Colorectal cancer incidence and clinicopathological features in northern Tunisia 2007–2009

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Practice points

- The aim of this study was to determine the age-standardized incidence rate (ASR) of colorectal cancer (CRC) for the period 2007–2009, to describe some CRC epidemiological characteristics and to analyze the clinicopathological features of the CRC in northern Tunisia.
- ASR of colorectal cancer during the period 2007–2009 was a bit higher than the 2004–2006 one.
- The distribution of CRC cases and standardized incidence rates by age, gender, sub site, histological type and governorates were described and analysed in northern Tunisia.
- Incidence standardized rate of CRC during the 2007–2009 period was 12.4 cases/100,000 (13.6 against 11.1 respectively in men and women) in the northern region of Tunisia.
- The mean age at diagnosis was 60 ± 15 years and the gender ratio was 1.2.
- Adenocarcinoma was the most common histological type observed.
- The most affected subsites were respectively the rectum, distal then proximal colon.

Colorectal cancer (CRC) is the third most commonly diagnosed cancer worldwide. The aim of this study was to determine CRC incidence and to describe clinicopathological features in north Tunisia for the period 2007–2009. The North Tunisia Cancer Registry was the source of data for the identification of patients. The age-standardized incidence rates (ASRs) were respectively 13.6 cases (7.5/100,000 for colon cancer and 6.2 for rectal cancer) and 11.1 cases (6.5/100,000 for colon cancer and 4.4 for rectal cancer) per 100,000 among male and female. The ASR varied widely by regions in northern Tunisia. The most common site in colon cancer was the distal colon comparing to the proximal one (49.0 and 29.9% respectively). Adenocarcinoma was the most common histological type. CRC screening should be strengthened in Tunisia to achieve a reduction of CRC incidence and mortality.

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Colorectal cancer (CRC) is a major cause of morbidity and mortality worldwide. It is the third most common cancer with 1.4 million new cases in 2012 and the fourth-leading cause of cancer with 693,333 deaths each year in the world [1–3]. However, there is a large variation in CRC incidences in more developed versus less developed countries. Indeed, the highest rates were observed in the USA, Canada, Australia, New Zealand and Europe (especially in Czech Republic and Slovakia) where the age-standardized incidence rate (ASR) was 44.8 in men and 32.2 per 100,000 in women; while India, Egypt and central-west Africa show the lowest rates with an ASR of 4.5 and 3.8 per 100,000 in men and women, respectively [4–8]. These differences are due to disparities of several risk factors, including obesity, eating habits and lack of physical activity, but also to the efficacy of prevention policies [9–14]. In Tunisia, CRC is also a serious health problem. It is the second most common cancer in terms of incidence in women and the third in men. According to estimations of the International Agency of Research on Cancer (GLOBOCAN 2012), the ASR was 10.9 per 100,000 which is a low-to-medium rate (11.9 and 10 per 100,000, respectively, among men and women) [15]. These cancers were included in the screening program as pilot experiences in cancer plans 2010–2014 and 2015–2019 [16].

Figure 1. Country of Tunisia: administrative subdivision.

The incidence data on cancers in Tunisia are provided by three regional registries that were implemented in 1998: one for the northern region, the second one for the governorate of Sousse in the center and the last one for the governorate of Sfax in the south. The northern cancer registry covers 11 governorates involving the district of Tunis (Tunis, Ben Arous, Ariana and Mannouba), the north east (Zaghuan, Bizerte and Nabeul) and the north west (Béja, Kef, Siliana and Jendouba; Figure 1) [17]. This northern-region population shelters 5,035,000 habitants which represents around the half of the Tunisian population [18]. In Tunisia, epidemiological data on CRC are rare; the latest incidence data are for the periods 2004–2006 and 2003–2007, for the northern and the central regions, respectively [17,19–21]. The aim of this study was to determine the ASR for the period 2007–2009, to describe some

Table 1. Distribution of colorectal standardized incidence rates by site and gender in northern Tunisia (2007–2009).

Number and ASR	Colon cancer			Rectal cancer			Colorectal cancer		
	Men	Women	Both	Men	Women	Both	Men	Women	Both
Number	524	473	997	439	319	758	964	791	1755
ASR (per 100,000)	7.5	6.5	7.1	6.2	4.4	5.3	13.7	10.9	12.4

ASR: Age-standardized incidence rate.

epidemiological characteristics of CRC in northern Tunisia and to analyze the clinicopathological features of the CRC.

Methods

Demographic data were provided by the National Institute of Statistics [18] concerning the distribution of the population of northern Tunisia according to years, depending on age classes (5-year intervals for each class), according to sex and governorates (Figure 1). The North Tunisia Cancer Registry was the source of data for the identification of patients for this study. The main data sources were medical ones of both public and private sectors in the corresponding governorates. Contractual doctors visited all sources to collect data using a standard data collection sheet. This record includes three parts: sociodemographic characteristics of patients, identification of the tumor and evolution of the disease. Regarding codification of tumors, the International Classification of Diseases for Oncology (ICD-O) was used (ICD-O-1 during the period 1994–2003 and ICD-O-3 since 2004). CRC was divided into subsites: proximal colon that includes the cecum (C18.0), ascending colon (C18.2), the hepatic flexure of the colon (C18.3), transverse colon (C18.4) and the splenic flexure of the colon (C18.5); distal colon includes descending colon (C18.6) and sigmoid colon (C18.7); and the rectum includes the rectosigmoid junction (C19) and the rectum (C20). Data were entered using Epi Info software (version 6). The checks of the data entered are performed periodically, by following some steps: careful search of duplicates; verification of the degree of filling the mandatory variables (gender, age, place of residence); verification of the validity of codes of tumors and the search for incoherencies between gender, age and nature of the tumor, histological type and site. To determine the incidence of CRC, we have calculated crude and standardized rates using the direct method of standardization. Data were analyzed using SPSS version 17. Categorical data were described by calculating percentages and quantitative data through the calculation of means and standard deviations.

Results

Incidence of CRC

During the 2007–2009 period, 1755 new cases of CRC were recorded in the northern region of Tunisia (964 cases among men and 791 cases among women, gender ratio = 1.2). Table 1 summarizes the distribution of incidence by site (colon or rectum) and gender. The standardized incidence rates were respectively 13.6 cases (7.5/100,000 for colon cancer and 6.2/100,000 for rectal cancer) and 11.1 cases (6.5/100,000 for colon cancer and 4.4 for rectal cancer) per 100,000, respectively, for male and female (Table 1).

Age distribution

The mean age at diagnosis of CRC was 60 ± 15 years (61.4 ± 14 years in men and 58.5 ± 15 years in women). The highest proportions were observed for the age groups 65–69 and 70–74 years, 13.8 and 13.7%, respectively (Figure 2).

For both genders, and for colon and rectum cancer, incidence rates increased by age (Figures 3 & 4).

Distribution by subsite & gender

Figure 5 shows that the most common site in colon cancer was the distal colon comparing to the proximal one (49.0 and 29.9%, respectively). The sigmoid colon showed most cases of distal colon with 28.8% (Table 2). Figure 6 illustrates that the most common site within female gender was distal colon while it was the rectum within males.

Distribution by histological type

Adenocarcinoma was the most common histological type, which represented 86.3 and 82.0% for men and women, respectively (Table 3).

Figure 2. Case distribution by age group.

Figure 3. Colon cancer: incidence by age and gender.

Figure 4. Rectal cancer: incidence by age and gender.

Figure 5. Proportion of cases by subsite.
NOS: Not otherwise specified.

Table 2. Number and proportion of cases by gender and anatomic site.

Site	Men		Women		Total	
	n	%	n	%	n	%
Cecum	58	11.0	31	6.6	89	8.9
Appendix	8	1.5	26	5.5	34	3.4
Ascendant colon	75	14.3	51	10.8	126	12.6
Hepatic flexure of the colon	10	1.9	7	1.5	17	1.7
Transverse colon	8	1.5	14	3.0	22	2.2
Splenic flexure of the colon	8	1.5	6	1.3	14	1.4
Proximal colon [‡]	167	31.8	135	28.6	302	30.3
Descendant colon	51	9.7	61	12.9	112	11.2
Sigmoid colon	149	28.4	138	29.2	287	28.8
Adjoining lesion of the colon	9	1.7	8	1.7	17	1.7
Distal colon [§]	209	39.8	207	43.9	416	41.7
Colon NOS	149	28.4	130	27.5	279	28.0

[‡]Proximal colon is composed from the caecum, appendix, ascendant colon, hepatic flexure of the colon, transverse colon and the splenic flexure of the colon.

[§]Distal colon is composed from the descendant colon and the sigmoid colon.

NOS: Not otherwise specified.

Figure 6. Proportion of cases by gender and subsite.

NOS: Not otherwise stated.

Table 3. Number and proportion of cases by gender, site of cancer and histological type.

Histological type	Men, n (%)			Women, n (%)		
	Colon	Rectum	Colorectal	Colon	Rectum	Colorectal
Adenocarcinoma	445 (86.1)	371 (86.7)	816 (86.3)	477 (83.7)	266 (85.0)	639 (82.0)
Mucinous adenocarcinoma	22 (4.3)	16 (3.7)	38 (4.0)	29 (5.1)	22 (7.0)	51 (6.5)
Carcinoma NOS	20 (3.9)	19 (4.4)	39 (4.1)	16 (2.8)	8 (2.6)	24 (3.1)
Sarcoma	2 (0.4)	4 (0.9)	6 (0.6)	4 (0.7)	0 (0.0)	4 (0.5)
Malignant NOS	28 (5.4)	18 (4.2)	46 (4.9)	44 (7.7)	17 (5.4)	61 (7.8)

NOS: Not otherwise specified.

Distribution by governorates

The ASR varied widely by regions in northern Tunisia; highest rates were observed in Bizerte (13.8/100,000), the district of Tunis (12.7/100,000) and Nabeul (12.3/100,000 persons). Figure 7 shows that the discovery of the tumor at a local stage was higher in the governorates of Tunis and Bizerte. While the western region showed lowest rates (Figure 8).

Figure 7. Distribution of age-standardized incidence rates (ASRs) by governorates.

Figure 8. Percentage of local extension stage at diagnosis according to governorates.

Discussion

This study has highlighted an ASR of 12.4 cases/100,000 (13.6 against 11.1, respectively, in men and women) of CRC during the 2007–2009 period in the northern region of Tunisia. This incidence is very close to that reported by the registry of cancer of the Sousse region for the 2003–2007 period, which was 11.3 cases (12.6 for men and 10.1 for women) [6,19,20]. The ASR by site in the region of Sousse were also very close to rates reported in this study, which were respectively 7.0 and 5.9 in men and women for colon cancer against 5.6 and 4.2 for rectal one.

CRC is the third most common cancer worldwide, with 1.2 million new cases estimated by GLOBOCAN 2012 [15], with an average ASR of 17.2 cases/100,000.

The incidence rate of CRC varies widely between different regions of the world [6,13,19]. Countries with high incidence (>40/100,000 inhabitants), well above the rate observed in the northern region of Tunisia, are the USA, Canada, Australia, New Zealand and some parts of Europe (The Czech Republic and Slovakia); while low-incidence countries, with a relatively close rates to that reported by this study are essentially India, Egypt and central east of Africa [4–6,13,15,22]. The incidence trend is declining in developed countries, on the contrary of developing countries where, this trend is on the rise. In Tunisia, an increasing of CRC incidence was observed in central and north of Tunisia [20,23].

The ASR in other Maghreb countries are also rather close to those reported in this work. Incidence rates were 10.5/100,000 (12 in men and nine in women) in Morocco (2006–2008 registry) [24] and 11/100,000 (8.7 in men and 13.4 in women) [25] in Algeria (2006). The comparison with middle east countries shows that the ASR of CRC

in northern Tunisia is lower compared with those observed in Lebanon (19.1/100,000 [19.5–18.9]) [26], Qatar (18.4/100,000 [20.2–16.6]) and Jordan (17.3/100,000 [18.2–16.5]) [27]. While some countries such as Bahrain (12.3/100,000 [14.7–10]) [28] and Kuwait (12.7/100,000 [13.6–11.8]) [29] show almost similar incidence to our results. In contrast, incidence observed in this study were higher than those recorded in Iran in 2009 (8.5/100,000 [11.3–5.8]) [30] and in Egypt (5.4/100,000 [6–4.9]) [31].

The comparison with Asian countries shows a close level of incidence in Turkey with an ASR of 14/100,000 [32]. While rates in other countries in Asia are higher; thus in Korea and Japan where the ASR are, respectively, 36 and 35/100,000 [33–35].

These differences between countries could be explained mainly by nutrition behavior, practice of physical activity, obesity and also by screening activities [10,14,36].

Tunisia is situated among countries with a middle-to-low rate of ASR CRC. This result should be accompanied by a study on the trend of this cancer which is known to be declining or stable in developed countries.

The present study showed that 60 years was the mean age at diagnosis in northern Tunisia that is slightly higher than that observed in other north-African countries such as Morocco and Algeria with an average age around 55 years [37–40]. The average age is much lower in Egypt and some African countries with, respectively, 50 and 47 years [31,41–43]. Otherwise, the average age is around 70 years in Westernized countries [44,45]. The young average age in the northern region of Tunisia, as well as in developing countries, could be explained by the young population structure in these regions [29,46].

Patients over 50 years old accounted for 75%, which is close to that observed in Morocco (75%) and China (72%) [38,40,47], but remains lower than Westernized countries where over 90% of CRCs occur in people over 50 years [5,48–50]. The proportion of patients under 40 years (9%), observed in this study is higher compared with those observed in developed countries such as the USA and France, where CRC in young patients is very rare before 40 years and accounts for 1–4% [44,48,50]. CRC in young patients is more common in Maghreb countries with a proportion of 11% in Morocco and much higher in the Middle East with 18% in Turkey and 38% in Egypt [51–53]. CRC in young adults (under 40) is important to consider because of their poor prognosis and their family character. The fight against these cancers is based on family screening, genetic study by molecular biology and early diagnosis in case of predisposing factors [13,54,55].

This study showed that the incidence gradually increased with age, especially from 40 years with a greater increase after 50 years. A peak of incidence was observed between 60 and 74 which is later in developed countries and earlier in some Maghreb countries (between 50 and 60 years in Morocco) and Asia (between 50 and 59 years in China). The distribution of incidence by age is important because it guides the screening strategy and particularly the lower limit of age to be targeted by this intervention. Indeed, it is clear that for ages with low specific incidence rates (young adult) with generally poor prognosis and sometimes familial or genetic characteristics are not suitable for mass screening (the cost–effectiveness of screening would be reduced) [13,56–59].

Male gender is reported to be more concerned by CRC [8,60]. This was confirmed by our study where sex ratio was 1.2. This ratio remains stable for 15 years in Tunisia and is very close to that observed in other Maghreb and Middle-Eastern countries (around 1.1) [5,29,38,40]. Male predominance is obvious in Westernized countries between 1.5 and 1.7 [48,61], but also in central Africa, especially in Niger and Congo with respectively a gender ratio of 1.5 and 1.6 [43,62]. The male predominance in CRC reported in the literature is poorly understood; Wu *et al.* explain that by a more exposure to risk factors for this cancer between males [63].

Our study showed that the most affected sites were the rectum, distal and proximal colon with, respectively, 43, 24 and 17%. Our results are consistent with those observed in China and Africa, where the most affected site is the rectum and the least reached one is proximal colon [40,47,64]. This is not the case in developed countries as in the USA and Canada, where the most affected site is the proximal colon followed by the rectum [5,48,50,60,65].

Gender ratio also differs depending on the site [66]; for colon cancer, the gender ratio is around one with a slight male predominance that concord with the results of our study (gender ratio = 1.1). However, for rectal cancer the male predominance is more obvious [8,60,61,67] that also concord with our results and gender ratio was 1.3.

Regarding colon cancer, the relation between gender and proximal or distal sites varies between countries. In the present study, women predominance was observed in distal colon while in Western countries, it is the proximal. Some series speak about right to left shift, which mean an increase in cases in proximal colon against decreasing cases in distal colon, especially for women [68–70]. Which can be explained by the progress in diagnosis technology, so that proximal colon cancer can be more explored and diagnosed in developed countries. This was not the case in our study.

According to the literature, the most common histological type is adenocarcinoma, the proportion reported in the present study was 84.4%. This percentage concord with those observed in other Maghreb [71], Middle East and Asian countries (73.4% in Niger, 82% in Morocco, 84.6% in Jordan). However, it is relatively lower than those of Western countries (94% of cancers in Europe) [72].

This study showed that the highest rates were observed in the governorates of Bizerte, the District of Tunis and Nabeul with, respectively, 13.8, 12.7 and 12.3/100,000 that constitute the higher socioeconomic governorates in northern Tunisia; while the lowest incidence rates were recorded in the governorate of Kef (6.7/100,000), Jendouba (7.1/100,000), Siliana (7.4/100,000) and Zaghouan (8.3/100,000). Several hypotheses could explain these differences; The first one is related to diagnostic facilities in governorates benefiting from best care [73]. In favor of this hypothesis, a higher proportion of cases diagnosed at a local stage of development of the tumor; in fact, this proportion was higher in the governorate of Tunis, followed by the governorate of Bizerte and Ben Arous. The lowest rates were observed in Siliana, Kef and especially in Zaghouan. The second assumption is related to different levels of exposure to major risk factors, including poor dietary behavior, lack of physical activity and obesity.

Conclusion

This study has shown that Tunisia is still situated among countries with a middle-to-low rate of ASR CRC. The mean age at diagnosis in northern Tunisia was 60 years and male gender was more concerned by CRC. The most affected subsites were respectively the rectum, distal then proximal colon. Commonly, adenocarcinoma was the most common histological type. Higher incidence in some governorates could be related to better access to health services in these governorates increasing the probability of CRC detection, and also to higher level of main colorectal risk factors. CRC screening should be strengthened in Tunisia to achieve a reduction of CRC incidence and mortality.

Future perspective

Promoting primary prevention of CRC risk factors, strengthening CRC screening and increasing public awareness are recommended to reduce CRC incidence and mortality in Tunisia.

Financial & competing interests disclosure

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