

Epidemiology and risk factors of colorectal cancer in Syria: a single-center retrospective study

R.M. HARFOUCH^{1,2}, Z. ALKHAIER³, S. ISMAIL^{2,4}, A. YOUSSEF⁵, A.-A. ALHASAN⁵, F. BOUALI⁵, R. SHAABAN⁵, N. ABDULLAH⁶, Z. AL-SHEHABI^{2,7}, Y. ELSHIMALI⁸

¹Department of Microbiology and Biochemistry, Faculty of Pharmacy, Al-Sham Private University (ASPU), Latakia, Syria

²Cancer Research Center (CRCTU), Tishreen University Hospital, Latakia, Syria

³Faculty of Medicine, Al Andalus University, Al-Qadmous, Tartous, Syria

⁴Department of Pathology, Tishreen University, Latakia, Syria

⁵Faculty of Medicine, Al Andalus University, Al-Qadmous, Tartous, Syria

⁶Department of Oncology, Faculty of Medicine, Tishreen University Hospital, Latakia, Syria

⁷Department of Pathology, Tishreen University, Latakia, Syria

⁸Department of Pathology, Faculty of Medicine, Charles Drew University of Medicine and Science/ University of California Los Angeles (UCLA), CA, USA

Abstract. – OBJECTIVE: Colorectal cancer represents the third most common malignancy and the second leading cause of cancer deaths worldwide. Many factors contribute to the risk of developing colorectal carcinoma including diet, lifestyle, age, and genetic abnormalities. Recent findings have shown a considerable increase in the incidence rate of CRC in developing countries. However, there is little information regarding its incidence in the Middle East countries, including Syria. With our manuscript we aimed at presenting the first large epidemiological study regarding colorectal carcinoma incidence in Syria.

PATIENTS AND METHODS: We conducted a retrospective study on colorectal carcinoma cases at our institution from 2014 to 2018. The data include the cases that were diagnosed and recorded based on multiple parameters including gender, age, year of diagnosis, city of origin, and profession.

RESULTS: The number of colorectal cancer cases was 1,117 out of 13,589 cases of all malignant tumors recorded from 2014 to 2018, with an annual average incidence of 8.2%. There was a statistically significant difference in CRC cases according to age and gender. We also found a statistically significant difference according to physical activity and occupation.

CONCLUSIONS: These results demonstrate that risk factors related to colorectal cancer incidence in Syria mainly include male sex, age over 50 years old, and occupation with no physical activity.

Key Words:

Colorectal cancer, Characteristics, Epidemiology, Syria.

Introduction

Colorectal Carcinoma (CRC) is defined as the growth of abnormal cells in the colon and rectum with the potential to spread and metastasize to other organs¹. Many factors contribute to the risk of developing CRC including diet, lifestyle, age, and genetic abnormalities. Furthermore, gastrointestinal diseases including chronic ulcerating colitis, Crohn's disease, and familial adenomatous polyposis are also considered potential risk factors^{2,3}.

About 9.8 million deaths from cancer were recorded in 2018 according to the World Health Organization (WHO) statistics⁴. CRC ranks third among the most widespread cancers and the second leading cause of cancer deaths worldwide with considerable international and geographical variations⁵.

The largest incidence of CRC was stated in the Republic of Czech, Australia, New Zealand, Canada, and in the United States, while the least were registered in Central Africa, India, and Central Asia⁶. Considering the different embryonic origins of the colon and the rectum, these two organs have different anatomical and histological features. Hence, different chemical receptors, PH levels, and exposure to fecal lead to different risk factors and severity of cancer. Also, the absence of the protective serosa in the rectum in contrast to the colon plays a significant role in increasing the risk of cancer spreading to the adjacent organs, and hence, a worse prognosis and greater incidence. Reports from the American Cancer Society display that rectal carcinoma's overall 5-year sur-

vival rate of 66.5% is slightly higher than that of colon cancer (64.2%), but stage-specific survival has similar rates, the mortality rate is 30-40% and is higher in men than in women.

Recent findings have shown a considerable increase in the incidence rate of CRC in developing countries⁷. However, in those countries, the rise in incidence rate is related to the influence of dietary patterns, obesity, and lifestyle factors. On the other hand, a lower mortality rate is seen in developed countries which reflects the improvements in the practice of cancer treatment and management⁸.

Although the Middle East is considered as a low-risk region for CRC incidence (with 37/100,000 cases in most Middle East countries), recent studies⁹⁻¹¹ suggest a growing incidence of CRC with a variation in recorded cases between different parts of this region, given the common cultural characteristics and dietary habits.

Researchers^{12,14} suggest that high fat and meat intake, family history, physical activity, body mass index, and hormone replacement therapy are the main risk factors for CRC. Nevertheless, there is little information regarding CRC in the Middle East, and the database is limited to the Middle Eastern countries, including Syria.

In this research, we aimed at providing records of CRC cases that were admitted to the Tishreen University hospital, which was considered the second-largest oncology center in Syria during the period 2014-2018. Furthermore, we managed to study the demographic and occupational characteristics of patients including age, gender, occupation and geographical distribution in addition to discussing their possible relationship with the increase in colorectal cancer cases in our region.

Patients and Methods

We conducted a retrospective study for the cases of CRC in Tishreen University Hospital, Latakia city, in Syria, from 2014 to 2018. Our study was reviewed and approved by the Institutional Review Board at Tishreen University, and we collected our data from the database of the Center of Oncology at Tishreen University Hospital in the city of Latakia.

Data include cases that were diagnosed between 2014 and 2018 and recorded based on multiple parameters including gender, age, year of diagnosis, city of origin, and profession. We performed statistical analysis using SPSS v.20 (IBM Corp., Armonk, NY, USA). Association was con-

sidered significant when p -value is lower than 0.05. The data provided had not been published before, as the study included registered cancer cases within the past 5 years.

Statistical Analysis

Statistical analysis was applied using the Chi-square test and SPSS statistical program. According to our data, 1,117 subjects were diagnosed with CRC out of 13,587 registered cancer cases during the studied period, which represents 8.2% of all cancer cases. The number of recorded cases is shown in Table I.

Results

According to our data, the percentages of CRC cases that were recorded at our Institution were 7.35%, 8.38%, 8.82%, 8.65%, and 8.07% of all tumor cases during the years 2014, 2015, 2016, 2017 and 2018, respectively.

In total, 1,117 subjects were diagnosed with CRC out of 13,589 registered cancer cases during the studied period, which represents 8.2% of all cases. The highest number of cases was 236 in 2018, while the highest percentage of all cancer cases was in 2016, as shown in Table I.

According to our data, we found a statistically significant difference between females and males in CRC cases during the 5 years with a p -value < 0.05 , and cases among males were more frequent than among females. There was a difference between CRC cases according to age. The number of cases was higher among patients older than 50 years compared patients under 50 years old, and this difference was statistically significant with a p -value < 0.05 .

We also found a statistically significant relationship between both geographic site and occupation with CRC cases. As we can notice from Table II, there was a statistically significant difference between active and inactive occupations, 81.3% of CRC cases were working in non-active occupations (teachers, housekeepers, freelancer), while 18.7% of CRC cases were working in occupations which require more activity (construction workers, police officers, health care workers).

Discussion

Colorectal cancer is considered the third deadliest cancer of all cancer types; this paper is the

Table I. Number of CRC cases and other types of cancer during 2014-2018.

N	2014	2015	2016	2017	2018	Total
CRC cases	226	211	221	223	236	1,117
Other tumor cases	2,846	2,304	2,282	2,353	2,687	12,472
Percentage of CRC cases	7.356%	8.3896%	8.829%	8.656%	8.073%	8.219%
Total	3,072	2,515	2,503	2,576	2,923	13,589

first to statistically discuss CRC cases in Tishreen University Hospital in Latakia city, Syria, which contains the second-largest oncology center of Syria. The collected data represent the incidence of CRC among all cancer cases: 8.07% in 2018, which is slightly lower if compared to the worldwide incidence rate of 10.2%, according to American Cancer Society – Global Cancer Statistics 2018⁴.

The number of annual cases of colorectal cancer over a period of 5 years varied, but the number of diagnosed cases of colorectal cancer in 2018 amounted to 236 cases, a percentage of 21.13%, which represents the highest recorded number in all 5 years.

According to our study, the mean age of CRC patients is 58 years old and 24% were under 35 years old, which is in correspondence with Simaan and Jerf¹⁵, who inferred that the mean age of CRC patients was 51 years old and 23% were under 35 years old. Our results showed a significant difference between males and females, and this is similar to White et al¹⁶ who highlighted that the overall incidence is higher in men.

The percentage of CRC among males is 52.73%, which is higher than that of women

(47.27%), and it was observed that 75.65% of all patients were over 50 years old. Whereas, for those under the age of 30, their number was 17 cases, which is the lowest among people with colon and rectal cancer, equivalent to 1.52%.

Our study found an inverse relationship between physical activity and risk of colorectal cancer, whereas 86.03% of CRC patients from both genders had occupations without physical activity (p -value < 0.05), and this result is consistent with several previously published works¹⁷⁻¹⁹.

The number of registered cases of colorectal cancer in Latakia is 462, with a percentage of 41.36%; this percentage was higher than that of the rest of other Syrian cities. We can attribute this large number to the increase in diagnostic methods at Tishreen University Hospital in Latakia and the emphasis on cases recorded in colon and rectal cancer in the oncology center database from which data were collected.

Conclusions

In our manuscript, we managed to present the first study that highlights the epidemiology and

Table II. Characteristics of patients with CRC and other types of cancer registered in the oncology center database during the period 2014-2018.

		CRC		Other		Total		<i>p</i> -value
		n	%	n	%	n	%	
Year	2014	226	7.36	2,846	92.64	3,072	22.61	0.278
	2015	211	8.39	2,304	91.61	2,515	18.51	
	2016	221	8.83	2,282	91.17	2,503	18.42	
	2017	223	8.66	2,353	91.34	2,576	18.96	
	2018	236	8.07	2,687	91.93	2,923	21.51	
Gender	F	528	47.27	6,691	53.65	7,219	53.12	0.000043
	M	589	52.73	5,781	46.35	6,370	46.88	
Age	< 50	272	24.35	4,749	38.08	5,021	36.95	< 0.00001
	≥ 50	845	75.65	7,723	61.92	8,568	63.05	
Geographic Site	Costal	735	65.80	7,521	60.30	8,256	60.75	0.000312
	Inner	382	34.20	4,951	39.70	5,333	39.2	
Occupation	Active	156	13.97	2,336	18.73	2,492	18.34	0.000081
	Inactive	961	86.03	10,136	81.27	11,097	81.66	

risk factors of colorectal cancer in Syria. Our study demonstrated that the incidence of CRC among all cancer cases was slightly lower than the worldwide incidence rate. Our study also revealed that colorectal carcinoma was associated with male gender, older ages, and occupations with no physical activity.

Conflict of Interest

The authors declare that they have no competing interests.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Availability of Data and Material

The data are represented in the manuscript, additional data is available upon request.

Code Availability

Not applicable.

Ethics Approval

Our study was reviewed and approved by the Institutional Review Board at Tishreen University.

Informed Consent

Written informed consent was obtained from the patients for participating in this study.

ORCID ID

Rim M. Harfouch: 0000-0001-7002-8728.

References

- 1) Assi R, Mukherji D, Haydar A, Saroufim M, Temraz S, Shamseddine A. Metastatic colorectal cancer presenting with bone marrow metastasis: a case series and review of literature. *J Gastrointest Oncol* 2016; 7: 284-297.
- 2) Zeraatkar D, Han MA, Guyatt GH, Vernooij RWM, El Dib R, Cheung K, Milio K, Zworth M, Bartoszko JJ, Valli C, Rabassa M, Lee Y, Zajac J, Prokop-Dorner A, Lo C, Bala MM, Alonso-Coello P, Hanna SE, Johnston BC. Red and Processed Meat Consumption and Risk for All-Cause Mortality and Cardiometabolic Outcomes: A Systematic Review and Meta-analysis of Cohort Studies. *Ann Intern Med* 2019; 171: 703-710.
- 3) Van Der Kraak L, Gros P, Beauchemin N. Colitis-associated colon cancer: Is it in your genes?. *World J Gastroenterol* 2015; 21: 11688-11699.
- 4) Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2018; 68: 394-424.
- 5) GBD 2015 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016; 388: 1659-1724.
- 6) Center MM, Jemal A, Smith RA, Ward E. Worldwide variations in colorectal cancer. *CA Cancer J Clin* 2009; 59: 366-378.
- 7) Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A. Global cancer statistics, 2012. *CA Cancer J Clin* 2015; 65: 87-108.
- 8) Arnold M, Sierra MS, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global patterns and trends in colorectal cancer incidence and mortality. *Gut* 2017; 66: 683-691.
- 9) Salim EI, Moore MA, Al-Lawati JA, Al-Sayyad J, Bazawir A, Bener A, Corbex M, El-Saghir N, Habib OS, Maziak W, Mokhtar HC, Seif-Eldrin IA, Sobue T. Cancer epidemiology and control in the arab world - past, present and future. *Asian Pac J Cancer Prev* 2009; 10: 3-16.
- 10) Salim EI, Moore MA, Bener A, Habib OS, Seif-Eldin IA, Sobue T. Cancer epidemiology in South-West Asia - past, present and future. *Asian Pac J Cancer Prev* 2010; 11: 33-48.
- 11) Moore MA, Eser S, Igisinov N, Igisinov S, Mohagheghi MA, Mousavi-Jarrahi A, Ozentürk G, Soipova M, Tuncer M, Sobue T. Cancer epidemiology and control in North-Western and Central Asia - past, present and future. *Asian Pac J Cancer Prev* 2010; 11: 17-32.
- 12) Johnson CM, Wei C, Ensor JE, Smolenski DJ, Amos CI, Levin B, Berry DA. Meta-analyses of colorectal cancer risk factors. *Cancer Causes Control* 2013; 24: 1207-1222.
- 13) Giovannucci E, Ascherio A, Rimm EB, Colditz GA, Stampfer MJ, Willett WC. Physical activity, obesity, and risk for colon cancer and adenoma in men. *Ann Intern Med* 1995; 122: 327-334.
- 14) Hébert-Croteau N. A meta-analysis of hormone replacement therapy and colon cancer in women. *Cancer Epidemiol Biomarkers Prev* 1998; 7: 653-659.
- 15) Simaan S, Jerf FA. Cancer in Syria (magnitude of the problem). *Int J Cancer Tremnt* 2018; 1: 10-15.

- 16) White A, Ironmonger L, Steele RJC, Ormiston-Smith N, Crawford C, Seims A. A review of sex-related differences in colorectal cancer incidence, screening uptake, routes to diagnosis, cancer stage and survival in the UK. *BMC Cancer* 2018; 18: 906-916.
- 17) Moradi T, Gridley G, Björk J, Dosemeci M, Ji BT, Berkel HJ, Lemeshow S. Occupational physical activity and risk for cancer of the colon and rectum in Sweden among men and women by anatomic subsite. *Eur J Cancer Prev* 2008; 17: 201-208.
- 18) Boyle T, Keegel T, Bull F, Heyworth J, Fritschi L. Physical activity and risks of proximal and distal colon cancers: a systematic review and meta-analysis. *J Natl Cancer Inst* 2012; 104: 1548-1561.
- 19) Jedrychowski W, Tobiasz-Adamczyk B, Steindorf K, Popiela T, Penar A, Matyja A, Wahrendorf J. Rola aktywności fizycznej w zapobieganiu zachorowaniom na raka jelita grubego [Protective effects of physical activity in the occurrence of colon cancer]. *Przegl Lek* 2002; 59: 21-25.