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Cancer and Its Determinants: Identifying Major Risk Factors Among Patients in Southern Bangladesh

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ABSTRACT: ***Background:*** Cancer is a leading cause of morbidity and mortality worldwide, with multiple lifestyles, environmental, and genetic factors contributing to its development. ***Objective:*** This study aimed to identify major risk factors and characterize the demographic and clinical profiles of cancer patients in southern Bangladesh. A cross-sectional study was conducted at Khulna City Medical College Hospital from January 2024 to June 2025. Data were collected from 300 cancer patients attending outpatient and inpatient services. Sociodemographic information, lifestyle behaviors, medical and family history, and cancer type were recorded using structured interviews and review of medical records. Descriptive statistics summarized the characteristics of patients, and chi-square analysis examined associations between risk factors and cancer types. ***Results:*** Of the 300 patients, 168 (56.0%) were male and 132 (44.0%) were female, with a mean age of 52.4 ± 14.2 years. The most common cancers were lung (25.3%), gastrointestinal (17.3%), and oral & pharyngeal (16.0%), while breast (39.4%) and cervical (21.2%) cancers predominated among women. Tobacco use (48.0%), betel nut chewing (39.3%), alcohol consumption (13.3%), and sedentary lifestyle (53.3%) were prevalent, with significant associations between tobacco and lung/oral cancers ($p<0.001$), betel nut and oral/pharyngeal cancer ($p=0.002$), alcohol and gastrointestinal cancers ($p=0.004$), and sedentary behavior and breast/colorectal cancers ($p=0.017$). Family history of cancer was reported by 21.3% of participants and was significantly associated with breast and cervical cancers ($p=0.031$). Hypertension (30.7%) and diabetes (22.7%) were the most common comorbidities. ***Conclusion:*** Cancer in southern Bangladesh shows a clear pattern of lifestyle, hereditary, and metabolic risk factors. Tobacco and betel nut use, alcohol consumption, sedentary behavior, and family history are strongly associated with specific cancer types.

Keywords: Cancer, Risk Factors, Tobacco, Betel Nut, Sedentary Lifestyle, Southern Bangladesh.

INTRODUCTION

Cancer is one of the leading causes of mortality worldwide, representing a major public health concern. The World Health Organization (WHO) reported that in 2018, Bangladesh experienced 150,781 new cancer cases and 108,137 cancer-related deaths.[1, 2] These statistics highlight the urgent need for effective strategies to combat cancer, especially as projections suggest that both

incidence and mortality rates are expected to rise in the coming decades. However, research indicates that a significant proportion of cancer cases could potentially be prevented through modifications in lifestyle and behavior-related risk factors[2]. Adopting a healthy lifestyle is essential for both the prevention and management of cancer, as well as other major non-communicable diseases. Important lifestyle modifications include quitting smoking, a well-established risk factor for various cancers including lung and cervical cancers.[3-5] Maintaining a healthy body weight is equally important, as obesity has been associated with increased risks of multiple cancers. Engaging in regular physical activity has been shown to reduce the risk of breast cancer in women, while limiting alcohol consumption can lower the risk of cancers such as liver and esophageal malignancies.[6] Additionally, a balanced diet rich in fruits, vegetables, and whole grains, while avoiding processed foods, contributes to cancer prevention.[7] Reducing exposure to environmental pollutants is also critical. Both indoor and outdoor air pollution have been linked to an increased risk of cancer[8]. Pollutants such as particulate matter and industrial chemicals contribute to carcinogenesis. Excessive exposure to sunlight, radiation, and harmful chemicals present in some cosmetics has also been associated with higher risks of skin cancer.[9, 10] Genetic predisposition plays a significant role in cancer risk, with family history increasing susceptibility to various types of cancer. Studies have demonstrated that individuals with a family history of cancer have elevated risks for prostate, gastric, colorectal, breast, and colon cancers.[11-14]

Environmental factors such as air pollution, soil contamination, and temperature fluctuations have similarly been associated with higher cancer risk.[15-17] Occupational exposure to hazardous substances also affects cancer incidence[17]. Despite these insights, research gaps remain regarding the combined effects of lifestyle factors and environmental exposures on cancer prevention and prognosis, particularly in Bangladesh. Many rural households still rely on traditional biomass fuels such as wood, cow dung, and kerosene for cooking. These fuels release carcinogenic compounds and particulate matter, leading to prolonged exposure to toxic fumes. Studies in other developing countries have shown a clear link between biomass fuel use and elevated risks of lung, gastrointestinal, and other cancers.[18-21] Considering that approximately 60% of Bangladesh's population lives in rural areas where these practices are common, it is crucial to assess how such exposures influence cancer risk. Bengali culinary practices, often involving cooking fish and meat at high temperatures or over open flames, can generate carcinogens such as heterocyclic amines and polycyclic aromatic hydrocarbons when food is charred or overcooked.[22-24] This cultural practice differentiates the Bangladeshi population and represents a key area for cancer research.[25-28] Rapid industrialization in Bangladesh has increased exposure to environmental pollutants such as inorganic dust, silica, and pesticides.[29-31] Many rural residents are exposed to these substances due to agricultural and industrial activities combined with poor occupational safety standards.[25, 32-34] Additionally, mosquito repellents are commonly used, particularly during the monsoon season, and their chemical components have been linked to increased cancer risk.[26, 35-37] The effects of these environmental exposures on cancer biology may differ from other regions due to both the intensity and duration of exposure. Furthermore, there is a lack of extensive case-control studies examining how adherence to specific lifestyle patterns—such as physical activity, dietary habits, and transportation modes—and exposure to environmental factors, including inorganic dust, cotton dust, wood dust, and silica, influence cancer risk. Understanding the prevalence and determinants of cancer within specific populations is crucial for planning effective prevention and early detection strategies. Despite the growing burden of cancer in Bangladesh, data on the distribution of cancer types and associated risk factors in the southern region remain limited. Therefore, this study aimed to investigate the demographic characteristics, lifestyle behaviors, medical history, and familial predisposition among cancer patients attending Khulna City Medical College Hospital. By identifying the major risk factors and patterns of cancer in this population, the study seeks to inform targeted interventions and public health strategies to reduce cancer incidence and improve patient outcomes in the region.

METHODOLOGY

This cross-sectional study was conducted at Khulna City Medical College Hospital, Bangladesh, where both outpatient and inpatient cancer patients were enrolled. A total of 300 patients diagnosed with different types of cancer were included, representing various age groups and both sexes, residing in Khulna and the nearby districts. Participants were recruited during their visits for

follow-up, routine checkup, or other medical purposes between January 2024 and June 2025. Patients with confirmed cancer diagnoses who consented to participate and had accessible medical records were included, while those who were critically ill or unwilling to respond were excluded. Data were collected through face-to-face interviews using a structured questionnaire, along with a review of previous investigation reports and clinical documents. Information regarding sociodemographic characteristics, lifestyle factors such as tobacco use, betel nut chewing, alcohol intake, dietary habits, and physical activity, as well as medical history, including family history of cancer and comorbidities, was obtained. Clinical details such as cancer type, stage, and duration since diagnosis were also documented. All collected data were entered and analyzed using SPSS (version XX). Descriptive statistics were applied to summarize patient characteristics, and inferential analyses, including chi-square tests and logistic regression, were performed to determine significant risk factors. A p-value of less than 0.05 was considered statistically significant. Written informed consent was secured from each participant, ensuring the confidentiality of their information throughout the study.

RESULTS

A total of 300 cancer patients were included in the study. Among them, 168 (56.0%) were male and 132 (44.0%) were female, giving a male-to-female ratio of 1.27:1. The mean age of the patients was 52.4 ± 14.2 years, ranging from 19 to 82 years.

Table 1: Sociodemographic Characteristics of Cancer Patients (N = 300)

Variable	Category	Male (n, %)	Female (n, %)	Total (n, %)
Age group	<40 years	28 (16.7)	22 (16.7)	50 (16.7)
	40–49 years	40 (23.8)	28 (21.2)	68 (22.7)
	50–59 years	52 (31.0)	34 (25.8)	86 (28.7)
	≥60 years	48 (28.6)	48 (36.4)	96 (32.0)
Education	SSC	58 (34.5)	42 (31.8)	100 (33.3)
	HSC	42 (25.0)	32 (24.2)	74 (24.7)
	Graduation	40 (23.8)	28 (21.2)	68 (22.7)
	Post-graduation	28 (16.7)	30 (22.7)	58 (19.3)
Occupation	Govt. job	46 (27.4)	14 (10.6)	60 (20.0)
	Business	72 (42.9)	12 (9.1)	84 (28.0)
	Housewife	–	82 (62.1)	82 (27.3)
	Others	50 (29.7)	24 (18.2)	74 (24.7)

Table 1 illustrates the sociodemographic characteristics of the study participants. The highest proportion of patients belonged to the age group ≥60 years (32.0%). Educational attainment varied, with one-third educated up to SSC (33.3%), followed by HSC (24.7%), graduation (22.7%), and post-graduation (19.3%). Occupational distribution showed that business (28.0%) and housewives (27.3%) constituted the majority, while 20.0% were government employees.

Table 2: Lifestyle and Behavioral Risk Factors (N = 300)

Variable	Category	Male (n, %)	Female (n, %)	Total (n, %)
Tobacco use	Yes	110 (65.5)	34 (25.8)	144 (48.0)
	No	58 (34.5)	98 (74.2)	156 (52.0)
Betel nut chewing	Yes	72 (42.9)	46 (34.8)	118 (39.3)
	No	96 (57.1)	86 (65.2)	182 (60.7)
Alcohol consumption	Yes	34 (20.2)	6 (4.5)	40 (13.3)
	No	134 (79.8)	126 (95.5)	260 (86.7)
Physical activity	Active	84 (50.0)	56 (42.4)	140 (46.7)

	Sedentary	84 (50.0)	76 (57.6)	160 (53.3)

Table 2 shows the distribution of lifestyle risk factors. Tobacco use was much higher in males (65.5%) compared to females (25.8%). Betel nut chewing was also common (39.3%), while alcohol consumption was reported by 13.3% of participants. More than half of the patients (53.3%) led a sedentary lifestyle.

Table 3: Medical and family history of cancer patients (N = 300)

Variable	Category	Frequency (n)	Percentage (%)
Family history of cancer	Yes	64	21.3
	No	236	78.7
Comorbidities	Diabetes	68	22.7
	Hypertension	92	30.7
	Both Diabetes & Hypertension	40	13.3
	None	100	33.3

Table 3 demonstrates that 21.3% of participants had a family history of cancer. Hypertension (30.7%) and diabetes (22.7%) were the most common comorbidities, while one-third of the patients (33.3%) had no associated chronic illness.

Table 4: Distribution of cancer types among patients (N = 300)

Cancer type	Male (n, %)	Female (n, %)	Total (n, %)
Lung	64 (38.1)	12 (9.1)	76 (25.3)
Oral & pharyngeal	38 (22.6)	10 (7.6)	48 (16.0)
Gastrointestinal (stomach, colon, liver)	34 (20.2)	18 (13.6)	52 (17.3)
Breast	–	52 (39.4)	52 (17.3)
Cervical	–	28 (21.2)	28 (9.3)
Others (prostate, ovarian, hematologic, etc.)	32 (19.0)	12 (9.1)	44 (14.7)

Table 4 illustrates the distribution of cancer types, where lung cancer (25.3%) and gastrointestinal cancers (17.3%) were most prevalent overall. Breast cancer accounted for 39.4% of female cases, while cervical cancer represented 9.3% of total patients.

Table 5: Association of risk factors with cancer type (Chi-square analysis)

Risk factor	Cancer type most associated	χ^2 value	p-value
Tobacco use	Lung, oral & pharyngeal	18.45	<0.001
Betel nut chewing	Oral & pharyngeal	12.73	0.002
Alcohol consumption	Liver & gastrointestinal	9.86	0.004
Sedentary lifestyle	Breast, colorectal	8.14	0.017
Family history	Breast, cervical	6.92	0.031

Table 5 shows the statistical associations of selected risk factors with cancer types. Tobacco and betel nut use were significantly associated with lung and oral cancers ($p < 0.001$), while alcohol consumption was linked to gastrointestinal cancers ($p = 0.004$). Sedentary lifestyle showed a significant association with breast and colorectal cancers ($p = 0.017$). A positive family history of cancer was

more common among breast and cervical cancer patients (p = 0.031).

DISCUSSION

This hospital-based study among 300 cancer patients in southern Bangladesh provides important insights into the demographic distribution, lifestyle exposures, comorbidities, and cancer site patterns in the region. The majority of patients were male (56.0%), with a mean age of 52.4 years, and nearly one-third (32.0%) were aged ≥60 years. This age profile is consistent with the natural epidemiology of cancer, as risk increases with advancing age, and mirrors national cancer statistics where the majority of cases occur after midlife.[4] Educational attainment was modest, with one-third of participants having completed only SSC level, while post-graduate education was achieved by fewer than one-fifth (19.3%). Occupation revealed gendered differences, with business (42.9%) being most common among men and housewives (62.1%) dominating among women. These social determinants are relevant, as lower education and certain occupations are often linked with higher cancer risk through greater exposure to carcinogenic behaviors such as tobacco and betel quid use.[7, 8] Lifestyle and behavioral risk factors were widespread. Tobacco consumption was reported by nearly half of the cohort (48.0%), with a striking male predominance (65.5% vs. 25.8% in women). Betel nut chewing was also common (39.3%), while 13.3% reported alcohol use, much higher among men than women. More than half of patients (53.3%) led sedentary lifestyles. These findings are consistent with national surveys showing high prevalence of tobacco and betel quid use in Bangladesh, particularly among men.[9, 11, 12] Importantly, chi-square analysis confirmed strong associations: tobacco with lung and oral cancers ($p<0.001$), betel quid with oral/pharyngeal cancers ($p=0.002$), and alcohol with gastrointestinal cancers ($p=0.004$). These associations align with well-established carcinogenic pathways recognized by the International Agency for Research on Cancer (IARC), which classify tobacco, areca nut/betel quid, and alcohol as Group 1 carcinogens.[17, 18] A significant proportion of patients (21.3%) reported a family history of cancer, with breast and cervical cancers showing significant associations ($p=0.031$).

This highlights the contribution of genetic predisposition in addition to environmental exposures, especially in hormonally driven cancers such as breast cancer.[19, 20] Physical inactivity, reported by 53.3% of the cohort, was significantly linked with breast and colorectal cancers ($p=0.017$). These findings are supported by global evidence showing that sedentary behavior increases the risk of obesity-related cancers, whereas physical activity has protective effects.[22, 23] Regarding comorbidities, hypertension (30.7%) and diabetes (22.7%) were frequent, and 13.3% had both conditions. Metabolic comorbidities may exacerbate cancer risk through mechanisms involving chronic inflammation, hormonal imbalance, and insulin resistance, and prior studies have linked diabetes to higher risks of breast, liver, colorectal, and endometrial cancers.[24, 25] The cancer site distribution in this study is notable. Lung cancer was the most common overall (25.3%), followed by gastrointestinal cancers (17.3%) and oral/pharyngeal cancers (16.0%). Among women, breast cancer was predominant (39.4%), followed by cervical cancer (21.2%). These findings are consistent with both national cancer registries and international data from South Asia, which identify lung, breast, oral, and cervical cancers as the leading burdens.[26-28] The strong male predominance in lung and oral cancers directly reflects the higher prevalence of tobacco and betel nut consumption among men, while the high frequency of breast and cervical cancers among women reflects both genetic and reproductive risk factors as well as limited access to preventive screening in Bangladesh.

CONCLUSION

The study reinforces the multifactorial etiology of cancer in Bangladesh, highlighting modifiable lifestyle risk factors (tobacco, betel quid, alcohol, sedentary lifestyle), non-modifiable hereditary risks (family history), and the contribution of metabolic comorbidities. The results call for integrated cancer control strategies, including intensified tobacco and areca nut cessation programs, promotion of physical activity, reduction of harmful alcohol use, and implementation of cancer screening programs for breast and cervical cancers. Moreover, addressing comorbidities such as diabetes and hypertension in oncology care is essential for holistic management.

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