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Patterns of incidence of colorectal cancer in Brazil from 1990 to 2016

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Colorectal cancer (CRC) has a high prevalence in both sexes. Although its incidence among the elderly is declining, some studies show an increased incidence in age group under 50 populations, an age group that is not included in the global screening protocols. However, screening the disease in a defined population at younger age groups is of paramount importance in reducing mortality rate. This is an ecological study that spans from 1990 to 2016 in Brazil aimed at knowing the incidence of this neoplasm in the Brazilian population below 50 years. Data recorded by the Global Burden of Disease (GBD) revealed that patients under 50 years of age were diagnosed with invasive CRC. The results showed significant association between CRC and age groups 15 to 49 years ($p<0.01$) in both sexes while the association trend rose with increasing age. Also, there was a significant increase in hospitalizations for colorectal cancer in all age groups (14 to 49 years) in both sexes.

Key words: Colon neoplasia, epidemiology.

INTRODUCTION

Colorectal cancer is the third most common cancer among men and the second in women, with around 20% mortality rate, compared to the other types of neoplasia (Larsen et al., 2018). This illness presents several genetic (Chen et al., 2006; Palomaki et al., 2009; Tenesa and Dunlop, 2009) and non-genetic predictive factors (Park et al., 2009), with familial adenomatous polyposis and Lynch syndrome that are well studied and associated with colorectal cancer (Choi et al., 2018; Peltomaki and Vasen, 1997).

Although its incidence among the elderly is decreasing, some studies show an increase in this rate in the population under 50 years (Patel and Ahnen, 2018). Diagnosis and screening is done basically by colonoscopy, which is being considered during examination with better diagnostic acuity for lesions of the colon mainly for neoplasia (Da Silva et al., 2003).

Mortality of CRC is closely related to the stage of the disease at the time of diagnosis. The survival of patients with early diagnosis reaches 90% in 5 years, while in patients diagnosed at later stages of the disease, or with distant metastasis, the 5-year survival drops dramatically to 15% (O'Connell, et al., 2004; Siegel, et al., 2017). Thus, a diagnosis in the early stages is of exponential importance to reduce mortality in the population, and this issue must be taken into account for the production of

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Table 1, Hospital admission rate for colorectal cancer from 1990 to 2016.

Age group (years)	Male				Female			
	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum
15-19	19.37	3.98	11.79	24.56	13.56	1.8	10.13	16.11
20-24	51.51	9.78	33.84	60.77	47.2	6.78	36.26	54.53
25-29	105.42	21.17	74.17	130.81	110.5	22.89	82.34	141.71
30-34	170	39.07	107.98	233.47	198.58	42.91	133.85	270.47
35-39	296.27	80.98	155.74	436.2	351.72	92.07	188.59	513.92
40-44	440.93	144.72	198.67	663.84	550.09	183.75	243.27	825.07
45-49	608.08	233.02	239.73	938.76	766	306.77	296.52	1190

ancillary measures to prevent and track the disease.

In this context, the importance of tracking and possible increase in the number of cases in younger population of Brazil is far from ideal. This is because the Brazilian protocols on the screening of rectal cancer are still limited, in general, to the elderly population and present several obstacles that determine a delay in the diagnosis (Dias et al., 2007).

Thus, the objective of this study is to analyze the incidence of colorectal cancer in patients under 50 years of age in Brazil in an attempt to improve the Brazilian diagnostic and screening system, thus avoiding complications arising from late diagnosis.

METHODS

Study design and data source

This is an ecological study on patients younger than 50 years of age diagnosed with invasive rectal cancer and registered by the Global Burden of Disease (GBD) in Brazil from 1990 to 2016. GBD is open source software that provides updated data on health levels and trends in the world from 1990 to 2016. This program of disease burden assesses mortality, disability from major diseases and risk factors, incidence and other health data. GBD is a collaboration of over 1800 researchers from 127 countries.

The cases were stratified by tumor site according to ICD 10 codes: C18-C21.9, D01.0-D01.3, D12-D12.9, and D37.3-D37.5. ICD 9 was used for cases prior to the publication of ICD 10 in codes 153-154.9, 209.1, 209.5, 211.3-211.4, and 230.3-230.6. Data were collected according to the date of diagnosis and the GBD platform itself standardized the two international classifications of diseases to represent the same morbidity, taking into account the broad period studied.

We selected the study years from 1990 to 2016 to better understand the incidence trend changes in Brazil. The analysis included stratification by sex and age groups (1 to 4 years, 5 to 9 years, 10 to 14 years, 15 to 19 years, 20 to 24 years, 25 to 29 years, 30 to 34 years, 35 to 39 40 to 44 years, and 45 to 49 years). The age groups followed the standardization available in the GBD so that it was possible to analyze and compare the populations of different regions of Brazil.

Statistical analysis

In the statistical analysis, linear regression models were used to evaluate the trend of the incidence of this neoplasia in the studied period. The trend was also estimated according to national standard rates for each location and age group, with a confidence level of 95% using statistical program Data Analysis and Statistical Software for Professionals (Stata) version 11.0®.

RESULTS

Sample description was made through measures of central tendency, grouping all cases of colorectal neoplasia recorded from 1990 to 2016 at any time of patient admission, in order to stratify the analysis by standardized age groups. No patient younger than 15 years with this neoplasia was registered during the study period for both sexes (Table 1).

A significant association between colorectal cancer and age groups ($p<0.01$) was found in both sexes. The association trend rose with increasing age in both sexes (Figures 1 and 2). Thus, for men aged 15 to 19 years, there was an increase in the hospitalization rate of 0.48 (CI 0.41, 0.54); for 20 to 24 years of age, this increase was 1.15 (CI 0.96, 133); for 25 to 29 years it was 2.60 (CI 2.36, 2.84); for 30 to 34 years old it was 4.91 (CI 4.77, 5.05); for 35 to 39 years old it was 10.13 (CI 9.63, 10.63); for 40 to 44 years of age it was 18.15 (CI 17.43, 18.87); and for 45 to 49 years of age, this increase in the hospitalization rate, as shown by linear regression was intensified reaching 29.24 (CI 28.77, 30.31) in Table 2.

A similar fact was observed for women since the association between colorectal cancer and age was also higher at later ages, increasing with advancing age. Thus, for the 15-19 age group, there was an increase in hospital admissions of 0.22 (0.21, 0.24); for 20 to 24 years old, this increase was 0.76 (0.61, 0.92); for 25 to 29 years old it was 2.79 (2.48, 3.09); for 30 to 34 years old it was 5.35 (5.04, 5.66); for 35 to 39 years old it was 11.51 (10.92, 12.10); for 40 to 44 years old it was 23.06 (22.26, 23.87); and for 45 to 49 years of age, this increase in hospitalization rate was the highest found in this study, reaching 38.45 (36.83, 40.07). Increases in all age groups were significant (Table 2).

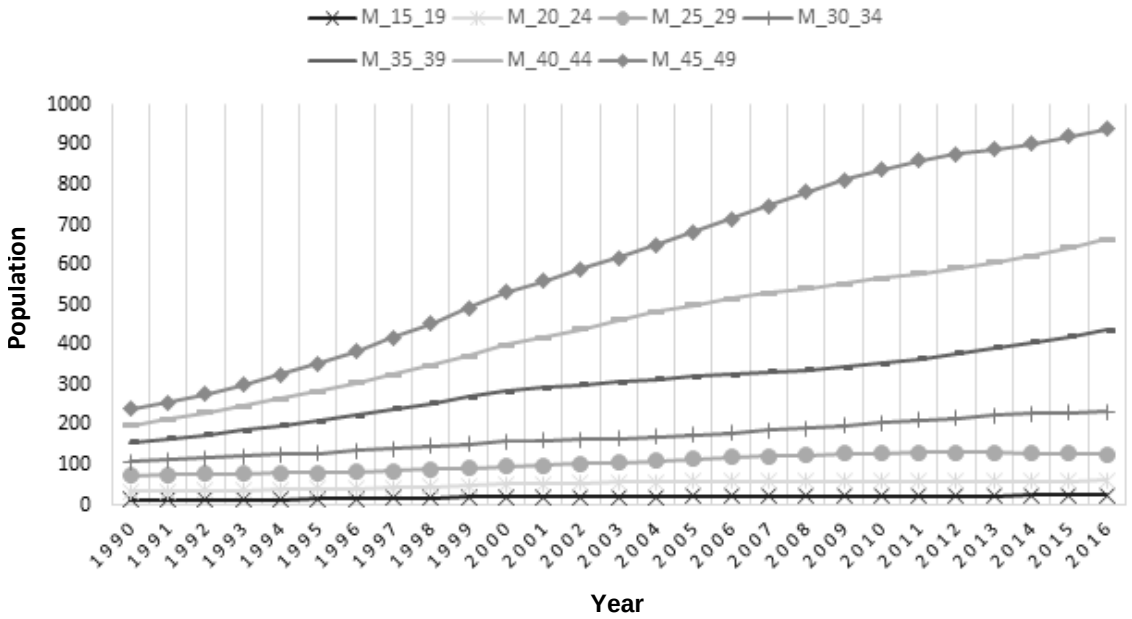

Figure 1. Temporal trend of male hospitalizations for colorectal cancer from 1990 to 2016. Time regression with p<0.01 in all age groups was considered.

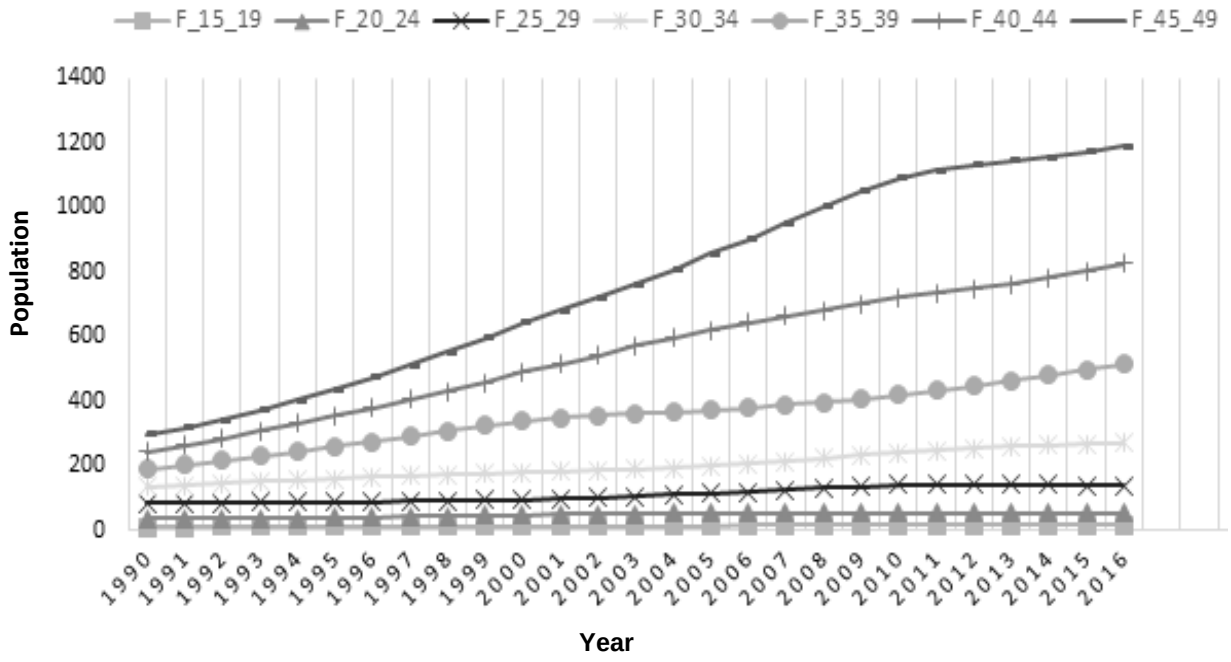

Figure 2, Temporal trend of female hospitalizations for colorectal cancer from 1990 to 2016. Time regression with p<0.01 in all age groups was considered.

DISCUSSION

Colorectal cancer is still one of the most prevalent and incident type of cancer among men and women (Larsen et al., 2018), possessing a high mortality rate if not diagnosed in early stages of the disease (O'Connell et al., 2004). Thus, in this study we have an important result, which is the significantly relevant incidence in ages under 50 years, and an increasing trend for these same age groups.

Table 2, Association between hospitalizations for colorectal cancer and age groups.

Age group (years)	Hospitalizations in Brazil from 1990 to 2016			
	Male	p-value*	Female	p-value *
	β (CI 95%)		β (CI 95%)	
15-19	0.477395(0.4147575; 0.5400325)	<0.001	0.2238106 (0.2098407; 0.2377805)	<0.001
20-24	1,14712 (0.9621654; 1.332075)	<0.001	0.7646184 (0.60794; 0.9212968)	<0.001
25-29	2,600276 (2.356359; 2.844192)	<0.001	2,786705 (2.48044; 3.092969)	<0.001
30-34	4,91146 (4.774592; 5.048328)	<0.001	5,35288 (5.042266; 5.663494)	<0.001
35-39	10,1301 (9.631536; 10.62867)	<0.001	11,511 (10.92289; 12.0991)	<0.001
40-44	18,14839 (17.42819; 18.86859)	<0.001	23,06662 (22.25694; 23.8763)	<0.001
45-49	29,24386 (28.17907; 30.30865)	<0.001	38,44858 (36.83008; 40.06709)	<0.001

*Linear Regression.

This result draws attention to the lack of care that these younger age groups receive for the prevention and screening of this neoplasm. It creates the need for developing new protocols targeted at initiating the screening for colorectal cancer in younger ages, since the current protocols are the results of analyzes and epidemiological patterns that are outdated, according to the standards employed by this study, insisting on screening at ages above 50 years (Ebell et al., 2018). This change proposed here has already been considered by other guidelines, such as the American Cancer Society, which aims to begin screening at age 45 (Smith et al., 2018). This can further corroborate our study findings, since we found a high and increasing incidence of this neoplasm in the 45 to 49 years age group in both sexes. A possible cause for this increased incidence of colorectal cancer in ages under 50 years is increased exposure to unsatisfactory nutritional factors such as increased carbohydrate and fat in adolescence (Castro et al., 2010). This increase in carbohydrate may increase the incidence of breast cancer in women and right colon cancer in men (Borugian et al., 2002; Kim et al., 2015). The fat increase is positively associated with the incidence of neoplasms in both the right and left colon in both sexes (McMichael and Potter 1985; West et al., 1989).

Another possible cause of this increase in hospital admissions for colorectal cancer may arise from dysfunctions of the intestinal microbiota, which are common today in obese children and youngsters (Mendez-Salazar et al., 2018). With this alteration there may be an increase in inflammatory infiltrates that would be positively associated with the carcinogenesis of this neoplasm by altering the cytotoxic cellular response (Kho and Lal, 2018).

Thus, the present study pointed to a drastic increase in hospital admission rates for colorectal cancer in the period studied especially for the 45 to 49 years age group. This increase was 29.24 for men, reaching a significant mark of 38.45 among women in the study period for this age group. Thus, if the screening was done in this age group, many early diagnoses could be made, since it is the age at which the diagnosis curve grows more exponentially.

Conclusion

As earlier discussed, this study has shown that there was a significant increase in colorectal cancer admissions in all age groups between men and women, which was more drastic among the 45 to 49 years age group. This information can be taken into consideration while formulating public health strategies and secondary prevention, creating a new cut-off for the minimum age of screening of colorectal cancer.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ABBREVIATIONS

GBD, Global Burden of Disease; **CRC,** colorectal cancer.

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