Original Article

Factors Associated with Delay from Diagnosis to Treatment Initiation among Patients with Head & Neck Cancer at a Tertiary Care Hospital in Karachi, Pakistan

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ABSTRACT

Objective: Timely initiation of treatment is essential for improving outcomes among patients with head and neck cancer (HNC). Delays between diagnosis and treatment initiation may adversely affect disease progression, treatment efficacy, and survival. This study aimed to identify factors associated with delay from diagnosis to treatment initiation among patients with head and neck cancer presenting to a tertiary care hospital in Karachi, Pakistan.

Methodology: A prospective observational cross-sectional study was conducted at the Department of Otolaryngology-Head and Neck Surgery, Aga Khan University Hospital, Karachi, Pakistan, from July 2021 to July 2022. A total of 155 adult patients with histopathologically confirmed head and neck carcinoma were enrolled using a non-probability consecutive sampling technique. Of these, 142 patients were managed with surgery, while 13 patients were managed with chemoradiation as the definitive primary treatment modality. Data regarding sociodemographic characteristics, clinical variables, and potential factors contributing to treatment delay were collected. The diagnosis-to-treatment interval (DTI) was defined as the time from histopathological confirmation of head and neck cancer to the initiation of definitive primary treatment, either surgery or chemoradiation/Radiotherapy (CRT/RT). Descriptive statistics were computed, while Chi-square and independent sample t-tests were used for univariate analyses. Multivariable logistic regression analysis was performed to identify factors independently associated with treatment delay. A p-value <0.05 was considered statistically significant.

Results: The mean age of participants was 50.8 ± 14.5 years, and 111 (71.6%) were male. Treatment delay was observed in 128 (82.6%) patients. The median diagnosis-to-treatment interval was 4 weeks (IQR: 2–12 weeks), while the mean interval was 11.2 ± 14.5 weeks. Univariate analysis demonstrated significant associations between treatment delay and quality of counselling (p=0.022), alcohol use (p=0.029), and seeking alternative treatment modalities (p=0.033). Among patients with treatment delay, inadequate quality of counselling was the most frequently reported reason in both surgical and concurrent chemoradiotherapy groups. Multivariable logistic regression revealed that adequate counselling was independently associated with lower odds of treatment delay (AOR=0.23, 95% CI: 0.06-0.86; p=0.029). Seeking alternative treatment modalities showed a borderline association with delayed treatment initiation (AOR=8.27, 95% CI: 0.99-69.29; p=0.051). No significant associations were observed for age, marital status, financial constraints, or alcohol use.

Conclusion: Treatment delay was highly prevalent among patients with head and neck cancer. Inadequate counselling emerged as the only independent associate of delayed treatment initiation. Strategies aimed at improving physician-patient communication and counselling may facilitate timely initiation of treatment and improve oncologic outcomes.

KEY WORDS: Head and Neck Neoplasms; Treatment Delay; Diagnosis-to-Treatment Interval; Counseling; Pakistan; Health Services Accessibility.

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INTRODUCTION

Cancer remains one of the leading causes of morbidity and mortality worldwide despite substantial advances in diagnosis and treatment modalities.[1] Head and neck cancer (HNC) is among the most common malignancies globally, accounting for approximately 890,000 new cases and over 450,000 deaths annually.[2] Timely delivery of cancer care has emerged as an important indicator of healthcare quality, and reducing delays in diagnosis and treatment has become a priority in improving oncologic outcomes.[3,4]

Several factors contribute to delays in the management of HNC. Tumors arising in anatomically concealed regions or those producing nonspecific symptoms may remain undetected for prolonged periods, resulting in delayed presentation and diagnosis.[5,6] Consequently, symptom characteristics often influence healthcare-seeking behavior, with certain symptoms such as hoarseness associated with longer delays, whereas the presence of a neck mass may prompt earlier medical consultation.[7] Furthermore, tumor site, symptom severity, and disease stage at presentation may influence the interval between diagnosis and treatment initiation.

In addition to patient-related factors, healthcare system factors may contribute significantly to treatment delays. Previous studies have reported considerable variation in the interval from diagnosis to treatment, ranging from a few days to several months.[6] Factors such as educational status, health literacy, access to healthcare services, availability of specialists, financial constraints, and institutional processes have all been implicated in delayed treatment initiation.[1,8] Increasing evidence suggests that prolonged diagnosis-to-treatment intervals are associated with tumor progression, stage migration, reduced treatment efficacy, and poorer survival outcomes.[3,9,10]

Although head and neck tumors are generally accessible to clinical examination, many patients present with advanced-stage disease because early symptoms are often subtle or overlooked.[11,12] Delays between diagnosis and initiation of definitive treatment may permit disease progression, potentially affecting treatment planning and prognosis. Kowalski and Carvalho demonstrated that prolonged delays may contribute to clinical upstaging and adverse outcomes in patients with HNC.[13] Understanding the factors associated with treatment delay is therefore essential for developing targeted interventions aimed at improving the timeliness of care and clinical outcomes.

The present study aimed to identify factors associated with delay from diagnosis to treatment initiation among patients with head and neck cancer presenting to a tertiary care hospital in Karachi, Pakistan.

METHODOLOGY

This prospective observational cross-sectional study was conducted at the Department of Otolaryngology–Head and Neck Surgery, Aga Khan University Hospital, Karachi, Pakistan, between July 2021 and July 2022. Ethical approval was obtained from the institutional ethics review committee prior to commencement of the study.

The sample size was calculated using OpenEpi version 3.01 by considering an anticipated prevalence of treatment delay of 54% based on a previous study by Tiwari et al., with a confidence level of 95% and an absolute precision of 5%, yielding a minimum required sample size of 155 patients.

Patients aged 18 years and older of either gender with histopathologically confirmed head and neck carcinoma were eligible for inclusion. Patients with recurrent disease and those who had received neoadjuvant chemotherapy or radiotherapy before definitive treatment were excluded.

The primary outcome was the diagnosis-to-treatment interval (DTI), defined as the duration between histopathological confirmation of malignancy and initiation of definitive treatment. The cutoff point is the defined time limit used to assess whether the interval from diagnosis to treatment decision is within an acceptable or optimal range. For surgical treatment, the cutoff ranges from less than 1 week to a maximum of 16 weeks. For chemoradiation or radiation therapy, the cutoff ranges from less than 1 week to a maximum of 12 weeks. Therefore, delays beyond 16 weeks for surgery or 12 weeks for chemoradiation/radiation may be considered outside the optimal treatment-decision timeframe. This cutoff was selected based on previous literature demonstrating adverse oncologic outcomes associated with prolonged diagnosis-to-treatment intervals in head and neck cancer. Data were collected regarding potential factors associated with treatment delay, including educational status, financial constraints, lack of counseling regarding the disease, fear or denial of diagnosis, preference for alternative treatment methods, transportation difficulties, lack of family support, optimization of medical comorbidities, and unavailability of a surgeon. Treatment modality was categorized as surgical treatment or chemoradiation or radiation therapy (CRT/RT) based on the definitive treatment received by the patient. Alternative treatment modalities included consultation with traditional healers, use of herbal remedies, homeopathic treatment, spiritual healing, or other non-conventional therapies sought before initiation of definitive oncologic treatment.

Quality of counselling was assessed using a structured interviewer-administered questionnaire developed for the study. Patients were asked whether they had received adequate information regarding the nature of the disease, treatment options, expected outcomes, and consequences of treatment delay. Counselling was categorized as adequate when patients reported receiving sufficient information in all domains and inadequate when one or more domains were insufficiently addressed.

Table-I: Sociodemographic and Clinical Characteristics of Study Participants (N = 155).

Variable	*n (%)*
Age (years), mean ± SD	50.8 ± 14.5
Gender	
Male	111 (71.6)
Female	44 (28.4)
Education	
Illiterate	18 (11.6)
Primary education	25 (16.1)
Higher secondary	55 (35.5)
Graduate or above	57 (36.8)
Residence	
Urban	137 (88.4)
Rural	18 (11.6)
Marital status	
Married	141 (91.6)
Unmarried	13 (8.4)
Cigarette smoking	
Yes	46 (29.9)
No	108 (70.1)
Alcohol consumption	
Yes/Occasional	12 (8.2)
No	134 (91.8)
Regular doctor/dentist visits	
Yes	40 (27.0)
No	108 (73.0)
Initial impression regarding symptoms	
Benign problem	76 (51.7)
Possible cancer	30 (20.4)
Did not know	41 (27.9)
Initial healthcare provider	
General practitioner	83 (54.6)
ENT specialist	54 (35.5)
Dentist	9 (5.9)
Alternative healer	4 (2.7)
Stage at diagnosis	
Stage I	85 (56.7)
Stage II	24 (16.0)
Stage III	28 (18.7)
Stage IV	13 (8.7)
Quality of counselling inadequate	106 (68.4)
Financial constraints present	51 (32.9)
Sought second opinion	45 (29.0)
Fear regarding treatment	26 (16.8)
Transportation issues	16 (10.3)
Medical comorbidities	16 (10.3)
Sought alternative treatment modalities	32 (20.6)
Treatment delay present	128 (82.6)
Surgery	142 (91.6)
Chemoradiotherapy/ Radiotherapy(CRT/RT)	13 (8.4)

Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics were used to summarize demographic, clinical, and treatment-related characteristics. Continuous variables were presented as mean ± standard deviation (SD) or median with interquartile range (IQR), whereas categorical variables were summarized as frequencies and percentages. The diagnosis-to-treatment interval (DTI) was described using both mean and median values. Associations between categorical variables and treatment delay were assessed using the Chi-square test or Fisher's exact test, as appropriate, while independent sample t-tests were used for continuous variables. Variables demonstrating a p-value <0.20 in univariate analysis, along with clinically relevant covariates, were entered into a multivariable logistic regression model to identify factors independently associated with treatment delay. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported. A p-value <0.05 was considered statistically significant.

RESULTS

Patient Characteristics: A total of 155 patients with head and neck cancer were included in the study. The mean age of the participants was 50.8 ± 14.5 years, with ages ranging from 17 to 78 years. The majority of participants were male (111, 71.6%), married (141, 91.6%), and

residents of urban areas (137, 88.4%). Most patients had attained at least secondary education, with 57 (36.8%) being graduates and 55 (35.5%) having completed higher secondary education. The most common primary tumor sites were tongue squamous cell carcinoma (50, 32.3%) and buccal squamous cell carcinoma (46, 29.7%). At diagnosis, 85 (56.7%) patients presented with stage I disease, while 13 (8.7%) had stage IV disease. Regarding treatment modalities, the majority of patients underwent surgical treatment (142, 91.6%), whereas 13 (8.4%) patients received concurrent chemoradiotherapy (CRT/RT). Overall, treatment delay was observed in 128 (82.6%) patients, while only 26 (16.77%) initiated treatment without delay. The median diagnosis-to-treatment interval (DTI) was 4 weeks (interquartile range [IQR]: 2–12 weeks), whereas the mean DTI was 11.2 ± 14.5 weeks, with intervals ranging from 0 to 52 weeks. Inadequate counselling was reported by 106 (68.4%) patients, financial constraints by 51 (32.9%), and seeking alternative treatment modalities by 32 (20.6%) patients. Additionally, 45 (29.0%) patients sought a second opinion prior to treatment initiation. (Table-I).

Table-II: Univariate Analysis of Factors Associated with Treatment Delay.

Variable	*Delayed n (%)*	*Not Delayed n (%)*	*p-value*
Gender			0.309
Male	89 (80.2)	22 (19.8)	
Female	39 (88.6)	5 (11.4)	
Residence			0.674
Urban	112 (81.8)	25 (18.2)	
Rural	16 (88.9)	2 (11.1)	
Marital Status			0.175
Married	114 (80.9)	27 (19.1)	
Unmarried	13 (100)	0 (0)	
Cost and Financial Support			0.127
Financial constraints present	46 (90.2)	5 (9.8)	
No financial constraints	82 (78.8)	22 (21.2)	
Second Opinion			0.532
Yes	39 (86.7)	6 (13.3)	
No	89 (80.9)	21 (19.1)	
Regular Doctor/Dentist Visits			0.219
Yes	36 (90.0)	4 (10.0)	
No	86 (79.6)	22 (20.4)	
Alcohol Use			0.029*
Yes/Occasional	11 (100)	0 (0)	
No	109 (81.3)	25 (18.7)	
Quality of Counselling			0.022*
Adequate	46 (93.9)	3 (6.1)	
Inadequate	82 (77.4)	24 (22.6)	
Seeking Alternative Treatment Modalities			0.033*
Yes	31 (96.9)	1 (3.1)	
No	97 (78.9)	26 (21.1)	

Table-III: Association Between Treatment Modality and Treatment Delay

Treatment modality	*Delayed n (%)*	*Not delayed n (%)*	*Total n (%)*	*p-value*
Surgery	120 (84.5)	22 (15.5)	142 (91.6)	
CRT/RT	8 (61.5)	5 (38.5)	13 (8.4)	0.037*
Total	128 (82.6)	27 (17.4)	155 (100)	

Factors Associated with Delay in Treatment Initiation: Univariate analysis was performed to determine factors associated with delay in treatment initiation. Categorical variables were analyzed using the Chi-square test, whereas continuous variables were analyzed using the independent sample t-test.

Among the variables studied, quality of counselling (p = 0.022), alcohol use (p = 0.029), and seeking other treatment modalities (p = 0.033) were significantly associated with delayed treatment initiation. Quality of counselling and those who sought alternative treatment modalities were more likely to experience treatment delays. Patients undergoing surgery had a higher frequency of treatment delay compared with those receiving (CRT/RT) (84.5% vs. 61.5%). Specifically, treatment delay was observed in 120 of 142 patients (84.5%) undergoing surgery and in 8 of 13 patients (61.5%) receiving (CRT/RT). Pearson Chi-square analysis demonstrated a statistically significant association between treatment modality and treatment delay ($\chi^2 = 4.37$, p = 0.037); however, Fisher's exact test yielded a borderline non-significant result (p = 0.052), warranting cautious interpretation because of the small number of patients in the CRT/RT group.

No statistically significant associations were observed between treatment delay and age (p = 0.310), gender (p = 0.309), residence (p = 0.674), marital status (p = 0.175), stage at diagnosis (p = 0.526), cost and financial support (p = 0.127), obtaining a second opinion (p = 0.532), initial healthcare presentation (p = 0.411), and number of doctor/dentist visits (p = 0.219). The detailed results of the univariate analysis are presented in Table-II.

Association between treatment modality and treatment delay: Treatment delay was significantly more common among patients undergoing surgery than among those receiving chemoradiotherapy/radiotherapy (CRT/RT) (84.5% vs. 61.5%, p = 0.037). The association between treatment modality and treatment delay is shown in Table-III.

Reasons for treatment delay according to treatment modality among delayed patients: Among the 128 patients who experienced treatment delay, 120 (93.8%) underwent surgery while 8 (6.2%) received concurrent chemoradiotherapy (CRT/RT). In the surgery group, inadequate quality of counselling was the most frequently reported reason for treatment delay (75/120, 62.5%), followed by financial constraints (45/120, 37.5%), seeking a second opinion (37/120, 30.8%), and seeking alternative treatment modalities (29/120, 24.2%). Among patients receiving CRT/RT, inadequate quality of counselling was also the most common

Table-IV: Distribution of reported reasons for treatment delay according to treatment modality among patients with delayed treatment initiation (n = 128).

Reason for delay	*Surgery (n = 120) n (%)*	*CRT/RT (n = 8) n (%)*	*Fisher's exact p-value*
Inadequate quality of counselling	75 (62.5%)	7 (87.5%)	0.257
Financial constraints	45 (37.5%)	1 (12.5%)	0.257
Seeking a second opinion	37 (30.8%)	2 (25.0%)	1.000
Seeking alternative treatment modalities	29 (24.2%)	2 (25.0%)	1.000
Fear regarding treatment	21 (17.5%)	2 (25.0%)	0.634
Medical comorbidities	15 (12.5%)	0 (0.0%)	0.595
Transportation issues	14 (11.7%)	0 (0.0%)	0.597
Family doctor influence	7 (5.8%)	0 (0.0%)	1.000
Lack of family/moral support	6 (5.0%)	1 (12.5%)	0.371

Data are presented as n (%). Percentages are calculated within each treatment modality. Fisher's exact test was used because of the small number of patients receiving CRT/RT (n = 8).

Table-V: Multivariable Logistic Regression Analysis of Factors Independently Associated with Treatment Delay.

Variable	*Adjusted Odds Ratio (AOR)*	*95% CI*	*p-value*
Quality of counselling (Inadequate vs Adequate)	5.63	1.22–25.93	0.026*
Cost and financial support (Present vs Absent)	2.82	0.86–9.21	0.087
Seeking alternative treatment modalities (Yes vs No)	7.18	0.90–57.51	0.063
Age (per year increase)	1.00	0.97–1.04	0.953

reported reason (7/8, 87.5%), while seeking a second opinion, seeking alternative treatment modalities, and fear regarding treatment were each reported by 25.0% of patients. No statistically significant differences were observed in the distribution of delay-related factors between treatment modalities (all Fisher's exact p >0.05) (Table-IV).

Multivariate Logistic Regression Analysis: Variables with a p-value <0.20 in univariate analysis and clinically relevant covariates were entered into a multivariable logistic regression model. After adjustment, inadequate counselling remained independently associated with delayed treatment initiation. Patients reporting inadequate counselling had significantly higher odds of treatment delay (AOR = 5.63, 95% CI: 1.22–25.93; p = 0.026). Seeking alternative treatment modalities was associated with increased odds of treatment delay; however, this association did not achieve statistical significance in the adjusted model (AOR = 7.18, 95% CI: 0.90–57.51; p = 0.063). Financial constraints and age were not independently associated with treatment delay (p >0.05). Marital status and alcohol use were excluded from the final model because of sparse data resulting in model instability. The results of the multivariable logistic regression analysis are shown in Table-V.

DISCUSSION

The present study investigated factors associated with delay from diagnosis to treatment initiation among patients with head and neck cancer presenting to a tertiary care hospital in Karachi, Pakistan. The findings demonstrated that treatment delay was highly prevalent, with more than four-fifths (82.6%) of patients experiencing delayed initiation of treatment. This finding is concerning because prolonged diagnosis-to-treatment intervals in head and neck cancers have been consistently associated with disease progression, reduced survival, and poorer quality of life. Previous systematic reviews have similarly reported substantial treatment delays among patients with head and neck malignancies worldwide, emphasizing the need for interventions aimed at reducing such delays.[14,15]

A key finding of the present study was that quality of counselling emerged as the only independent associate of treatment delay. Patients who received adequate counselling had significantly lower odds of delayed treatment initiation. This finding underscores the importance of effective physician-patient communication in facilitating timely cancer care. Appropriate counselling enhances patients' understanding of disease severity, available treatment options, expected outcomes, and the consequences of postponing therapy. Poor communication and inadequate counselling may result in confusion, fear, mistrust, and indecision, ultimately delaying treatment initiation. Similar observations have been reported in previous studies, which identified patient education and counselling as essential components of efficient oncologic care pathways.[9,14]

Another important observation was the association between seeking alternative treatment modalities and treatment delay. Although this factor did not retain statistical significance after adjustment, patients who sought alternative therapies demonstrated substantially increased odds of delayed treatment initiation. The high adjusted odds ratio suggests that this factor may have important clinical implications. Previous studies have reported that utilization of complementary and alternative medicine frequently delays initiation of evidence-based oncologic treatment and may adversely affect outcomes. Kato and Neale demonstrated that patients pursuing alternative therapies were more likely to postpone conventional treatment.[16]

Among patients with delayed treatment initiation, inadequate quality of counselling was the most frequently reported reason for delay in both the surgery and CRT/RT groups. Financial constraints and obtaining a second opinion were additional commonly reported reasons among patients undergoing surgery. Although no statistically significant differences were observed between treatment modalities, these findings highlight the importance of strengthening pre-treatment counselling and improving patient navigation to address informational and financial barriers before treatment initiation. The small number of patients receiving CRT/RT limits definitive comparisons between treatment groups.[9,14,15]

Alcohol use was significantly associated with treatment delay in univariate analysis; however, the association disappeared after adjustment for potential confounders. This suggests that alcohol consumption may interact with other social and behavioral

determinants rather than independently influencing treatment delay. Similar inconsistencies have been observed in previous studies evaluating demographic and lifestyle factors associated with delayed treatment initiation.[7,11,12,14]

The present study also demonstrated an association between treatment modality and treatment delay, with patients undergoing surgery experiencing delays more frequently than those receiving CRT/RT. This finding may be attributable to the additional preoperative assessments, multidisciplinary consultations, operative scheduling, and perioperative optimization required before surgical intervention. In contrast, patients planned for CRT/RT may enter treatment pathways more rapidly once treatment decisions have been finalized. However, this association should be interpreted cautiously because of the relatively small number of patients receiving CRT/RT and the borderline significance observed on Fisher's exact testing. Previous studies have similarly reported that healthcare system factors and treatment pathways can substantially influence diagnosis-to-treatment intervals in patients with head and neck cancer.[9,14,15]

Interestingly, sociodemographic factors including age, gender, residence, and marital status were not significantly associated with treatment delay in the present study. Likewise, stage at diagnosis, financial constraints, and seeking second opinions were not independent associates of delay. These findings suggest that modifiable healthcare-related factors may exert a stronger influence on treatment initiation than demographic characteristics alone. Previous studies have similarly shown that healthcare system factors and care coordination frequently play a more important role than patient characteristics in determining treatment intervals in head and neck cancer.[6,7,14]

The findings of this study have important implications for clinical practice. Structured counselling programs, patient navigation services, and multidisciplinary educational interventions may improve patient understanding and facilitate earlier treatment initiation. Furthermore, public awareness campaigns addressing misconceptions regarding alternative therapies may reduce unnecessary delays in seeking definitive oncologic treatment.

Strengths & Limitations: The strengths of this study include the prospective collection of data, evaluation of multiple patient- and healthcare-related factors associated with treatment delay, and generation of local evidence regarding barriers to timely treatment initiation among patients with head and neck cancer in Pakistan. To our knowledge, this is among the few studies from the region to specifically evaluate factors influencing diagnosis-to-treatment intervals in head and neck malignancies. The present study has several limitations also. First, the single-center design limits the generalizability of the findings to other healthcare settings. Second, the relatively small sample size and imbalance between delayed and non-delayed groups may have reduced statistical power and contributed to wide confidence intervals in regression analysis. Third, because of the observational design, causal relationships cannot be established. The small number of patients receiving concurrent chemoradiotherapy limited statistical comparisons between treatment modalities and reduced the power to detect significant differences. Despite these limitations, this study provides important local evidence regarding factors influencing treatment delays among patients with head and neck cancer in Pakistan.

CONCLUSION

Delayed treatment initiation was common among patients with head and neck cancer. Inadequate quality of counselling emerged as both an independent factor associated with treatment delay and the most frequently reported reason for delay across treatment modalities. Improving patient counselling, addressing financial barriers, and discouraging unnecessary delays related to second opinions or alternative treatment modalities may facilitate more timely initiation of definitive treatment.

Abbreviations:

DTI: Diagnosis to Treatment Initiation.
CRT/RT: Chemoradiotherapy/ Radiotherapy.

OPERATIONAL DEFINITIONS

Delay of Treatment: Time period from the point of biopsy result proving cancer till the start of treatment.

Diagnosis to Treatment Initiation (DTI): Duration in between the result from biopsy till the start of treatment.

Cigarette use: Number of cigarette packs used per day.

Stage at diagnosis: Clinical stage at diagnosis of lesion using TMN classification system.

Site of diagnosis: Head and Neck region (Oropharynx, Larynx, Thyroid, salivary glands, Oral Cavity and Hypopharynx)

Alternative Treatment Modalities: Consultation with traditional healers, use of herbal remedies, homeopathic treatment, spiritual healing, or other non-conventional therapies sought before initiation of definitive oncologic treatment.

DECLARATIONS

Ethics Approval and Consent to Participate: The study was approved by the Ethical Review Committee of Aga Khan University Hospital, Karachi, Pakistan (ERC No. 2021-5931-16847). Written informed consent was obtained from all participants before enrollment in the study.

Availability of Data and Materials: The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

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