. Mohammad Heidari contributed to conceptualization, methodology, validation, analysis, supervision, and writing, review, and editing. Leila Ravanyar participated in conceptualization, methodology, validation, analysis, data management, and writing, review, and editing.

Availability of Data and Materials

The authors are willing to make the data underlying this study available to other researchers upon reasonable request.

Conflict of Interest

The authors declare that there is no conflict of interests associated with this manuscript.

Consent for Publication

Not applicable.

Ethical Considerations

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The present study has been approved by the Student Research Committee of Urmia University of Medical Sciences with code (IR.UMSU.REC.1398.324). Participants were informed about the purpose and necessity of the research before the interview and written informed consent was obtained from all participants.

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