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# Clinicopathological Correlation in Laryngeal Carcinoma — An Analysis of Demographics, Symptoms, and Histological Patterns

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***ABSTRACT***

***Introduction:*** *Laryngeal carcinoma is one of the most common head and neck cancers, making up about 30-40% of all head and neck cancers. Understanding the relationship between clinical and pathological features is essential for managing patients and determining their prognosis. This study aimed to look into the demographic factors, clinical signs, and tissue patterns of laryngeal carcinoma patients in Bangladesh.* ***Methods & Materials:*** *An observational cross-sectional study took place over six months, from March to September 2015, at Dhaka Medical College Hospital. The study included one hundred patients confirmed to have laryngeal carcinoma, selected using convenient and purposive non-randomized sampling. Data collection involved structured interviews, physical exams, and tissue analysis. Statistical analysis used SPSS v26 for descriptive statistics, correlation analysis, and chi-square tests.* ***Results:*** *Most patients were male (92%) and aged 51-60 years (52%). A large number came from lower socioeconomic backgrounds (74%) and rural areas (73%). Supraglottic tumors were more frequent (66%) compared to glottic tumors (34%). The most common symptom was a change in voice (70%), followed by difficulty swallowing (50%) and breathing problems (44%). Most patients had moderately differentiated tumors (60%) and were at stage III (44%). A strong positive correlation appeared between histological grade and TNM stage ($r=0.62$, $p<0.05$).* ***Conclusion:*** *The study highlights a significant male predominance and rural prevalence of laryngeal carcinoma, which aligns with global trends. The strong link between histological differentiation and disease stage shows how important thorough pathological evaluation is for treatment planning and assessing prognosis.*

***Keywords:*** *laryngeal carcinoma, clinicopathological correlation, histological grading, TNM staging.*

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## INTRODUCTION

Laryngeal carcinoma is a major global health issue, making up about 1% of all cancers worldwide and 30-40% of head and neck cancers[1]. As the most common cancer seen in ear, nose, and throat (ENT) practice, laryngeal carcinoma shows significant geographical and demographic differences in incidence. The disease mainly affects people aged 65-74 years, but there are regional differences in age distribution. Concerns

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arise from reports of cases in children as young as 10 years old in Bangladesh, signaling a worrying trend toward early onset of this disease[2]. Globally, around 189,000 new cases of laryngeal carcinoma are diagnosed each year, making up 0.95% of all cancers, with especially high rates in South Asia, including Bangladesh and India[3]. There are marked regional differences, with age-standardized incidence rates ranging from 6.8 per 100,000 people in Australia to 2.1 per 100,000 in the United States. The lifetime risk also shows a clear gender gap, with males having a risk of 1 in 200 compared to 1 in 840 for females[4]. The causes of laryngeal carcinoma are varied, with tobacco and alcohol use being the leading risk factors. Recent research shows that up to 66% of patients with laryngeal squamous cell carcinoma were smokers, and nearly 75% had smoked for over 30 years before being diagnosed[5]. In Bangladesh, cancers related to tobacco account for 46% of all malignancies, and laryngeal cancer makes up a significant part of this due to high rates of smoking and smokeless tobacco use. Other risk factors include gastroesophageal reflux, workplace exposures, genetic factors, and local customs like chewing betel quid[6].Clinical symptoms can differ based on where the tumor is located within the larynx: supraglottic (16%), glottic (49%), or subglottic (5%). Common symptoms include hoarseness (especially noticeable in glottic tumors), difficulty swallowing, pain while swallowing, noisy breathing, and swollen lymph nodes in the neck[7]. Squamous cell carcinoma accounts for over 95% of laryngeal cancers, and the grading of the tumor (well-differentiated, moderately differentiated, or poorly differentiated) is a crucial factor for treatment planning and predicting outcomes. Getting an accurate diagnosis involves a thorough clinical assessment that includes flexible or rigid laryngoscopy, advanced imaging techniques (CT or MRI), and confirmation through tissue biopsy or fine-needle aspiration from regional lymph nodes. The TNM staging system is the standard for classifying the disease and provides important information for treatment choices and prognosis[8]. In developing countries like Bangladesh, laryngeal carcinoma poses unique challenges, such as late diagnosis, limited diagnostic resources, and social and economic barriers that impact access to treatment. According to GLOBOCAN 2022, laryngeal carcinoma leads to about 103,000 deaths each year, representing 1.1% of all cancer deaths worldwide, with a five-year prevalence of 583,868 cases[9,10]. This study aims to scrutinize the clinicopathological correlation in laryngeal carcinoma patients at a tertiary care center in Bangladesh. It will explore demographic characteristics, risk factors, symptoms, tumor location, histological grading, and staging to better understand disease patterns in South Asian populations and support evidence-based clinical practices.

## METHODS & MATERIALS

This observational cross-sectional study took place over six months, from March to September 2015, in the Department of ENT and Head Neck Surgery at Dhaka Medical College Hospital, Bangladesh. It included patients of all ages and both sexes diagnosed with laryngeal carcinoma. The initial sample size calculation, which used a standard formula with a 95% confidence level and a 5% margin of error, indicated that 1,536 participants were needed. However, due to time limits and the study's educational goals, only 100 cases were included. Participants were chosen through convenient and purposive non-randomized sampling methods. The inclusion criteria required a confirmed histopathological diagnosis of laryngeal carcinoma and written informed consent. Patients who did not provide consent were not included in the study. The operational definitions were as follows: smokers were those who smoked 2-3 cigarettes daily for 2-3 years, alcohol drinkers consumed at least one pack per day for the same period, and betel-nut/leaf chewers consumed one daily for 2-3 years. Income levels were categorized based on annual earnings, from very poor (≤$875/year) to rich (>$10,725/year). Data collection included structured face-to-face interviews with patients or their attendants conducted in Bangla, followed by thorough physical examinations and indirect laryngoscopy. All patients had their biopsy specimens examined histopathologically for tumor grading and TNM staging based on standard criteria. Statistical analysis was conducted using SPSS version 26. Cross-tabulations examined relationships between variables. Pearson correlation coefficient analysis assessed the strength and direction of associations between continuous and ordinal variables, such as age group, education level, tumor site, lesion type, vocal cord mobility, histological grade, TNM stage, and symptom duration. Chi-square tests evaluated the statistical significance of categorical associations. A p-value of less than 0.05 was deemed statistically significant. Ethical considerations included voluntary participation, written informed consent from all participants, and strict confidentiality. The institutional ethics committee approved the study protocol.

## RESULTS

The demographic analysis in Table I shows a clear male predominance, with 92% of patients being male and 8% female, resulting in a male-to-female ratio of 11.5:1. The age distribution reveals the highest incidence in the 51-60 years group at 52%, followed by the 41-50 years and 61-70 years groups at 18% each. Younger patients aged 24-40 years made up only 4% of cases, while elderly patients aged 71-80 years accounted for 8%. Socioeconomically, most patients belonged to lower-income groups (74%), with middle-class patients at 22% and those with higher status at 4%. The educational analysis showed high illiteracy rates at 64%, with primary education at 22%, secondary at 10%, and higher secondary or more at 4%. Rural patients outnumbered urban patients significantly (73% vs. 27%), indicating a greater disease burden in rural areas, likely linked to higher exposure to risk factors and delayed access to healthcare. [Table I].

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**Table – I: Distribution of Patients with Laryngeal Carcinoma Based on Basic Characteristics (*n*=100)**

| Basic Characteristics | (n) | (%) |
|---|---|---|
| **Age Distribution** | | |
| 24–40 | 4 | 4% |
| 41–50 | 18 | 18% |
| 51–60 | 52 | 52% |
| 61–70 | 18 | 18% |
| 71–80 | 8 | 8% |
| **Sex** | | |
| Male | 92 | 92% |
| Female | 8 | 8% |
| **Socioeconomic Status** | | |
| Lower | 74 | 74% |
| Middle | 22 | 22% |
| Higher | 4 | 4% |
| **Education Level** | | |
| Illiterate | 64 | 64% |
| Primary | 22 | 22% |
| Secondary | 10 | 10% |
| Higher Secondary & Above | 4 | 4% |
| **Residential Status** | | |
| Urban | 27 | 27% |
| Rural | 73 | 73% |

The clinical symptoms differ significantly between supraglottic and glottic tumors which is shown in Table II. Change of voice was the most common symptom at 70%, with both tumor sites contributing (supraglottic: 30, glottic: 40). Dysphagia was much more common in supraglottic tumors (45 vs. 5), reflecting the involvement of swallowing mechanisms. Respiratory distress occurred more frequently with supraglottic lesions (30 vs. 14), likely due to airway blockage from large tumors. Cough affected 36% of patients, with a relatively equal distribution between sites. Neck swelling was mostly linked to supraglottic tumors (22 vs. 2), indicating a higher likelihood of lymph node spread. Neck pain and hemoptysis were less common, affecting 6% and 4% of patients, respectively. [Table II].

**Table – II: Clinical Presentation by Tumor Site (*n*=100)**

| Symptom | Supraglottic | Glottic | Total | Percentage |
|---|---|---|---|---|
| Change of Voice | 30 | 40 | 70 | 70% |
| Respiratory Distress | 30 | 14 | 44 | 44% |
| Dysphagia | 45 | 5 | 50 | 50% |
| Cough | 20 | 16 | 36 | 36% |
| Neck Swelling | 22 | 2 | 24 | 24% |
| Neck Pain | 5 | 1 | 6 | 6% |
| Haemoptysis | 3 | 1 | 4 | 4% |

The analysis of symptom duration represented in Table III troubling delays in diagnosis. The largest group of patients (40%) had symptoms for 3-6 months before diagnosis, followed by 28% with symptoms lasting 1-3 months. One-fifth of patients (20%) experienced symptoms for 6-12 months, indicating significant delays in diagnosis. Equal proportions (6% each) presented within one month or after more than 12 months of symptom onset. [Table III].

**Table – III: Duration of Symptoms before Diagnosis (*n*=100)**

| Duration | (n) | (%) |
|---|---|---|
| <1 month | 6 | 6% |
| 1–3 months | 28 | 28% |
| 3–6 months | 40 | 40% |
| 6–12 months | 20 | 20% |
| >12 months | 6 | 6% |

Indirect laryngoscopy in Table IV demonstrated that supraglottic tumors were more common (66%) than glottic tumors (34%), with no subglottic cases found. The most common types of lesions were exophytic (58%), followed by ulcerative (32%) and fungating lesions (10%). This variety suggests different growth patterns with distinct clinical implications. Vocal cord movement assessment showed normal mobility in 40% of patients, while 26% experienced impaired movement (right: 6%, left: 14%). Fixed vocal cord movement was seen in 34% of patients (right: 20%, left: 14%), indicating advanced local disease with possible invasion of intrinsic laryngeal muscles or involvement of the cricoarytenoid joint. [Table IV].

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**Table – IV: Findings of indirect laryngoscopy (*n*=100)**

| Findings | (n) | (%) |
|---|---|---|
| **Region of involvement** | | |
| Supraglottic | 66 | 66% |
| Glottic | 34 | 34% |
| Sub-glottic | 0 | 0% |
| **Nature of lesion** | | |
| Exophytic | 58 | 58% |
| Ulcerative | 32 | 32% |
| Fungating | 10 | 10% |
| **Effect on vocal cord movement** | | |
| Mobile | 40 | 40% |
| Impaired movement | Right-06 | 12% |
| | Left-07 | 14% |
| Fixed vocal cord movement | Right-10 | 20% |
| | Left-07 | 14% |

The histopathological analysis in Table V showed that moderately differentiated carcinoma was the most common type, making up 60% of cases. Well-differentiated carcinoma accounted for 12% of cases, indicating better differentiation and a potentially favorable prognosis. Poorly differentiated carcinoma affected 24% of patients, suggesting that these tumors tend to be more aggressive. Undifferentiated carcinoma was the least common, representing 4%, and is known to be the most aggressive histological type. This distribution aligns with typical patterns for laryngeal carcinoma, where moderately differentiated tumors are most prevalent. The combined 28% of poorly differentiated and undifferentiated tumors suggests a link to more advanced cases and delayed diagnosis noted in this population. [Table V].

**Table – V: Histological grading of carcinoma larynx (*n*=100)**

| Degree of differentiation | (n) | (%) |
|---|---|---|
| Well differentiated | 12 | 12 |
| Moderately differentiated | 60 | 60 |
| Poorly differentiated | 24 | 24 |
| Undifferentiated | 04 | 04 |

The TNM staging analysis in Table VI denotes a pattern of advanced disease presentation. Most patients had Stage III disease (44%), followed by Stage II (32%) and Stage I (18%). Stage IV disease affected 6% of patients. This distribution indicates that 76% of patients had locally advanced disease (Stages III-IV), highlighting issues in timely diagnosis and possibly aggressive tumor biology. [Table VI].

**Table – VI: Different clinical stages of carcinoma larynx of study cases by TNM classification (*n*=100)**

| Stage of Carcinoma Larynx | (n) | (%) |
|---|---|---|
| Stage - I | 18 | 18 |
| Stage - II | 32 | 32 |
| Stage - III | 44 | 44 |
| Stage - IV | 06 | 06 |

**Table – VII(A): Pearson Correlation Coefficient (r-value) Matrix**

| Variable | Age Group | Sex | Education Level | Residence | Site | Lesion Type | Vocal Cord Mobility | Histological Grade | TNM Stage | Symptom Duration |
|---|---|---|---|---|---|---|---|---|---|---|
| Age Group | 1.00 | | | | | | | | | |
| Sex | 0.08 | 1.00 | | | | | | | | |
| Education Level | -0.12 | 0.03 | 1.00 | | | | | | | |
| Residence | -0.02 | 0.01 | 0.29 | 1.00 | | | | | | |
| Site | -0.06 | -0.05 | -0.12 | -0.13 | 1.00 | | | | | |
| Lesion Type | 0.01 | -0.01 | 0.04 | 0.02 | -0.08 | 1.00 | | | | |
| Vocal Cord Mobility | 0.01 | 0.04 | -0.09 | -0.05 | -0.12 | 0.11 | 1.00 | | | |
| Histological Grade | 0.03 | -0.02 | -0.04 | -0.11 | -0.14 | 0.06 | 0.05 | 1.00 | | |
| TNM Stage | 0.02 | 0.00 | -0.21 | -0.18 | -0.06 | 0.10 | 0.08 | 0.62 | 1.00 | |
| Symptom Duration | 0.01 | -0.01 | -0.14 | -0.12 | -0.03 | 0.02 | 0.03 | 0.44 | 0.50 | 1.00 |

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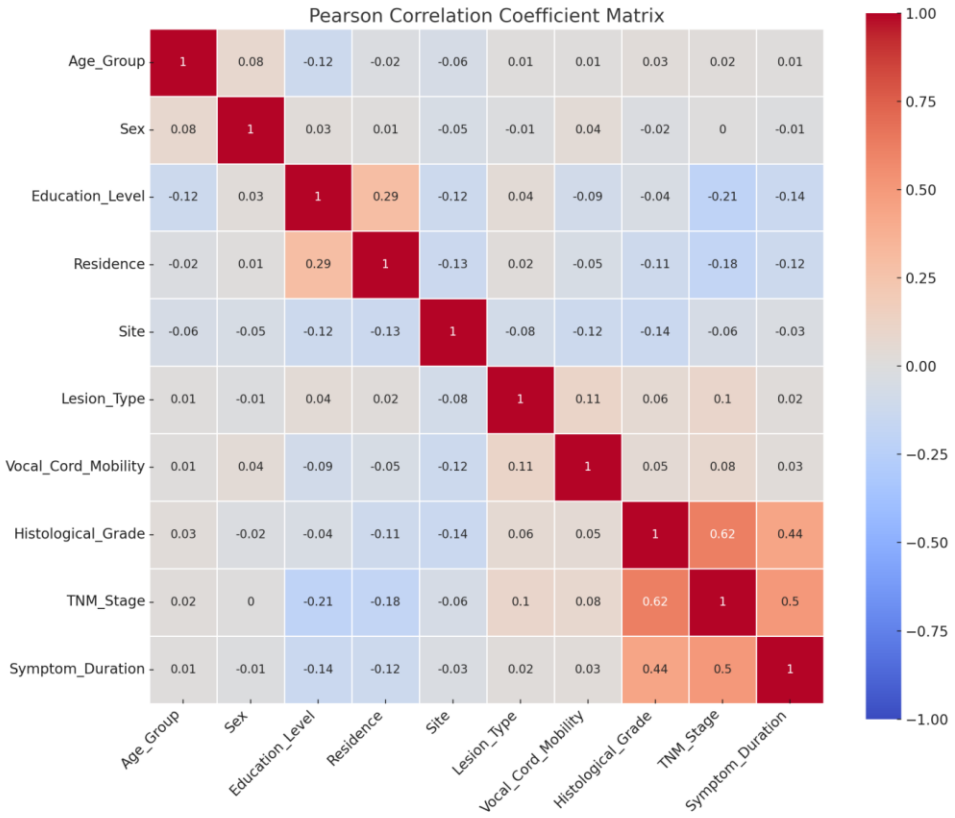



**Figure – 1: Pearson Correlation Coefficient Matrix**

This heatmap in Figure 1 visualizes the Pearson correlation coefficients among the variables in the study. Positive correlations are shown in blue, negative in red, and the intensity reflects the strength of the correlation. The Pearson correlation analysis in Tables VII(A) and VII(B) found several important relationships between study variables. The strongest positive correlation was between histological grade and TNM stage (r=0.62, p<0.05), showing that poorly differentiated tumors are closely linked to advanced cancer stages. Moderate positive correlations also existed between symptom duration and TNM stage (r=0.50) and between symptom duration and histological grade (r=0.44), indicating that longer delays in diagnosis relate to more advanced and aggressive disease. We noted weak negative correlations between education level and TNM stage (r=-0.21) and between residence and TNM stage (r=-0.18). [Tables VII(A) and VII(B)].

**Table – VII(B): Interpretation of Pearson Correlation Coefficient (r-value) Matrix**

| Variables Compared | r-value | Strength of Correlation | Direction | Interpretation |
|---|---|---|---|---|
| Histological Grade vs. TNM Stage | 0.62 | Strong | Positive | Higher histological grade (poor differentiation) is strongly associated with advanced cancer stage. |
| Symptom Duration vs. TNM Stage | 0.50 | Moderate | Positive | Longer symptom duration is moderately associated with a more advanced cancer stage. |
| Symptom Duration vs. Histological Grade | 0.44 | Moderate | Positive | Longer duration of symptoms tends to correlate with poorer histological differentiation. |
| Education Level vs. TNM Stage | -0.21 | Weak | Negative | Lower education is weakly associated with a more advanced cancer stage. |
| Residence vs. TNM Stage | -0.18 | Weak | Negative | Rural residence is weakly associated with more advanced disease. |
| Education Level vs. Symptom Duration | -0.14 | Weak | Negative | Lower education is slightly associated with longer symptom duration. |
| Site vs. Histological Grade | -0.14 | Weak | Negative | Supraglottic tumours show slightly poorer differentiation. |
| Vocal Cord Mobility vs. TNM Stage | 0.08 | Very Weak | Positive | Slight association between vocal cord impairment and higher stage. |
| Lesion Type vs. TNM Stage | 0.10 | Very Weak | Positive | Ulcerative/fungating lesions are slightly linked to a higher stage. |
| Age Group vs. TNM Stage | 0.02 | Negligible | Positive | Age has no meaningful correlation with stage. |

## DISCUSSION

This study provides valuable insights into the clinicopathological features of laryngeal carcinoma in the Bangladeshi population. It reveals patterns that both match and differ from global trends. The notable male dominance, with 92% of patients being male, is consistent with international data; however, it shows a greater gender imbalance than typically reported by Hay et al.[11]. A study by Huang et al. shows that laryngeal cancer makes up only 1% of total cancer cases, but consistently shows more cases in males across different populations[12]. This pattern likely results from higher exposure to primary risk factors, especially tobacco use, among men in our study group. The age distribution, with the highest incidence in the 51-60 years age group, differs from Western populations, where laryngeal cancer is most often diagnosed in individuals aged 65-74[13]. This earlier onset in our population may relate to earlier exposure to risk factors, genetic vulnerabilities, or environmental influences specific to South Asia. The high number of patients from lower socioeconomic backgrounds (74%) and rural areas (73%) underlines significant healthcare disparities, suggesting that social factors greatly impact disease occurrence and presentation[14]. The clinical presentation, showing predominance of supraglottic cases (66%) compared to glottic involvement (34%), is notable. The symptom profile indicates that voice changes are the most common presentation (70%), which aligns with laryngeal anatomy and function[15]. However, the high rates of swallowing difficulties (50%) and breathing issues (44%) suggest that patients present with more advanced disease compared to populations with earlier detection programs. Another concerning finding is the long duration of symptoms. Sixty percent of patients experienced symptoms for more than three months before their diagnosis[16]. This point to significant barriers to healthcare access. Such delays result in a high proportion of advanced-stage disease, with 76% of patients presenting at Stages III-IV. This rate is much higher than what is reported in developed healthcare systems[17]. The histopathological findings reveal that moderately differentiated carcinoma predominates (60%), which aligns with the existing literature pattern by Rakha et al.[18]. However, the relatively high number of poorly differentiated and undifferentiated tumors (28% combined) may reflect the advanced stage at which patients present. The strong positive correlation between histological grade and TNM stage ($r=0.62$, $p<0.05$) confirms the established link between tumor differentiation and disease progression, supporting the prognostic value of histopathological grading. The correlation analysis identifies significant relationships between demographic factors and disease characteristics. The negative correlation between education level and TNM stage ($r=-0.21$) suggests that health literacy and awareness may impact early detection and treatment-seeking behavior. Similarly, the link between rural living and advanced disease may highlight healthcare access challenges in rural areas. The high number of patients with vocal cord impairment or fixation (60%) indicates extensive local disease at the time of presentation, correlating with the advanced staging observed. This finding has major treatment implications, as vocal cord mobility is crucial in selecting treatment options and determining prognosis. These findings carry important clinical and public health implications. The late presentation indicates a need for better community awareness programs, improved healthcare access, and possibly screening initiatives for high-risk groups. The strong link between symptom duration and disease stage underscores the importance of quick evaluation and referral for patients with laryngeal symptoms.

### Limitations of the Study

The study's cross-sectional design and the use of convenience sampling could restrict how broadly the results apply. The sample size of 100 patients from one institution may not accurately reflect the wider population. Additionally, a study period of six months might have led to seasonal changes in patient presentation patterns.

## CONCLUSION

This study shows that laryngeal cancer in Bangladesh mainly affects men, accounting for 92%, and is more common in rural areas, at 73%. The highest number of cases is found in people aged 51 to 60. Most patients seek help when their disease is advanced, with 76% in Stages III-IV, after having symptoms for a long time. This condition primarily affects individuals from lower socioeconomic backgrounds who have little education. There is a strong link between histological differentiation and TNM stage, with a correlation of $r=0.62$ and $p<0.05$. This shows the importance of pathological grading for treatment planning. Supraglottic tumors are more frequent than glottic lesions, and a change in voice is the most common symptom. These findings highlight the urgent need for better early detection methods, greater access to healthcare, and thorough clinicopathological evaluations to improve patient outcomes in areas with limited resources.

## RECOMMENDATIONS

Future studies should focus on larger, prospective multicenter studies to confirm these findings in various populations. Community-based screening programs and health education initiatives should be assessed for their effectiveness in encouraging early detection. Long-term follow-up studies that look into treatment outcomes and survival patterns related to clinicopathological features are necessary to improve management strategies and patient outcomes.

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