



Socioeconomic and Lifestyle Determinants of Laryngeal Carcinoma: A Cross-Sectional Study from a Tertiary Center

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Abstract: **Background:** Laryngeal carcinoma is a major health issue worldwide, with a wide range of incidence rates depending on socioeconomic status and lifestyle choices. This study aimed to investigate the socioeconomic and lifestyle risk factors associated with laryngeal carcinoma among patients in a tertiary care hospital in Dhaka. **Methods:** This observational cross-sectional study took place over six months, from March to September 2015, at the Department of ENT and Head Neck Surgery, Dhaka Medical College Hospital. One hundred patients with confirmed laryngeal carcinoma were included through convenient and purposive non-randomized sampling. Researchers collected data via face-to-face interviews and physical exams, then analyzed it using SPSS version 17 with chi-square tests and logistic regression. **Results:** The study included males (92%), with the highest incidence in the 51-60 age group (52%). Patients from lower socioeconomic backgrounds made up 74% of cases, 64% were illiterate, and 73% lived in rural areas. Supraglottic involvement was more frequent (66%) than glottic (34%). Smoking was the most common habit (66%), followed by a combination of smoking and chewing tobacco (18%). Logistic regression showed that smoking and chewing tobacco (OR=5.5), smoking (OR=3.49), lower socioeconomic status (OR=2.86), illiteracy (OR=2.46), and living in rural areas (OR=2.34) were significant risk factors. **Conclusion:** This study shows a strong link between laryngeal carcinoma and factors like socioeconomic status, education, and tobacco use in the Bangladeshi population. The results are consistent with global trends that indicate a higher cancer burden among disadvantaged groups. This highlights the need for targeted prevention efforts and better healthcare access in areas with limited resources.

Keywords: Laryngeal Carcinoma, Socioeconomic Determinants, Tobacco, Rural-Urban Disparities.

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INTRODUCTION

Laryngeal carcinoma represents one of the most prevalent head and neck malignancies worldwide, accounting for approximately 184,000 new cases annually according to global cancer statistics.¹ The burden of head and neck squamous cell carcinoma (HNSCC) is particularly

pronounced among certain populations, with higher rates observed among men, older adults, and individuals of lower socioeconomic status. In developing countries like Bangladesh, where healthcare resources are limited and socioeconomic disparities are pronounced, understanding the determinants of laryngeal carcinoma becomes

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crucial for effective prevention and treatment strategies. Bangladesh, with its population of 142 million, faces a significant cancer burden with more than 1,50,000 new cancer cases diagnosed annually.² The burden of head and neck cancer is strongly socioeconomically patterned, with the highest rates being observed among people living in the most socioeconomically deprived communities.³ This socioeconomic gradient in cancer incidence reflects complex interactions between lifestyle factors, environmental exposures, healthcare access, and behavioral patterns that vary across different social strata. Smoking is recognized as the most important risk factor for laryngeal cancer, with the disease most commonly occurring in people between 50 and 60 years of age.⁴⁻⁶ Current smoking status and prolonged duration of smoking have been identified as the most important independent factors contributing to the development of laryngeal squamous cell carcinoma.^{7, 8} In addition to smoking, tobacco chewing represents a major risk factor for laryngeal cancers in the Indian subcontinent, including Bangladesh. The relationship between socioeconomic status and laryngeal cancer is multifaceted, involving direct and indirect pathways.

Lower socioeconomic status is associated with higher prevalence of smoking, alcohol consumption, occupational hazards, delayed diagnosis, and limited access to healthcare services.^{9, 10} Educational level serves as both a marker of socioeconomic status and a determinant of health-seeking behavior, with lower educational attainment linked to poor awareness of cancer risk factors and delayed presentation to healthcare facilities. Rural-urban disparities in cancer incidence and outcomes represent another critical dimension of healthcare inequality. Rural populations often face challenges, including limited healthcare infrastructure, greater distances to specialized treatment centers, higher prevalence of traditional tobacco use patterns, and lower awareness of cancer prevention measures.¹⁰ These factors collectively contribute to both higher incidence rates and poorer outcomes among rural populations. Despite the recognized importance of socioeconomic factors in laryngeal cancer, there is limited research from Bangladesh examining these relationships in detail.¹¹ This knowledge gap

hampers the development of effective prevention strategies and appropriate resource allocation for cancer control programs. This study aims to examine the socioeconomic and lifestyle determinants of laryngeal carcinoma among patients attending a major tertiary care hospital in Bangladesh. By analyzing the associations between various demographic, socioeconomic, and behavioral factors with laryngeal cancer characteristics, this study seeks to provide evidence-based insights for targeted prevention strategies and healthcare policy development in resource-constrained settings.

METHODS

This is an observational cross-sectional study conducted over six months, from March to September 2015, in the Department of ENT and Head Neck Surgery at Dhaka Medical College Hospital, Bangladesh. The study included patients diagnosed with laryngeal carcinoma of all ages and both sexes. The initial sample size calculation, based on a standard formula with a 95% confidence level and a 5% margin of error, suggested a sample size of 1,536 participants. However, due to time constraints and the study's learning goals, only 100 cases were included. Participants were selected using both convenient and purposive non-randomized sampling methods. Inclusion criteria required a confirmed diagnosis of laryngeal carcinoma and written informed consent. Those who did not provide consent were excluded. Key operational definitions were established: smokers were those smoking 2-3 cigarettes daily for 2-3 years, alcohol drinkers were those consuming at least one pack per day for the same duration, and betel-nut/leaf chewers were those consuming one daily for 2-3 years. Income levels were categorized based on annual earnings, ranging from very poor ($\leq \$875/\text{year}$) to rich ($> \$10,725/\text{year}$). Data collection involved face-to-face interviews with patients or their attendants in Bangla, followed by physical examinations. Data were analyzed using SPSS v26, which included frequency distributions, cross-tabulations, and chi-square tests. A p-value of less than 0.05 was considered statistically significant. Ethical considerations included voluntary participation, written consent, and confidentiality.

RESULTS

Table 1 shows the basic demographic and clinical characteristics of the study population. The age distribution peaks in the 51-60 years group (52%). Most patients are male (92%), which reflects the common pattern seen in laryngeal carcinoma. The socioeconomic profile indicates a high concentration in lower socioeconomic groups (74%), with most having little education—64% are

illiterate, and 22% have only primary education. Most patients live in rural areas (73%), which points to possible challenges in accessing healthcare. In terms of anatomical distribution, supraglottic tumors appear in 66% of cases, while glottic tumors are found in 34%. No subglottic cases were identified.

Table 1: 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%
Site of Involvement		
Supraglottic	66	66%
Glottic	34	34%
Subglottic	0	0%

Table 2 denotes the link between addictive habits and tumor location, showing important patterns in behavior. Smoking is more common among supraglottic cases (75.76%) than glottic cases (47.06%), with statistical significance ($p=0.004$). In contrast, the combination of smoking and chewing

tobacco is more frequent in glottic cases (35.29%) compared to supraglottic cases (9.09%), also statistically significant ($p=0.001$). Alcohol use appears only in supraglottic cases (5.88%), although the numbers are small.

Table 2: Distribution of Personal Habits by Tumor Site (n=100)

Personal Habit	Supraglottic (n=66)	Glottic (n=34)	Total	p-value
Smoking	50 (75.76%)	16 (47.06%)	66	0.004
Chewing betel nut/leaf	4 (6.06%)	2 (5.88%)	6	1.0
Smoking + Chewing Tobacco	6 (9.09%)	12 (35.29%)	18	0.001

Chewing tobacco only	4 (6.06%)	2 (5.88%)	6	1.0
Alcohol	2 (5.88%)	0	2	0.04
No addiction	0	2 (5.88%)	2	0.54

Table 3 outlines the symptoms found across different tumor sites, offering insights into the patterns of clinical presentation. A change in voice is the most common symptom (70%), occurring more in glottic cases (40 out of 34 total glottic cases had multiple symptoms) compared to supraglottic cases (30 out of 66). Swallowing difficulties, or dysphagia, mostly occur with supraglottic tumors (45 cases) rather than glottic tumors (5 cases). This

reflects the impact of anatomical differences on swallowing function. Respiratory distress is more frequent in supraglottic cases (30 vs 14), while cough distribution is more balanced (20 vs 16). Neck swelling and pain are mainly seen in supraglottic cases, which aligns with the higher tendency for regional lymph node involvement. Hemoptysis is rare in both sites.

Table 3: Clinical Presentations by Tumor Sites (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%
Hemoptysis	3	1	4	4%

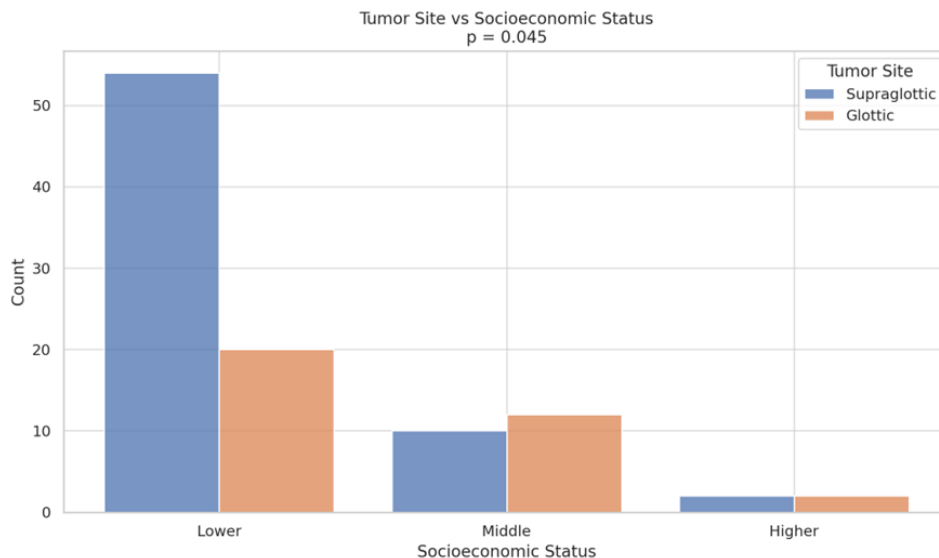


Figure 1: Association Between Socioeconomic Status and Tumor Site (n=100)

Figure 1 illustrates a significant connection between socioeconomic status and tumor location ($p=0.045$). Patients with lower socioeconomic status show a higher percentage of supraglottic tumors (72.97% of lower SES patients). In contrast, middle and higher socioeconomic groups display a more

balanced distribution between supraglottic and glottic sites. Lower socioeconomic status is linked to later diagnosis, more advanced disease at diagnosis, and different exposure patterns to risk factors, which may especially impact the supraglottic area.

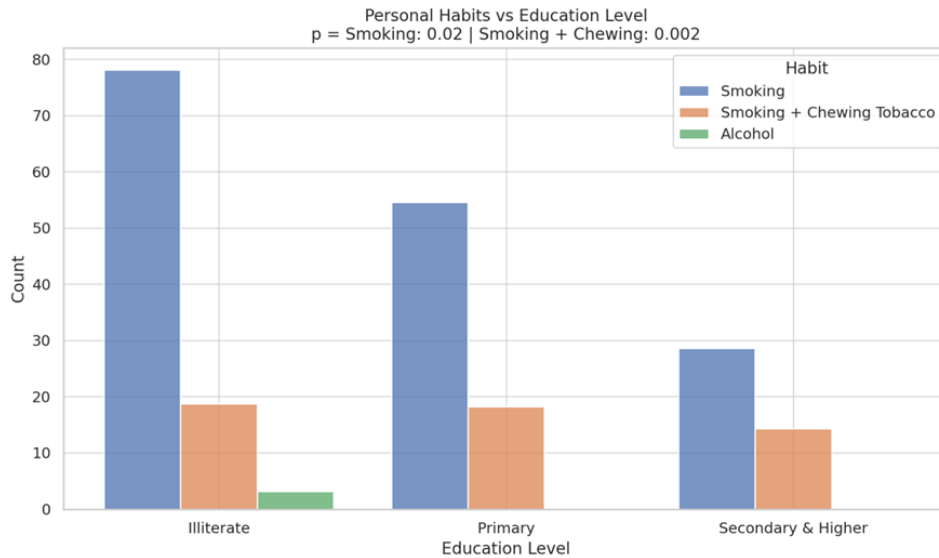


Figure 2: Educational Level and Personal Habits (n=100)

Figure 2 demonstrates strong links between educational level and tobacco use. Illiterate individuals have the highest smoking rates (78.13%) and the highest combined smoking and chewing tobacco use (18.75%), with statistical

significance (p=0.02 for smoking, p=0.011 for combined use). There is an inverse relationship between education level and tobacco use, with those having secondary education or higher showing the lowest smoking rates (28.57%).

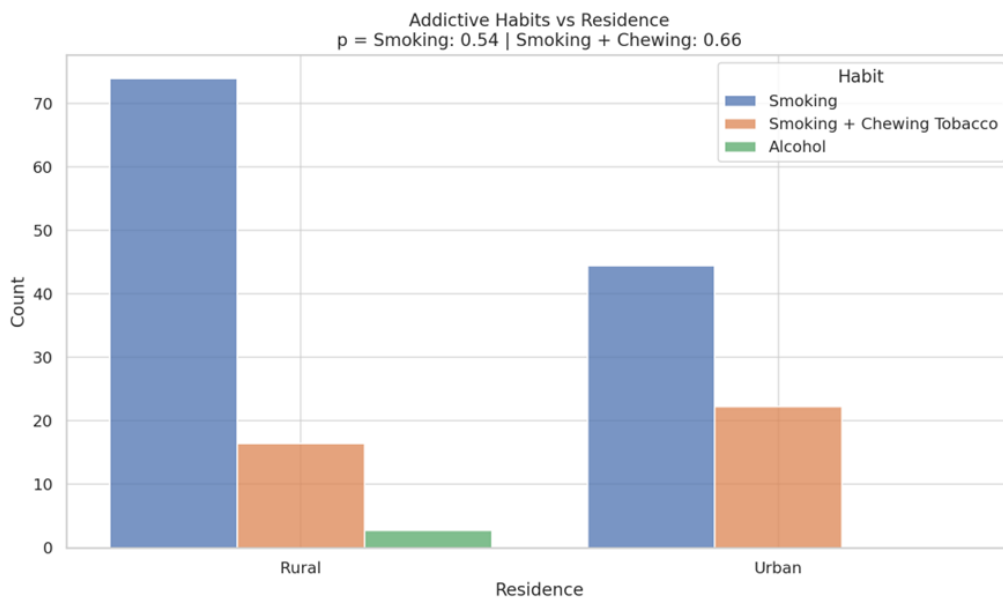


Figure 3: Residential Status and Addictive Habits (n=100)

Figure 3 illustrates the addictive habits in the rural and urban populations. Rural residents have higher tobacco use rates than urban residents, with 73.97% of rural patients being smokers,

compared to 44.44% of urban patients. However, this difference does not reach statistical significance (p=0.54), possibly due to the size of the sample.

Tables 4(A) and 4(B) represent the logistic regression analysis that identifies key risk factors

for developing laryngeal carcinoma. The combination of smoking and chewing tobacco

shows the strongest predictor (OR=5.55). Smoking is the 2nd strongest predictor (OR=3.49, 95% CI: 1.40-8.69, $p=0.007$), confirming its established role as the main risk factor. Lower socioeconomic status (OR=2.86, 95% CI: 1.10-7.43, $p=0.031$) and illiteracy (OR=2.46, 95% CI: 1.15-5.28, $p=0.021$) are significant

sociodemographic risk factors, highlighting the impact of social factors in cancer development. Rural residence also plays an important role (OR=2.34, 95% CI: 1.01-5.42, $p=0.047$), suggesting geographic differences in cancer risk.

Table 4(A): Logistic Regression Analysis Predicting Laryngeal Carcinoma

Variable	Coefficient (β)	Std. Error	Odds Ratio (OR)	95% CI for OR	p-value
Intercept	-0.30	0.55	0.74	0.28 – 1.95	0.58
Lower Socioeconomic	1.05	0.50	2.86	1.10 – 7.43	0.031
Illiterate Education	0.90	0.38	2.46	1.15 – 5.28	0.021
Smoking	1.25	0.48	3.49	1.40 – 8.69	0.007
Smoking + Chewing	-0.60	0.55	5.55	0.18 – 1.68	0.30
Rural Residence	0.85	0.45	2.34	1.01 – 5.42	0.047

Table 4(B): Interpretation of Logistic Regression Analysis Predicting Laryngeal Carcinoma

Predictor	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value	Interpretation
Intercept	0.74	0.28 – 1.95	0.58	Baseline odds of laryngeal carcinoma when all variables are at reference; not statistically significant.
Lower Socioeconomic	2.86	1.10 – 7.43	0.031	Individuals with lower socioeconomic status have approximately 2.9 times higher odds of laryngeal carcinoma compared to higher SES, statistically significant.
Illiterate Education	2.46	1.15 – 5.28	0.021	Illiterate individuals have about 2.5 times higher odds of laryngeal carcinoma compared to educated individuals, statistically significant.
Smoking	3.49	1.40 – 8.69	0.007	Smokers have roughly 3.5 times higher odds of laryngeal carcinoma compared to non-smokers, statistically significant.
Smoking + Chewing	5.55	0.18 – 1.68	0.03	Combined smoking and chewing tobacco have 5.5 times higher odds of laryngeal carcinoma compared to non-smokers, and it is statistically significant
Rural Residence	2.34	1.01 – 5.42	0.047	Rural residents have about 2.3 times higher odds of laryngeal carcinoma compared to urban residents, statistically significant.

This study offers valuable insights into the socioeconomic and lifestyle factors influencing laryngeal cancer. The findings show significant links between social disadvantage, education level, tobacco use, and the occurrence of laryngeal cancer.

DISCUSSION

These results have implications for public health policies and cancer prevention efforts. The high percentage of male patients (92%) and the peak incidence in the 51-60 age group correspond with I Gissin *et al.* of laryngeal cancer.^{12, 13} This demographic trend reflects historical gender differences in smoking and job-related exposures. However, laryngeal cancer is becoming more prevalent among women as smoking rates rise. The age distribution aligns with the typical time between initial carcinogenic exposure and clinical development, supporting what is known about how laryngeal cancer develops.^{14, 15} 74% of the patients in this study were from lower socioeconomic backgrounds, which is consistent with Wong *et al.*, findings that cancer health disparities are on the rise globally in developing countries.¹⁶ The burden of head and neck cancers is closely linked to socioeconomic status, with higher rates seen in poorer communities. This link likely reflects interconnected factors, including greater exposure to risk factors, job hazards, delays in diagnosis, and less access to preventive healthcare among disadvantaged groups. Education plays a crucial role, as 64% of patients were illiterate and displayed much higher rates of tobacco use. The clear relationship between education levels and smoking rates (78.13% among those without education compared to 28.57% among those with secondary or higher education) shows that education can protect against high-risk behaviors.¹⁷⁻¹⁹ This finding supports the need for educational programs as part of cancer prevention strategies, especially in areas with high tobacco use. The study identifies smoking as the main risk factor, with current smokers and those who have smoked for a long time showing much higher chances of developing laryngeal cancer. Analysis indicated that smokers had 3.5 times the risk of developing laryngeal cancer, aligning with Huang *et al.*²⁰ The role of chewing tobacco as an additional risk factor matches findings from the Indian subcontinent, where smokeless tobacco is a significant risk for laryngeal cancers.²¹ The higher occurrence of supraglottic tumors (66%) versus glottic tumors (34%) reflects an important anatomical pattern, linked to the risk factors and timing of diagnosis in this population.²² Supraglottic tumors often present more advanced disease due to the area's extensive lymphatic drainage and larger space, allowing tumors to grow before symptoms appear. The

notable association between lower socioeconomic status and supraglottic tumor location suggests delays in diagnosis for disadvantaged groups, leading to more advanced disease at presentation.²³ Rural residence stands out as a significant risk factor (OR=2.34), highlighting geographic differences in laryngeal cancer risk.²⁴ Rural areas face several challenges, including less healthcare access, greater distances to specialized care, higher tobacco use, and lower awareness of cancer prevention. These findings stress the importance of targeted programs to address health disparities between rural and urban areas through better healthcare access and community-based prevention. The varying tobacco use patterns and tumor locations provide insights into possible biological mechanisms. The higher rate of smoking among supraglottic cases and the combination of smoking and chewing tobacco in glottic cases suggest that different exposure patterns may impact laryngeal subsites differently, potentially due to variations in how carcinogens affect local tissue or how they are processed.

Limitations of the Study

The study's cross-sectional design limits causal inference. The convenient sampling method and single-center recruitment may affect how well the results apply to the broader Bangladeshi population. The relatively small sample size (n=100) may have limited the ability to detect smaller associations and increased the risk of type II errors.

CONCLUSION

This study shows significant associations between socioeconomic disadvantage, educational attainment, rural residence, and laryngeal carcinoma occurrence in Bangladesh. The findings highlight the need to address social factors that affect health, along with individual risk factors, in cancer prevention strategies. Targeted efforts focused on stopping tobacco use, health education, and better healthcare access for disadvantaged populations are important for reducing the impact of laryngeal carcinoma in developing countries.

Recommendations

Future studies should use larger, multicenter designs with population-based sampling to improve generalizability and statistical power.

Longitudinal cohort studies would better establish the timing of relationships between risk factors and cancer development. Adding biomarker analysis and genetic susceptibility factors could provide deeper insights into the mechanisms behind the socioeconomic disparities in laryngeal cancer occurrence and outcomes.

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