Socio Demographic Determinants and Co-Morbidities of Colorectal Cancer: Findings of a Case-Control Study

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ABSTRACT

Introduction: Colorectal cancer (CRC), a multifactorial disease, is among the rapidly emerging illnesses in developing countries, associated with substantial morbidity and mortality. Diverse sociodemographic factors increase the risk of CRC.

Objectives: To evaluate the sociodemographic factors associated with CRC.

Materials and Methods: This hospital-based age and sex-matched case-control study involved 102 cases and 102 controls from the National Institute of Cancer Research and Hospital (NICRH) and Combined Military Hospital (CMH) in Dhaka between July 2020 and June 2021. Data was collected via semi-structured questionnaires and in-person interviews.

Results: In this study, cases (mean age 44.7±13.9 years) and controls (mean age 45.6±13.3 years) comprised mainly females (56.9%). A higher proportion of cases resided in joint families (53.9% vs. 39.2%, p=0.035). Positive family history of CRC was noted in 5.9% of cases and 1.0% of controls (p=0.054). No significant difference was found between case and control group in case of education, occupation, marital status and income of the respondents(p>0.05). The prevalence of type 2 diabetes mellitus (T2DM) was considerably higher in patients (27.5%) compared to controls (15.7%, p=0.041).

Dyslipidemia, H.pilori infection, Inflamatory bowel disease, Intestinal polyps were found more prevalent in cases than control which was statistically significant (p<0.05).Logistic regression identified T2DM (OR=2.875, p=0.010) as significant contributors to CRC.

Conclusion: The study revealed that positive family history of CRC, urban residence, T2DM, Dyslipidemia, Pylori infection, Inflammatory bowel disease, Intestinal polyps were predominant factors associated with an increased risk of CRC.

Keywords: Colorectal cancer, dietary fiber, case-control study, Bangladesh

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INTRODUCTION

Colorectal cancer (CRC) was the second most lethal cancer and the third most common malignancy in 2020, with an estimated 1.9 million new cases and 0.9 million deaths worldwide.[1] Despite being primarily a high-income disease, the prevalence of colorectal cancer has rapidly increased in low- and middle-income nations.[2] In Bangladesh, a nation undergoing rapid demographic and lifestyle transitions, the burden of CRC has been increasingly recognized as a substantial contributor to the overall cancer burden.[3]

CRC exhibits a diverse array of risk elements that contribute to its onset.[4] Among the well-established risk factors are age, with incidence rates rising sharply in individuals over 50 years old, and a family history of CRC, underscoring the role of genetic predisposition.[5] Lifestyle choices that have been repeatedly linked to an increased risk of colorectal cancer (CRC) include a diet high in red and processed meats, low fiber intake, sedentary behavior, and obesity.[4,6,7] Additionally, tobacco and alcohol consumption have emerged as modifiable risk factors that can significantly impact CRC susceptibility.[6,7] Chronic inflammatory conditions of the colon, such as inflammatory bowel disease, represent another category of risk, emphasizing the complex interplay between chronic inflammation and cancer development.[8]

The incidence of CRC is escalating in Bangladesh; however, a comprehensive understanding of the specific factors contributing to the development of CRC in the Bangladeshi population is still limited. Therefore, this study is designed to identify the associated risk factors of CRC in Bangladesh, with the aim of providing insights that can inform research and public health policy priorities for the improvement of CRC control.

MATERIALS AND METHODS

Study design and setting

This hospital-based case-control study was conducted in National Institute of Preventive and Social Medicine (NIPSOM), Dhaka, Bangladesh, spanning from July 2020 to June 2021.

Participants

The study encompassed 204 participants, comprising 102 CRC cases and 102 age- and sex-matched controls without a history of CRC. CRC cases were identified as patients diagnosed by Colorectal Surgeons and Oncologists or specialist physicians based on colonoscopy-directed biopsy and histopathology reports, who attended the Oncology and Colorectal Surgery Department (OPD or IPD) at CMH Dhaka and NICRH, Dhaka, for treatment purposes. Inclusion criteria encompassed male and female patients aged 18 years and above with colonic and rectal cancer, regardless of the time of disease diagnosis, tumor location, size, and medical or surgical interventions. Controls consisted of normal healthy individuals without CRC or any diagnosed cancer attending the OPD or IPD of CMH Dhaka and NICRH, Dhaka. Matched male and female patients with an age variation of ±2 years were selected for the study. Exclusion criteria for both cases and controls included individuals with a history of other malignancies, those who were critically ill or mentally unstable, and those unwilling to participate.

Data collection

Trained interviewers conducted structured interviews using a standardized questionnaire to collect information on socio-demographic characteristics, family history of CRC, tobacco intake, alcohol consumption, and dietary fiber intake.

Statistical analysis

Data analysis was done using the Statistical Package for the Social Sciences (SPSS) version

27.0. Descriptive statistics were employed to summarize sociodemographic characteristics and risk factors. Bivariate analyses, including chi-square tests for categorical variables and t-tests for continuous variables, were conducted to assess differences between cases and controls. Multivariate logistic regression models were used to estimate odds ratios and 95% confidence intervals, adjusting for potential confounders. A p-value of <0.05 was considered statistically significant.

Ethical considerations

Before the study, ethical clearance was taken from the ethical review committee of NIPSOM, Dhaka. Informed written consent was obtained from all participants.

RESULTS

Table-I shows the socio-demographic characteristics of the study participants. The mean age of the cases was 44.7 years (SD = 13.9), and the mean age of controls was 45.6 years (SD = 13.3). The majority of participants were female in both the case (56.9%) and control (56.9%) groups. No significant difference was found between case and control group in case of education, occupation, marital status and income of the respondents (p>0.05).

TABLE-I: Socio-demographic characteristics of study participants

Characteristics		Case (n=102)	Control (n=102)	p-value
		N (%)	N (%)	
Age (years)	20 – 29	14 (13.7)	14 (13.7)	0.982
	30 – 59	72 (70.6)	71 (69.6)	
	60 – 75	16 (15.7)	17 (16.7)	
	Mean ± SD	44.7 ± 13.9	45.6 ± 13.3	0.625
Sex	Male	44 (43.1)	44 (43.1)	1.000
	Female	58 (56.9)	58 (56.9)	
Education	Illiterate	16 (15.7)	8 (7.8)	0.460
	Primary/Informal education	22 (21.6)	24 (23.5)	
	SSC/ Equivalent	31 (30.4)	27 (26.5)	
	HSC / Equivalent	17 (16.7)	20 (19.6)	
	Graduation/Equivalent	11 (10.8)	17 (16.7)	
	Post-graduation/Equivalent	5 (4.9)	6 (5.9)	
Occupation	Unemployed	10 (9.8)	8 (7.8)	0.256
	Service	13 (12.7)	22 (21.6)	
	Business	23 (22.5)	20 (19.6)	
	Farmer	9 (8.8)	7 (6.9)	
	Retired	14 (13.7)	22 (21.6)	
	Home maker	33 (32.4)	23 (22.5)	

Table-II shows that significant differences in family type were observed, with a higher proportion of cases (53.9%) originating from joint families compared to controls (39.2%), while nuclear family prevalence was lower in cases (46.1%) than in controls (60.8%), reaching statistical significance (p=0.035).

TABLE-II: Socio-demographic characteristics of study participants

Characteristics		Case (n=102)	Control (n=102)	p-value
Marital status	Unmarried	9 (8.8)	4 (3.9)	0.132
	Married	80 (78.4)	80 (78.4)	
	Separated	2 (2.0)	0 (0.0)	
	Widow/widower	11 (10.8)	18 (17.6)	
Family type	Nuclear	47 (46.1)	62 (60.8)	0.035
	Joint	55 (53.9)	40 (39.2)	
Monthly family income (BDT)	5000-10000	42 (41.2)	30 (29.4)	0.055
	10001-20000	37 (36.3)	34 (33.3)	
	20001-50000	23 (22.5)	38 (37.3)	
	Mean ± SD	15884±10077	17751±8413	
Residence	Urban	75 (73.5)	62 (60.8)	0.043
	Rural	27 (26.5)	40 (39.2)	

BDT: Bangladeshi Taka

Table-III shows that type 2 diabetes mellitus (T2DM) was present in 27.5% of cases compared to 15.7% of controls, which was statistically significant (p=0.041). Inflammatory bowel disease was present in 8.8% in cases compared to 1% in control group and this was found statistically significant (p<0.05). Similarly, Dyslipidemia, H. Pylori infection and Intestinal polyps were found statistically significant between cases and control(p<0.05). Other co-morbidities i.e., hypertension, coronary artery disease, intestinal polyps and diverticulitis showed no significant association.

TABLE-III: Comorbidities and colorectal risk

Comorbidities		Case (n=102)	Control (n=102)	p-value
		N (%)	N (%)	
Dyslipidemia	Present	4 (7.8)	2 (2.0)	0.049
	Absent	94 (92.2)	100 (98.0)	
Hypertension	Present	28 (27.5)	21 (20.6)	0.251
	Absent	74 (72.5)	81 (79.4)	
Type 2 DM	Present	28 (27.5)	16 (15.7)	0.041
	Absent	74 (72.5)	86 (84.3)	
Coronary artery disease	Present	10 (9.8)	10 (9.8)	1.000
	Absent	92 (90.2)	92 (90.2)	
H. Pylori infection	Present	11 (10.8)	6 (5.9)	0.032
	Absent	93 (91.2)	96 (94.1)	
Inflammatory bowel disease	Present	9 (8.8)	1 (1.0)	0.009
	Absent	96 (94.1)	101 (99.0)	
Intestinal polyps	Present	9 (8.8)	2 (2.0)	0.037
	Absent	93 (91.2)	100 (98.0)	
Diverticulitis	Present	0 (0.0)	1 (1.0)	1.000
	Absent	102 (100.0)	101 (99.0)	

Binary logistic regression analysis revealed that the odds of presence of dyslipidemia were 3.665 (95% CI: 0.566-23.79, p=0.17), the odds of having T2DM were 3.15 (95% CI: 1.428-6.91, p=0.004), the odds of having presence of H. Pylori Infection were 1.863(95% CI: 0.543-6.39, p=0.323), the odds of having inflammatory bowel disease were 4.397 (95% CI: 0.402-6. 3948.1, p=0.225) on colorectal cancer.

TABLE-IV: Binary Logistic Regression Analysis

Variables	p-value	OR	95% C.I.	
			Lower	Upper
Presence of dyslipidemia	.173	3.665	.566	23.749
Presence of type 2 diabetes mellitus	.004	3.151	1.428	6.951
Presence of H. Pylori Infection	.323	1.863	.543	6.396
Presence of inflammatory bowel disease	.225	4.397	.402	48.100
Presence of intestinal polyps	.547	1.768	.277	11.283

DISCUSSION

The hospital-based case-control study conducted aimed to explore factors associated with CRC in a developing country setting like Bangladesh, where CRC is rapidly emerging as a significant health concern. This study identified urban residence, positive family history, low dietary fiber intake, and T2DM as risk factors of CRC in context of Bangladesh.

The demographic characteristics of the participants revealed that both cases and controls were predominantly female, comprising 56.9% of the study population. The mean ages of cases and controls were 44.7±13.9 years and 45.6±13.3 years, respectively. These baseline characteristics provided a snapshot of the population under investigation. A study in China demonstrated the mean (±SD) age above 50 years among both the patients and controls.9 This indicates that CRC is relatively common in the younger age group in our country.

The presence of a positive family history of CRC in 5.9% of cases and 1.0% of controls (p=0.054) indicated a potential genetic component in CRC susceptibility. Although not statistically significant, this trend highlights the importance of considering genetic predispositions in CRC risk assessment. Future studies with larger sample sizes may elucidate the significance of this observation. On evaluation of risk prediction of CRC Slattery et al. found a family history of CRC in any first-degree relatives was present in 9.8% cases and 7.0% controls.[10] This could suggest the existence of recessive genetic elements that make a person more susceptible to colorectal cancer.

T2DM emerged as a comorbidity significantly associated with CRC, with a prevalence of 27.5% in cases compared to 15.7% in controls (p=0.041). This finding adds to the growing body of evidence that the rising incidence of diabetes contributes to the rising incidence of CRC. Dyslipidemia, H.Pylori infection, Inflamatory bowel disease, Intestinal polyps were found statistically significant between cases and control group (p<0.05). Diabetes mellitus is a recognized risk factor for colorectal cancer (CRC) that is unrelated to food, physical activity, smoking, obesity, or the metabolic syndrome.[11] The elevated levels of insulin and insulin-like growth factors most likely cause this impact.[12] Insulin encourages the growth of colon cancers. The system is activated by hyperinsulinemia, but insulin-like growth factors prevent colonic epithelial cells from dying.[13] Understanding the intricate connections between metabolic health and colorectal carcinogenesis could guide interventions and screening strategies, especially considering the rising prevalence of T2DM globally.

In this study, there was a correlation between CRC and urban living. Sedentary lifestyles are linked to urbanization and are also linked to colorectal cancer.[14] Dietary changes are also linked to urbanization, specifically a decrease in plant-based food consumption and an increase in meat, processed meals, and energy-dense

foods.[15] Consuming a lot of meat and processed foods is known to increase the risk of colorectal cancer.[16] The greater percentage of patients living in coupled families than controls (53.9% vs. 39.2%, p=0.035) was one significant finding. This observation suggests a potential link between familial living arrangements and CRC, raising questions about the impact of shared environments and lifestyles within family units on CRC risk.

Several limitations warrant consideration in interpreting our findings. The study's retrospective design may introduce recall bias in self-reported data. The modest sample size, drawn from specific hospital settings, may limit the generalizability of results to the broader population. Additionally, the reliance on participant interviews introduces the potential biasedness based on social desirability. Notwithstanding these drawbacks, this study offers insightful information about CRC risk factors specific to Bangladesh, and we advise using caution when extrapolating results to other populations.

CONCLUSION

This hospital-based case-control study in Bangladesh uncovered several factors associated with CRC. Socio demographic determinants were not found significantly associated with colorectal cancer. The observed links between urban residence, positive family history, and the prevalence of type 2 diabetes mellitus, Dyslipidemia, H.Pylori infection, Inflammatory bowel disease, Intestinal polyps provide valuable insights into the multifaceted nature of CRC risk in this population. These findings can inform targeted interventions, public health campaigns, and further research to mitigate the burden of CRC in developing countries.

REFERENCES

1. Xi Y, Xu P. Global colorectal cancer burden in 2020 and projections to 2040. Translational oncology. 2021;14(10):101174.

2. Khan SZ, Lengyel CG. Challenges in the management of colorectal cancer in low-and middle-income countries. Cancer Treatment and Research Communications. 2023:100705.

3. Raza AM. Clinico-demographic characteristics of colorectal carcinoma in Bangladeshi patients. Journal of Current and Advance Medical Research. 2016;3(1):22-5.

4. Haggar FA. Colorectal cancer epidemiology: incidence, mortality, survival, and risk factors. Clinics in colon and rectal surgery. 2009;22(04):191-7.

5. Johnson CM, Wei C, Ensor JE, Smolenski DJ, Amos CI, Levin B, et al. Meta-analyses of colorectal cancer risk factors. Cancer causes & control. 2013;24:1207-22.

6. Migliore L. Genetics, cytogenetics, and epigenetics of colorectal cancer. Journal of biomedicine & biotechnology. 2011;2011:792362.

7. Low EE, Demb J, Liu L, Earles A, Bustamante R, Williams CD, et al. Risk factors for early-onset colorectal cancer. Gastroenterology. 2020;159(2):492-501. e7.

8. Hnatyszyn A, Hryhorowicz S, Kaczmarek-Ryś M, Lis E, Słomski R, Scott RJ, et al. Colorectal carcinoma in the course of inflammatory bowel diseases. Hereditary cancer in clinical practice. 2019;17(1):1-9.

9. Zhong X, Fang Y-J, Pan Z-Z, Lu M-S, Zheng M-C, Chen Y-M, et al. Dietary fiber and fiber fraction intakes and colorectal cancer risk in Chinese adults. Nutrition and cancer. 2014;66(3):351-61.

10. Slattery M. Family history and colorectal cancer: predictors of risk. Cancer Causes & Control. 2003;14:879-87.

11. Pais R. Metabolic syndrome and risk of subsequent colorectal cancer. World journal of gastroenterology: WJG. 2009;15(41):5141.

12. Giovannucci E. Insulin, insulin-like growth factors and colon cancer: a review of the evidence. The Journal of nutrition. 2001;131(11):3109S-20S.

13. Kasprzak A. Insulin-like growth factor 1 (IGF-1) signaling in glucose metabolism in colorectal cancer. International Journal of Molecular Sciences. 2021;22(12):6434.

14. Hatime Z. Association of Physical Activity and Sedentary Behavior with Colorectal Cancer Risk in Moroccan Adults: A Large-Scale, Population-Based Case–Control Study. Asian Pacific Journal of Cancer Prevention: APJCP. 2022;23(6):1859.

15. Yan D. Arable land and water footprints for food consumption in China: From the perspective of urban and rural dietary change. Science of the Total Environment. 2022;838:155749.

16. Bernstein AM. Processed and unprocessed red meat and risk of colorectal cancer: analysis by tumor location and modification by time. PloS one. 2015;10(8):e0135959.