Original Research Article

Risk Factors of Early Age Colorectal Cancer among Patients Attending at National Institute of Cancer Research & Hospital

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Abstract: ***Background:*** Colorectal cancer (CRC) poses a significant public health burden worldwide, with a notable trend of increasing incidence among individuals aged 20 to 50 years. Understanding the risk factors associated with early-onset CRC is crucial for developing targeted prevention and intervention strategies, particularly in limited-resource settings. ***Objective:*** This study aimed to identify and analyze the risk factors contributing to the development of early-onset CRC in a population from a limited-resource country. ***Method:*** A comparative study was conducted among 178 CRC patients admitted to the National Institute of Cancer Research & Hospital (NICRH), Dhaka. Patients were divided into two groups: Group-A (age 20-50 years) and Group-B (age >50 years). Demographic and clinical data were collected, and statistical analyses were performed to determine associations between various risk factors and early-onset CRC. ***Results:*** The mean age of Group-A subjects was 43.6±7.1 years, significantly younger than Group-B subjects (59.2±9.3 years). Male patients constituted 69.1% of the cohort, with a statistically significant male-to-female ratio of 2.2:1. Higher BMI (≥25) was strongly associated with early-onset CRC (p<0.01). Occupations such as business and middle socioeconomic status were significantly linked to early-onset CRC. Regular exercise (>30 minutes daily) demonstrated a protective effect against CRC development. Consumption of red meat and fast food was associated with a higher risk of CRC, while regular consumption of vegetables was protective. Familial adenomatous polyposis (FAP) presence was significantly associated with early-onset CRC. ***Conclusions:*** Male sex, high BMI, specific occupations, dietary factors, and presence of FAP emerged as key risk factors for early-onset CRC. Encouraging regular exercise and promoting healthy dietary habits, particularly reducing red meat and fast-food intake, are crucial in mitigating the risk of early-onset CRC in similar populations*.*
Keywords: Colorectal cancer, early-onset, risk factors, limited-resource, prevention.

INTRODUCTION

Colorectal cancer (CRC) stands as the third most commonly diagnosed malignancy worldwide and ranks second in cancer-related mortality [1]. The staggering global burden is evidenced by approximately 1.9 million new cases and 935,000 deaths recorded in 2020 alone, reflecting its pervasive impact on public health [2]. Despite comprising 11% of all cancer diagnoses, CRC commands a disproportionate share of mortality, underscoring the urgent need for effective prevention and intervention strategies.

While CRC incidence and mortality rates have exhibited a downward trajectory across the general population, a concerning trend has emerged among individuals under 50 years of age, termed early-onset CRC. Since 1994, CRC incidence in this demographic has surged by 2% annually, a stark departure from the declining trend [3]. This worrisome surge is compounded by the distinct clinical characteristics of early-onset CRC, typified by advanced disease presentation and aggressive tumor behavior.

The American Cancer Society has responded to this alarming trend by revising its guidelines, recommending colorectal screening for all individuals starting at age 45 rather than the previous threshold of 50 years [4]. Despite these efforts, the etiological underpinnings driving the rising incidence of early-onset CRC remain elusive. Proposed risk factors include modifiable lifestyle behaviors such as obesity, sedentary lifestyle, and dietary habits characterized by high consumption of red meat, alcohol, and tobacco [5].

The burgeoning prevalence of the "Westernized lifestyle," encompassing dietary patterns rich in fat and low in fiber, has garnered attention as a potential contributor to CRC risk [6]. Pioneering research dating back to 1969 implicated dietary fat in CRC pathogenesis, attributing the increased risk to its influence on gut microbiota and bile acid metabolism [7]. Moreover, alcohol consumption and tobacco smoking have been definitively linked to elevated CRC risk, further exacerbating the disease burden [8].

Inflammatory bowel diseases, notably ulcerative colitis, and Crohn's disease, have also emerged as significant risk factors for CRC, owing to their chronic inflammatory milieu conducive to carcinogenesis [9]. Despite the escalating incidence of early-onset CRC, data specific to Bangladesh remain scarce, underscoring the imperative for localized investigations. While neighboring regions such as India have reported similar trends, comprehensive studies are warranted to elucidate the risk factors underpinning early-onset CRC in Bangladesh [10].

OBJECTIVES

General Objective
- To identify potential risk factors for early-age colorectal cancers (CRC).

Specific Objective
- To identify sociodemographic characteristics related to early-age CRC.
- To find out the association of lifestyle and personal habits with early-age CRC.
- To demonstrate the association of dietary habits with early-age CRC.
- To determine the association of GIT disorders with early-age CRC.

MATERIAL AND METHODS

Study Design
This study adopted a comparative design and was conducted at the Department of Medical Oncology, National Institute of Cancer Research & Hospital (NICRH), Dhaka. The research spanned 12 months, from August 2020 to July 2021, employing a purposive non-probability sampling technique.

Inclusion Criteria
- **Group A:** Patients diagnosed with colorectal cancer via histopathology, aged between 20 and 50 years, and admitted to NICRH.
- **Group B:** Colorectal cancer patients above 50 years of age admitted to NICRH.

Exclusion Criteria
- Patients with severe handicaps or psychological conditions hindering interview participation.
- Unconscious patients.
- Individuals are unwilling to partake in the study.

Study Procedure
The study adopted a comparative design, conducted at the National Institute of Cancer Research & Hospital, Dhaka, over 12 months (August 2020 to July 2021). Utilizing purposive non-probability sampling, it included 178 colorectal cancer patients divided into two groups: Group A (age 20-50) and Group B (age >50). In-depth interviews were conducted, and data on sociodemographic and clinical variables were collected using a semi-structured questionnaire. Statistical analysis employed SPSS version 22.0, presenting results through frequency tables and figures. Ethical clearance was obtained for the study.

Data Collection
Data collection involved face-to-face interviews using a semi-structured questionnaire

after obtaining informed consent. The questionnaire elicited sociodemographic information and clinical variables. Quality assurance measures ensured data accuracy. Participants meeting inclusion criteria were selected at the National Institute of Cancer Research and Hospital, Dhaka. Ethical clearance was obtained, and confidentiality was maintained.

Data Analysis

Following the data collection, all data was edited and encoded into a statistical software named Statistical Package for Social Science' (SPSS) version 22.0. Data were entered into the software according to the prior analysis plan. This study displayed continuous data as mean ± standard deviation if normally distributed or median [interquartile range] if non-normally distributed. The collected data have been compiled, organized, reviewed, and edited. The data was analyzed using a variety of tests. Since this study dealt with two variables, a bivariate analysis was performed. Moreover, the Chi-square test was used to measure the association between the two variables. In addition, Fisher's exact test compared the differences between those who had taken regular meat (> 2 times/week) and those who had taken irregular consumption of red meat (= or<times/week). An unadjusted odd ratio shows the relationship between dependent, independent, and extraneous variables. Finally, the analyzed results are presented in frequency tables and figures.

Ethical Considerations

Ethical considerations ensured minimal physical, psychological, social, and legal risks during all study procedures. Rigorous safety measures were implemented, and data access was restricted to research personnel. Ethical clearance was obtained from NIRCH's Ethical Committee and Institutional Review Board (***Ref. no: NICRH/Ethicals/2021/125***). Patients were informed of their rights to withdraw consent at any time. Strict confidentiality was maintained, with data presented anonymously. Data analysis was conducted only on subjects with valid consent. No financial incentives were offered, and procedures posed no risk to participants or researchers. Conflict of interest was absent.

RESULT

This study identified the potential risk factors of early-age colorectal cancers (CRC). A total of 178 subjects with colorectal cancer agreed to participate in this study after fulfilling the eligibility criteria, among which 89 were allocated to group A (age 20-50 years), and 89 were allocated to group B (age >50 years). The findings derived from data analysis are presented in charts and tables.

Table 1: Demographic Characteristics of Study; Comparison between Group A and Group B (n=178)

Variables	Group A (n=89)	Group B (n=89)	*p*-value
Age Range	32-50	51-69	<0.001
(Mean ± SD)	43.6 ± 7.1 years	59.2 ± 9.3 years	
Gender Distribution			
Male	68 (76.4%)	55 (61.8%)	<0.05
Female	21 (23.6%)	34 (38.2%)	
BMI (kg/m^2)			
Normal (18.5–24.9)	45 (50.6%)	71 (79.7%)	
Overweight (25.0–29.9)	36 (40.4%)	15 (16.9%)	<0.01
Obese (>30.0)	8 (9.0%)	3 (3.4%)	
Occupation			
Business	20 (22.5%)	8 (9.0%)	0.01
Others	40 (44.9%)	57 (64.0%)	
Socioeconomic class			
Lower class	16 (18.0%)	12 (13.5%)	0.15
Middle class	52 (41.6%)	72 (80.9%)	
Smoking Status			
Non-smoker	23 (25.8%)	39 (43.8%)	0.18
Smoker	66 (74.2%)	50 (56.2%)	
Alcohol Intake			
Non-drinker	80 (89.9%)	83 (93.2%)	0.42
Drinker	9 (10.1%)	6 (6.8%)	
Exercise Habit			
Yes (≥30 min/day)	23 (25.8%)	46 (51.7%)	<0.01
No (<30 min/day)	66 (74.2%)	43 (48.3%)	
Family History of CRC			
Positive	8 (9.0%)	0 (0.0%)	0.001

The table shows the age distribution of the study subjects. The mean±SD age of the group-A subject was 43.6±7.1 years with a range of 32 to 50 years, and the mean±SD age of the group-B subject was 59.2±9.3 years with a range of 51 to 69 years. The mean difference in age between groups was significant (p-value <0.001). Compares key variables between two age groups: Group A (20-50 years) and Group B (>50 years). Significant differences were found in mean age (p < 0.001), gender distribution (p < 0.05), BMI categories (p < 0.01), occupation (p = 0.01), socioeconomic class (p = 0.04), exercise habits (p < 0.01), and family history of CRC (p = 0.001). No significant differences were observed in smoking status (p = 0.18) or alcohol intake (p = 0.42) between the groups.
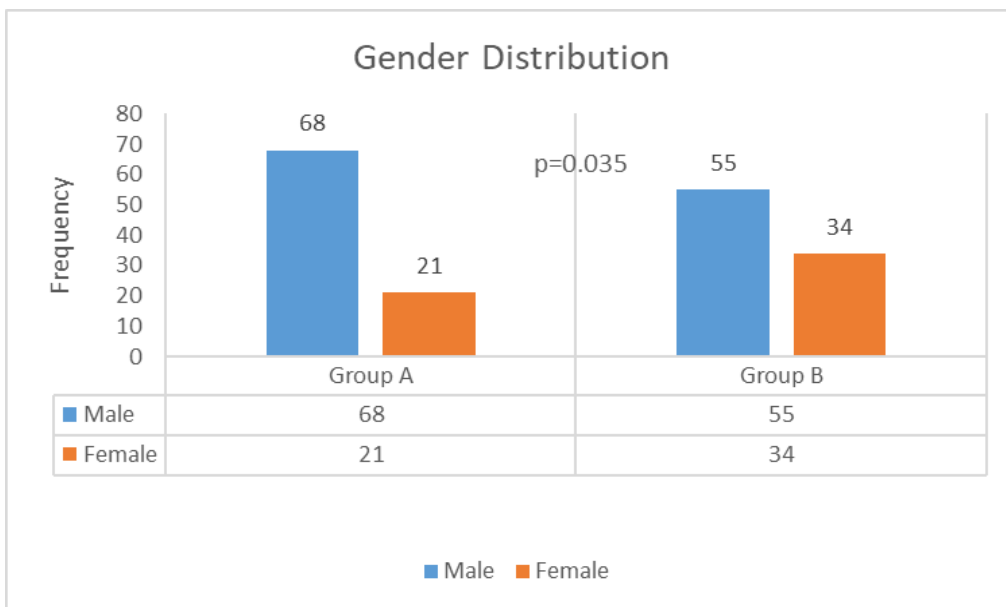

Figure 1: Gender distribution of the study respondents (n=178)

Bar diagram showing gender distribution of respondents. Out of 178 patients, a total of 123(69.1%) patients were male, 68(76.4%) in group A and 55(61.8%) in group B. Females patients were total 55(30.8%), 21(23.6%) in group A and 34(38.2%) in group B. Male: female ratio 2.2:1. The sex difference was statistically significant (p <0.05).
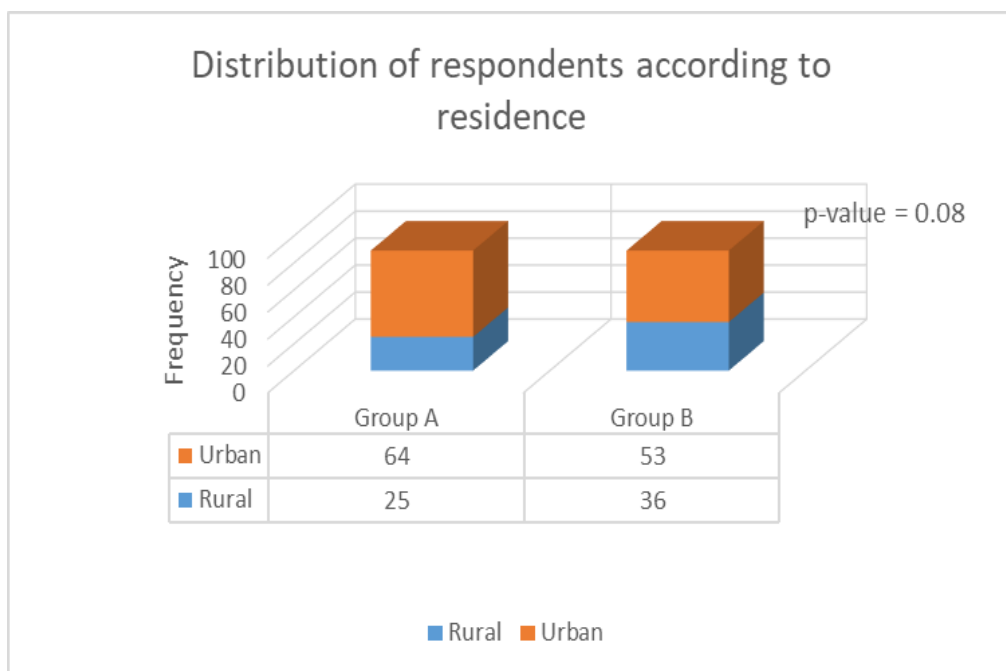

Figure 2: Distribution of the respondents according to residence

The figure shows the area of residence of the participants. Large numbers of respondents came from urban areas 117(65.7%), followed by rural areas 61(34.2%). The p-value is 0.0832. So, the result was statistically non-significant.

Table 2: Distribution of Respondents According to Diagnosed GIT Disorders

GIT Disorders	Group A (n=89)	Group B (n=89)	*p*-value
FAP	8 (9.0%)	0 (0.0%)	0.001
Inflammatory Bowel			
Disease	3 (3.4%)	0 (0.0%)	0.087
Malabsorption Syndrome	19 (21.3%)	15 (16.9%)	0.571

No significant differences were observed between the two groups regarding diagnosed gastrointestinal disorders, apart from familial adenomatous polyposis (FAP), which showed that strong positive association between the presence of FAP and the development of CRC in group-A.

Table 3: Dietary Patterns of the Respondents (n=178)

Variables	Group A (n=89)	Group B (n=89)	*p*-value
Red Meat Consumption			
Yes (>2 times/wk)	38 (42.7%)	19 (21.3%)	<0.01
No (<2 times/wk)	51 (57.3%)	70 (78.7%)	
Fast Food Consumption			
Yes (>2 times/wk)	23 (25.8%)	8 (9.0%)	<0.01
No (<2 times/wk)	66 (74.2%)	81 (91.0%)	
Poultry Meat Intake			
Yes (>2 times/wk)	20 (22.5%)	14 (15.7%)	0.34
No (<2 times/wk)	69 (77.5%)	75 (84.3%)	
Fish Intake			
Yes (>2 times/wk)	59 (66.3%)	51 (57.3%)	0.28
No (<2 times/wk)	30 (33.7%)	38 (42.7%)	
Vegetable Consumption			
Yes (>2 times/wk)	8 (9.0%)	11 (12.4%)	0.63
No (<2 times/wk)	81 (91.0%)	78 (87.6%)	

The table illustrates dietary habits between groups. Group A exhibited higher red meat (42.7%) and fast food (25.8%) consumption compared to Group B (21.3% and 9.0%, respectively), significantly increasing colorectal cancer risk (p < 0.01). Poultry meat intake was marginally higher in Group A (22.5%) than in Group B (15.7%), while fish (66.3% vs. 57.3%) and vegetable (9.0% vs. 12.4%) consumption showed no significant differences between the groups.
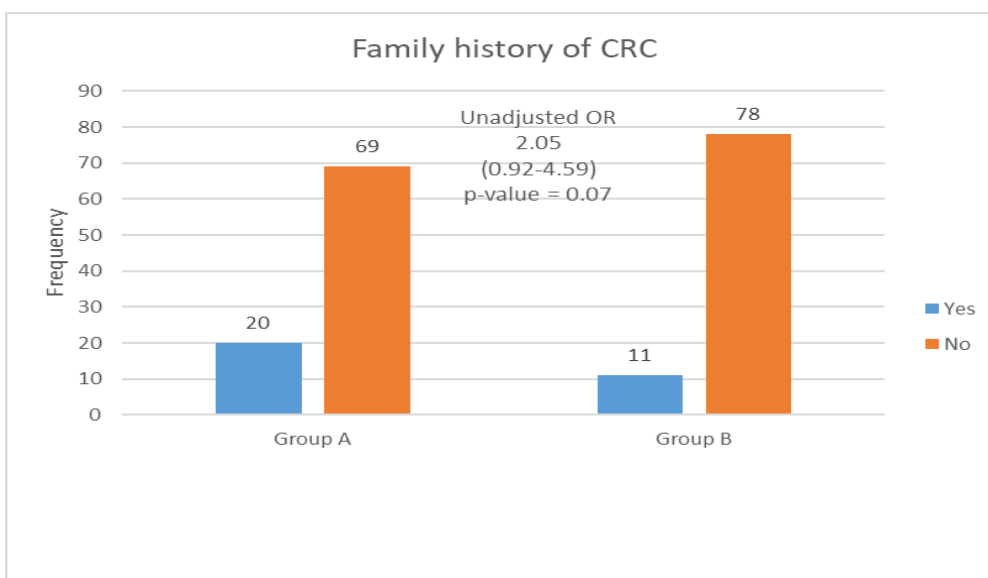

Figure 3: Distribution of respondents according to family history of colorectal cancer (n=178)

It was revealed that an unadjusted odds ratio found that a family history of colorectal cancer has a significant association with the development of colorectal cancer. Persons who had a positive family history were 2.05 times more likely to develop cancer compared to those with a negative family history. However, the result was not statistically significant in the early age group compared to the late age group.

DISCUSSION

This study conducted at the National Institute of Cancer Research and Hospital (NICRH) in Dhaka aimed to identify risk factors associated with early-age colorectal cancers (CRC) by comparing 178 patients allocated into two groups via purposive sampling. Group-A comprised individuals aged 20-50 years, while Group-B comprised patients older than 50 with CRC. The mean age for Group-A was 43.6±7.1 years, significantly younger than Group-B with a mean age of 59.2±9.3 years (p=<0.001). This finding corroborates with previous studies by [11], demonstrating a similar mean age of 45.3 years for early onset CRC, thus establishing the younger age distribution within this subgroup. Consistent with epidemiological trends, males constituted a higher proportion (69.1%) in Group-A compared to females (30.8%), with a significant male predominance (p=<0.001). This aligns with existing literature [12], highlighting the gender disparity in CRC incidence. Such trends underscore the importance of gender-specific approaches in early detection and prevention strategies.

Body Mass Index (BMI) and Urban Residence

Body mass index (BMI) evaluation revealed a significant association with early age CRC, with overweight and obesity emerging as significant risk factors. This contradicts findings by [13], who observed increased BMI as a protective factor against early-onset CRC (EOCRC). However, [14], and established CRC as an obesity-related cancer, corroborating our findings. Interestingly, urban residence did not exhibit statistical significance in our study, contrary to [15], who observed a rise in CRC incidence among urban areas. Discrepancies in findings may stem from variations in defining urban areas and sample sizes.

Occupation, Socioeconomic Class, and Educational Level

Occupation and socioeconomic class are significantly associated with early-age CRC, suggesting a higher prevalence among middle and middle-socioeconomic businesspeople. Educational level, however, did not exhibit significance in our study. This contrasts with [16], who found no association between socioeconomic class and education level with early-onset CRC. The heterogeneity in lifestyles among businesspersons may contribute to the positive association observed in our study.

Lifestyle Factors

Surprisingly, smoking and alcohol habits did not emerge as significant risk factors for early-age CRC in our study. This contradicts findings [17], potentially attributed to cultural factors influencing alcohol consumption and smoking patterns in our population. However, regular exercise demonstrated protective effects against early-age CRC, aligning with prior research by [18]. These findings underscore the importance of adopting healthy lifestyle behaviors in mitigating CRC risk, particularly among younger individuals.

Comorbidities and Gastrointestinal Disorders

Evaluation of hypertension, diabetes, and other comorbidities did not reveal significant associations with early-age CRC. This aligns with [19], who failed to establish connections between these comorbidities and early onset CRC. Regarding gastrointestinal disorders, familial adenomatous polyposis (FAP) emerged as a significant risk factor for early-age CRC in our study, consistent with and [20]. However, no significant associations were found with inflammatory bowel disease (IBD) or malabsorption syndrome, differing from [21], potentially due to diagnostic limitations and lack of awareness regarding these conditions.

Dietary Factors

Dietary factors played a significant role in early-age CRC development, with red meat and fast food consumption showing elevated risks. This aligns with global findings [22], highlighting the role of dietary patterns in CRC pathogenesis. Conversely, vegetable consumption demonstrated protective effects, corroborating findings by [23, 24]. The influence of fat intake on CRC risk underscores the impact of Western dietary patterns, as established by [25].

Family History

Surprisingly, family history did not exhibit significant associations with early-age CRC in our study [24]. They were suggesting a possible underreporting and limited data in resource-limited settings like Bangladesh. Despite these discrepancies, the implications of genetic predisposition in CRC warrant further investigation, particularly in diverse populations with varying healthcare access and awareness. This study identified several risk factors associated with early-age colorectal cancers (CRC) in a Bangladeshi population. These findings highlight the complex interplay of genetic, lifestyle, and environmental factors in CRC development,

emphasizing the importance of tailored interventions and preventive strategies. Future research should focus on elucidating the underlying mechanisms driving CRC pathogenesis in diverse populations, aiming to inform targeted interventions and improve clinical outcomes.

CONCLUSION

This study sheds light on colorectal cancer (CRC) risk factors among young individuals in Bangladesh. Male gender, overweight, obesity, and dietary habits, particularly red meat and fast-food consumption, are significant contributors to early-age CRC. Regular vegetable intake appears protective. A BMI over 25.0 poses the highest risk. While familial adenomatous polyposis (FAP) showed significance, other medical conditions lacked association. Business occupation and middle socioeconomic class correlated with early age CRC. Surprisingly, smoking and alcohol showed no significant links, but regular exercise demonstrated protective effects.

RECOMMENDATION

Based on the findings of the study, the following recommendations can be proposed:

- The consumption of red meat and fast foods should be avoided, and a vegetables and fiber diet should be practiced regularly.
- Need to encourage them to increase physical activities.
- An early screening program for a patient with positive family history.
- A mass awareness campaign should be done to encourage people.

Conflict of Interest: None declared

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Article at a Glance	
Study purpose:	Investigate risk factors for early-onset colorectal cancer (CRC) in Bangladesh.
Key findings:	Male gender, overweight/obesity, and dietary factors were significant risk factors. Regular consumption of red meat and fast food increases CRC risk. Higher vegetable intake lowered risk. Middle socioeconomic class associated with early-onset CRC.
Newer findings added:	Identifies specific risk factors for early-onset CRC in a limited-resource country like Bangladesh.
Abbreviations	CRC - Colorectal Cancer BMI - Body Mass Index IBD - Inflammatory Bowel Disease FAP - Familial Adenomatous Polyposis