Journal of Carcinogenesis
Covering Genesis to Therapeutics

Journal of Carcinogenesis, ISSN: 1477-3163
2025; Vol 24: Issue 4, https://carcinogenesis.com/

An Epidemiological Study on Early versus Late Onset Colorectal Cancers at Tertiary Care Centre in North East India

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ABSTRACT

Introduction: Colorectal carcinoma has shown a significant rise among young adult population around the world in the last few decades. We conducted a retrospective observational study to understand the associated risk factors and clinic-pathological characteristics by comparing early onset versus late onset colorectal carcinoma from North Eastern India.

Materials and Methods: 352 confirmed cases of colorectal carcinoma presenting at our centre in last eight years were studied. They were divided into early onset (<45 years) and late onset (>45 years) groups. Risk factors and clinic-pathological characteristics of the two groups were compared.

Results: Early Onset Colorectal Carcinoma constituted 33.2% of the total cases, with slight female preponderance. Early onset group showed higher association with the increased BMI than the late onset group (P value=0.008). There was higher association of the positive family history among the early onset group. Majority of the patients presented with bleeding per rectum or blood/mucus in stool, with more prevalence in late onset age group. Early onset group were found to have higher proportion of mucinous and medullary carcinomas with significantly higher histologic grade and stage at presentation as compared to the older age group.

Conclusion: Our study reveals a significant incidence of colorectal carcinomas among younger age group with observable differences in the existing risk factors and clinic-pathological features as compared to late onset group. Studies are required to relate risk factors among young generations to screen the disease at the earlier stages and proceed with more meticulous treatment strategies.

KEYWORDS: *Colorectal Carcinoma, North Eastern India.*

How to Cite: Mohan Babu B, Laishram Natasha, Laishram Purnima Devi, K.L.T. Gowtham, Ngairangbam Phalguni Singh, Farhana Tampakmayum., (2025) An Epidemiological Study on Early versus Late Onset Colorectal Cancers at Tertiary Care Centre in North East India, *Journal of Carcinogenesis, Vol.24, No.4*, 29-34.

1. INTRODUCTION

The Colorectal carcinoma is a collective term defined on anatomical basis to describe malignant tumors of the cecum, ascending colon, hepatic flexure, transverse colon, splenic flexure, descending colon, sigmoid colon and rectum. Colorectal carcinoma (CRC) is the third most common cancer worldwide, representing 10.6% of all incident cancers in men and 9.3% in women. It is the second most common cause of cancer-related death (9.4%) worldwide.[1] The highest incidence rates are in Australia and New Zealand, Europe, and North America, and the lowest rates are found in Africa and South-Central Asia.[2] These geographic differences appear to be attributable to differences in dietary and environmental exposures that are imposed upon a background of genetically determined susceptibility. According to the Cancer Statistics 2020 report from National Cancer Registry Program of India, Colorectal Carcinoma is the fourth leading cancer comprising an estimated incidence of 42487 in men and 30670 in women with an annual cumulative risk of 1 in 298. Males are affected relatively more than females, with a ratio ranging from 1.38:1.[3] In the North-Eastern Indian states, a project report of the ICMR-National Centre for Disease Informatics and Research, Bengaluru, 2021 estimated that Mizoram has the highest age-adjusted incidence rates (AARs) of colorectal cancer (12.2 per lac in men and 8.6 per lac in women) followed by

Kamrup Urban (10.9 per 100,000). In Manipur, Imphal West district has the highest AAR of CRC comprising 7.8 per lac in men and 5.5 per lac in women, with a state average AAR of 3.6 per lac population.[4]

Patients with CRC most commonly experience abdominal pain, change in bowel habits, hematochezia/melena, weakness, iron deficiency anemia and weight loss. [5] Less commonly, patients present with nausea, vomiting or abdominal distension, which may be signs of tumor-related obstruction.

Colorectal cancer, thought of as a disease of older patients (> 60 years) has a significant incidence in young adults. There has been a recent shift in the incidence of CRC from old age to the younger age group worldwide with the latter presenting more at advanced age and poorer prognosis. [6-9] Similar trend in the incidence of colorectal cancers has been observed in the Indian subcontinent which is thought to be accelerated by urbanisation and change in dietary habits.[10-12] Disease characteristics in young adults are distinct from those in older patients in stage, grade, location of tumour and survival. The disease in the young is more aggressive, presents at a later stage and has poorer pathologic findings.

Various studies from different regions from India have analyzed varying results on the early versus late onset CRCs in terms of demographic profile, clinical presentation and pathological grading and staging. However, similar studies have not been carried out in the context of North Eastern region, where the cultural and dietary habits are quite distinct from the rest of the country. Therefore, we aimed to conduct a retrospective study to find out the epidemiological and clinicopathological characteristics of CRC based on age of onset, in order to proceed with screening those at higher risk at the earlier age and treat at earlier stages.

2. MATERIALS AND METHODS

We Conducted a retrospective observational study using a database of cancer patients' case files maintained by the department of Radiation Oncology at the Regional Cancer Centre, RIMS, Imphal from January 2013 to December 2020. The patients had presented to the department of Radiation Oncology either pre- or post-operatively for their further management.

The socio-demographic details, clinical history, basic laboratory investigations, stage at diagnosis and the details of biomarkers were obtained from the database.

We divided the patients into two groups a) The early onset group with subjects up to the age of 45 years and b) the late onset group with subjects above the age of 45 years. The stage wise distribution and analysis was done according to the AJCC cancer staging manual eighth edition.

Percentages, proportions and statistical significance were analyzed using IBM SPSS statistics 26 for windows. P value of < 0.05 was be considered as significant.

3. RESULTS

We studied the files of 352 patients with colorectal carcinoma using the database from January 2013 to December 2020 (eight years). The age of the study subjects ranged from 14 to 92 years with a mean age of 53.33 ± 16.28 with a slightly higher preponderance of male patients (52%). Early onset CRC group aged below 45 years constituted 33.2% (almost one-third) of the total registered cases. There was slight female preponderance among the early onset group (51.3%) whereas the same was inverse in the late onset CRC group (46.4%).

On the basis of culture, early onset CRC was found more commonly among Christian (usually Hilly Tribals) and Muslim Communities as compared to the Hindu Meitei community. Body Mass Index analysis showed slightly higher BMI among males as compared to females in all age group. However, early onset group were found to be more overweight and obese than the late onset group (35.9% Vs 25.1%). Dietary habits of the patients revealed majority (96.5%) of the subjects were non-vegetarians, with a significant proportion with regular non-vegetarian diet. There was no significant difference in non-veg intake between the two groups. Patients having positive family history of colorectal carcinoma among first degree relatives were slightly higher among early onset group (11.1% Vs 9.8%). High risk behaviors like alcohol consumption and smoking were found significantly higher in the both age groups. The coexisting comorbidities like Diabetes, Hypertension, Heart diseases and viral hepatitis were found more in late onset age group patients. In the family history of colorectal cancer among first degree relatives, it was observed that the early onset age group had higher proportion of positive family history (34.2% Vs 23.8%).

Majority of the patients presented with bleeding per rectum or blood/mucus in stool, with more prevalence in late onset age group (Table 2). However, the symptoms like abdominal pain and altered bowel habits were encountered more with

early onset CRC group. Associated symptoms like weight loss and easy fatiguability (owing to iron deficiency anemia) were more common among late onset group.

According to the anatomical location of the disease, there was a preponderance of sigmoid colon and rectum in both the groups (67.5% in EOCRC and 69.7% in LOCRC) with slightly higher incidence or proximal colon among the younger age group (Table 3). Histopathological reports revealed higher incidence of moderately differentiated adenocarcinoma among the late onset CRC group whereas, early onset CRC group were found to have higher proportion of mucinous and medullary carcinomas with significantly higher histologic grade as compared to the older age group. While comparing the groups based on staging at presentation according to AJCC/TNM Eighth Edition, it was found that the early onset CRC presented with relatively more advanced stage as compared to the late onset group. The relationship between serum carcinoembryonic antigen (CEA) levels and the age showed relatively elevated levels of CEA among late onset age groups (60.9% Vs 51.2%)

Table 1. Comparisons of the study group based on demography, family history, behavioural factors and co-morbidities

Variables	Category	<45 years, N(%)	>45 years, N(%)	P Value
Gender	Male	57 (48.7%)	126 (53.6%)	0.386
	Female	60 (51.3%)	109 (46.4%)	
Religion	Hindu	66 (56.4%)	155 (65.9%)	0.085
	Christian	41 (35.0%)	71 (30.2%)	
	Muslim	10 (8.6%)	9 (3.9%)	
Body Mass Index	Undernourished <18.5)	3 (2.6%)	17 (7.2%)	0.08
	Normal (18.5-24.9)	72 (61.5%)	159 (67.8%)	
	Overweight (25-29.9)	40 (34.2%)	57 (24.2%)	
	Obese (≥30)	2 (1.7%)	2 (0.9%)	
Dietary Habits	Vegetarian	2 (1.7%)	10 (4.3%)	0.033
	Occassional Non Veg	75 (64.1%)	145 (61.7%)	
	Regular Non-Veg	40 (34.2%)	80 (34.0%)	
Family History of CRC	Yes	13 (11.1%)	23 (9.8%)	0.56
	No	104 (88.9%)	212 (90.2%)	
Alcohol use	Yes	65 (55.5%)	146 (62.1%)	0.872
	No	52 (44.5%)	89 (37.9%)	
Smoking Use	Yes	85 (72.6%)	177 (75.3%)	0.862
	No	32 (27.4%)	55 (24.7%)	
Comorbidities	Diabetes	2 (1.7%)	28 (11.9%)	0.025
	Hypertension	3 (2.6%)	35 (14.9%)	0.021
	Heart Disease	1 (0.85%)	2 (0.85%)	0.823
	Viral Hepatitis	1 (0.85%)	2 (0.85%)	0.823
	HIV	2 (1.7%)	1 (0.43%)	0.811
	None	107 (91.5%)	169 (71.9%)	

Table 2. Clinical presentation of early versus late onset groups

Symptoms	<45 years, N(%)	>45 years, N(%)	P value
Bleeding per Rectum	56 (47.9%)	191 (81.3%)	0.754
Blood/Mucus in Stool	22 (18.8%)	50 (21.3%)	0.294
Abdominal Pain	41 (35.0%)	70 (29.8%)	0.999

Altered Bowel Habits	56 (47.9%)	97 (41.3%)	0.754
Weight Loss	15 (12.8%)	120 (51.1%)	0.087
Easy Fatigue	58 (49.6%)	121 (51.5%)	0.115

Table 3. Pathologic Characteristics and stage at presentation

Variables	**Characteristics**	**< 45 years, N(%)**	**> 45 years, N(%)**	**P value**
Anatomic location	Ascending colon/Hepatic Flexure	26 (22.2%)	46 (19.5%)	0.226
	Tranverse Colon	8 (6.8%)	15 (6.5%)	
	Descending Colon/ Splenic Flexure	4 (3.5%)	10 (4.3%)	
	Rectum/Sigmoid Colon	79 (67.5%)	164 (69.7%)	
Tumor Type	Adenocarcinoma	87 (74.5%)	223 (94.9%)	0.009
	Signet Ring	17 (14.5%)	7 (2.9%)	
	Mucinous	12 (10.4%)	2 (0.9%)	
	Medullary	1 (0.85%)	1 (0.4%)	
	Squamous	0 (0%)	2 (0.9%)	
Histologic Grade	Well Differentiated	27 (23.1%)	50 (21.3%)	0.041
	Moderately Differentiated	57 (48.7%)	165 (70.2%)	
	Poorly Differentiated	33 (28.2%)	20 (8.5%)	
Stage	Stage I	0 (0%)	4 (1.7%)	0.294
	Stage II	21 (17.9%)	54 (23%)	
	Stage III	59 (50.4%)	115 (49.0%)	
	Stage IV	37 (31.6%)	62 (26.3%)	
Serum CEA Level	Elevated (>5 ng/L)	60 (51.2%)	143 (60.9%)	0.093
	Normal (< 5ng/L	57 (48.8%)	92 (39.1%)	

4. DISCUSSION:

Various studies from other regions of the country have reported a male predominance in both early onset and late onset colorectal cancers. [13,14] However, in our study we found slight female predominance among early onset CRC group with a male to female ratio of 1:1.05; but the male predominance persists in late onset group. Studies have shown that of early

onset colorectal carcinoma constitute around 35.5-39.05% of all colorectal malignancies, whereas we found slightly lower incidence in our study (33.2%).[12,13,15] Our findings on association of higher BMI with colorectal cancer matches with the other studies from across the world, however we could not find any significant difference between the two age groups. [16] Our study revealed slightly higher incidence of hereditary association of the disease among the younger onset age group, which is in congruence with the findings from other parts of the country. [17]

Many observational studies have linked early onset CRC with smoking and alcohol consumption. [18] However, our study revealed that those risk behaviours were more predominant among late onset age group with relatively higher consumption of alcohol and smoking in both the groups. Our study shows that Diabetes and Hypertension are more commonly associated comorbidities among late onset group, which correlates with a meta-analysis investigating the association of diabetes with colorectal cancer. [19]

Astin et al reported in a systematic review of 55 papers that rectal bleeding and abdominal pain are the principal presenting symptoms in CRC. [20] In our study also, we found those symptoms to be predominant among both the age groups. Weight loss was found to be significantly predominant clinical presentation among late onset group in our study (51.1% Vs 12.8%) in our study, which is contradictory to the Low et al findings that weight loss is a potential early clinical finding that could be associated in early onset CRC. [21]

In regard to the anatomical localisation of CRC, various reports describe tumor localisation in the right colon among the young patients. [22] Our study also reveals slightly higher incidence of right sided CRC among early onset group as compared with the late onset CRC. However, various studies from the Indian subcontinent have shown left sided predilection in early onset patients. [13,15]

Histologically unfavourable disease (poorly differentiated and/or mucinous or signet ring cell) was more common in the younger age group, which is in accordance with the patterns observed by Minardi et al and O'Connell et al. [16,22,23] Majority of the global as well as Indian studies have reported early onset CRCs present at more advanced stages. [13,15,24] Our study also revealed that early onset group of patients presented at relatively advanced stages than the late onset group. Arnaud JP et al have described the sensitivity of CEA in detecting CRC increases with advancing stage of the disease. [25] However in our study, the late onset group with lesser proportion of advanced stage was characterised by higher proportion of subjects with elevated level of CEA marker.

5. CONCLUSION

In our study, we found that early onset colorectal carcinoma constitutes one third of total CRCs registered in our institute in the last eight years, no significant difference in sex. People having positive family history of CRC have higher risk of developing the disease at early age. Majority of early age group presented with abdominal pain and change in bowel habits whereas older age group presented more with bleeding per rectum and weight loss. Our study revealed the early onset CRC were histologically more aggressive and presented at more advanced stage. Therefore, age-specific data and tumour characteristics of young CRC patients in our study and those from other Indian and international databases show a need for a high index of suspicion for the disease in young Indian adults. Further studies are required to relate the genetic factors and dietary habits among young generations to screen the disease at the earlier stages and proceed with more meticulous treatment strategies.

Source of funding
None.

Conflicts of interest
None.

REFERENCES

[1] Colorectal Cancer: SourceGlobocan 2020: https://gco.iarc.fr/today/data/factsheets /cancers/10_8_9-Colorectum-fact-sheet.pdf. Accessed on July 21, 2021.
[2] Fitzmaurice C, Allen C, et al. Global, Regional, and National Cancer Incidence, Mortality, Years of Life Lost, Years Lived With Disability, and Disability-Adjusted Life-years for 32 Cancer Groups, 1990 to 2015: A Systematic Analysis for the Global Burden of Disease Study. JAMA Oncol 2017; 3:524.
[3] Cancer Statistics, 2020: Report From National Cancer Registry Programme, India (researchgate.net). Accessed on July 21, 2021.
[4] Profile of cancer and related health indicators in the north east region of India. https://ncdirindia.org/All_Reports/NorthEast2021/resources/NE_Complete.pdf. Accessed on July 21, 2021

[5] Kohler Ba et al. Annual report to the nation on the status of cancer, 1975-2007, featuring tumors of the brain and other nervous system. J Natl Cancer Inst. 2011; 103(9):714-736
[6] Martin CS Wong, Junjie Huang, Veeleah Lok, Jingxuan Wang, Franklin Fung, Hanyue Ding, Zhi-Jie Zheng. Differences in Incidence and Mortality Trends of Colorectal Cancer Worldwide Based on Sex, Age, and Anatomic Location. Clinical Gastrology and Hepatology Journal. May 01, 2021; 19-5: 955-966
[7] Din KSE, Loree JM, Sayre EC, Gill S, Brown CJ, Dau H, DeVera MA. Trends in the Epidemiology of young-onset colorectal cancer: a worldwide systematic review. BMC Cancer. 2020 Apr 6;20(1):288
[8] Chambers AC, Dixon SW, White P, Williams C, Thomas G, Messenger DE. Demographic trends in the incidence of young-onset colorectal cancer: a population-based study. Wiley Online Library. November 27, 2019. 10.1002/bjs.11486
[9] Ullah MF, Fleming CA, Mealy K. Changing trends in age and stage of colorectal cancer presentation in Ireland From the nineties to noughties and beyond. The Surgeon, Journal of the Royal Colleges of Surgeons of Edinburgh and Ireland. 2018. I-5
[10] Gupta RK, Ali S, Sakhuja1 P, Mukherjee D, Agarwal AK, Puri AS. Colorectal carcinoma up to the second decade of life: An 8-year experience in a tertiary care center. Indian Journal of Cancer. 2014; 51: 557-559
[11] Patil PS, Saklani A, Gambhire P, Mehta S, Engineer R, De'Souza A et al. Colorectal Cancer in India: An Audit from a Tertiary Center in a Low Prevalence Area. Indian J Surg Oncol. April 12, 2017; 10.1007/s13193-017-0655-0
[12] Gupta S, Bhattacharya D, Acharya AN, Majumdar S, Ranjan P, Das S. Colorectal carcinoma in young adults: a retrospective study on Indian patients: 2000–2008. Colorectal is. 2010;12:182–189.
[13] Sudarshan V, Hussain N, Gahine R, Mourya J. Colorectal cancer in young adults in a tertiary care hospital in Chhattisgarh, Raipur. Indian J Cancer. 2013;50(4):337–337.
[14] Sinha R, Doval DC, Hussain S, Kumar K, Singh S, et al. Lifestyle and sporadic colorectal cancer in India. Asian Pac J Cancer Prev. 2015;16(17):7683–7688.
[15] J. Nath, C. Wigley, M. R. B. Keighley and B. Perakat. Rectal cancer in young adults: a series of 102 patients at a tertiary care centre in India. Colorectal Disease. May 6, 2008;11(5):475-9.
[16] Matsuo K, Mizoue T, Tanaka K, Tsuji I, Sugawara Y, Sasazuki S et al. Association between body mass index and the colorectal cancer risk in Japan: pooled analysis of population based cohort studies in Japan. Annals of Oncology. February 1, 2012;23(2):479-490.
[17] Maharaj R, Shukla PJ, Sakpal SV, Naraynsingh V, Dan D, Hariharan S. The impact of hereditary colorectal cancer on the Indian population. Oct-Dec 2014;51(4):538-41.
[18] Zisman AL, Nickolov A, Brand RE, Gorchow A, Roy HK. Associations between the age at diagnosis and location of colorectal cancer and the use of alcohol and tobacco:implications for screening. Arch Intern Med. 2006;166(6):629–634.
[19] Linde J, Karlstad O, Eriksen A, Vestergaard S, Bronsveld P et al. CARING (Cancer Risk and Insulin analogues): the association of diabetes mellitus and cancer risk with focus on possible determinants-a systematic review and a meta-analysis. Curr Drug Saf. 2013;8(5):296–332.
[20] Astin M, Griffn T, Neal RD, Rose P, Hamilton W. The diagnostic value of symptoms for colorectal cancer in primary care: a systematic review. Br J Gen P ract. 2011; 61 (586):231–243.
[21] Low E. Abstract 982. Presented at: Digestive disease week; May 18-21, 2019,San Diego.
[22] Minardi AJ, Sittig KM, Zibari GB, Mcdonald JC. Colorectal cancer in the young patient. Am Surg. 1998;64(9):849.
[23] Connell JB, Maggard MA, Livingston EH, Cifford KY. Colorectal cancer in the young. The Am J Surg. 2004;187(3):343–348.
[24] Dozois EJ, Boardman LA, Suwanthanma W, Limburg PJ, Cima RR, et al. Young-onset colorectal cancer in patients with no known genetic predisposition: can we increase early recognition and improve outcome. Med. 2008;87(5):259.
[25] Arnaud JP, Koehl C, Adloff M. Carcinoembryonic antigen (CEA) in diagosis and prognosis of colorectal carcinoma. Dis Colon Rectum.1980;23(3):141–144