Cancer Epidemiology 44S (2016) S74–S81

Contents lists available at ScienceDirect

Cancer Epidemiology

The International Journal of Cancer Epidemiology, Detection, and Prevention

journal homepage: www.cancerepidemiology.net

Burden of colorectal cancer in Central and South America☆

Monica S. Sierra*, David Forman

International Agency for Research on Cancer, Lyon, Rhone, France

ARTICLE INFO

Article history:
Received 16 November 2015
Received in revised form 17 March 2016
Accepted 18 March 2016

Keywords:
Colon
Rectum
Colorectum
Neoplasm
Central and South America

ABSTRACT

Rationale and objective: The colorectal cancer (CRC) burden is increasing in Central and South American due to an ongoing transition towards higher levels of human development. We describe the burden of CRC in the region and review the current status of disease control.

Methods: We obtained regional- and national-level incidence data from 48 population-based cancer registries in 13 countries, as well as cancer deaths from the WHO mortality database for 18 countries. We estimated world population age-standardized incidence (ASR) and mortality (ASMR) rates per 100,000 person-years for 2003–2007 and the estimated annual percentage change for 1997–2008.

Results: The CRC rate in males was 1–2 times higher than that in females. In 2003–2007, the highest ASRs were seen in Uruguayan, Brazilian and Argentinean males (25.2–34.2) and Uruguayan and Brazilian females (21.5–24.7), while El Salvador had the lowest ASR in both sexes (males: 1.5, females: 1.3). ASMRs were <10 for both sexes, except in Uruguay, Cuba and Argentina (10.0–17.7 and 11.3–12.0). CRC incidence is increasing in Chilean males. Most countries have national screening guidelines. Uruguay and Argentina have implemented national screening programs.

Conclusion: Geographic variation in CRC and sex gaps may be explained by differences in the prevalence of obesity, physical inactivity, diet, smoking and alcohol consumption, early detection, and cancer registration practices. Establishing optimal CRC screening programs is challenging due to lack of healthcare access and coverage, funding, regional differences and inadequate infrastructure, and may not be feasible. Given the current status of CRC in the region, data generated by population-based cancer registries is crucial for cancer control planning.

1. Introduction

Colorectal cancer (CRC) is one of the most common cancers in the world. With nearly 1.4 million new cases and 700,000 cancer deaths occurring globally in 2012, CRC is the third leading diagnosis and the fourth most common cause of cancer-related deaths in both sexes combined [1]. The distribution of CRC varies extensively across the globe; the highest age-standardized incidence and mortality rates are observed in more developed regions of the world (29.2 and 11.7 per 100,000, respectively) whereas substantially lower rates are seen in less developed regions (11.7 and 6.6 per 100,000, respectively) [1].

In the United States and Canada, Australia, New Zealand, and most European countries, the incidence and mortality of CRC have been declining or stabilizing since the 1970s; this may be explained by reduced exposure to risk factors, earlier detection and prevention, and improved treatments [2–7]. However, in countries that have transitioned towards higher levels of human development – such as those in Central and South America and Eastern Europe – the burden of CRC has increased remarkably [3–5,8–10]. Risk factors for CRC include obesity, a diet high in calories and animal fat, physical inactivity, tobacco smoking and heavy alcohol consumption; these factors are also related to economic advancement or "Westernization" [2,11–13].

The Central and South American region has undergone a rapid epidemiologic and demographic transition, and the cancer profile is now changing from infection-related cancers (i.e., cervix and stomach) to those cancers typically diagnosed in countries with the highest human development, such as CRC [8,11,12]. GLOBOCAN estimates of 2012 indicate that CRC is the third most frequent

* Corresponding author.
E-mail address: sierram@fellows.iarc.fr (M.S. Sierra).

http://dx.doi.org/10.1016/j.canep.2016.03.010

cancer diagnosis and the fourth most common cause of cancer-related death in the region (in both sexes combined) with an estimated 80,000 new cancer cases and almost 44,000 cancer deaths; and the burden of CRC is expected to increase by almost 80% by the year 2030, with 140,000 new cases and 80,000 cancer deaths due to demographic changes [1]. The methods used to make these estimations rely on the best available data and depend largely on high-quality cancer incidence and mortality data, which for most countries in the CSA region are still lacking; however, the expected increases in the number of CRC cases in future years are alarming.

We describe the current incidence and mortality patterns from CRC in Central and South America and present an overview of these countries' capacity for screening in order to describe their efforts to address this increasing CRC burden.

2. Methods

The present analysis includes colon (C18–C19) and rectum (C20) cancers combined (C18–20), as coded by the 10th edition of the International Classification of Diseases for Oncology (ICD-10). In spite of their different etiologies, colon and rectum cancers were combined to avoid possible misclassification of tumors diagnosed at the rectosigmoid junction [3,4]. We also compared the incidence patterns for colon and rectum cancers and they were fairly similar, hence we considered them as a single entity. The analysis of mortality data included colon and rectum cancers as well as tumors of the anal canal (anus) C18–C21 because rectum and anus cancers (C19–C21) are always reported together in this database [14]. Anal cancer is a rare disease and represents about 4% of all lower gastrointestinal malignancies [15,16]. A similar proportion of anal cancers was diagnosed in the Central and South American region (4%) and thus are unlikely to change the overall mortality of CRC. For simplicity, we refer to these cancers collectively as colorectal cancers (CRCs).

The data sources and methods are described in detail in an earlier article in this issue. In brief, from the 22 countries located in Central and South America (including Cuba), we obtained regional and national-level incidence data from 48 population-based cancer registries in 13 countries and cancer deaths from the World Health Organization mortality database for 18 countries. We estimated age-standardized incidence (ASR) and mortality (ASMR) rates per 100,000 person-years using the direct method and the World standard population [17,18]. We estimated national ASRs by aggregating the data from the available cancer registries using a weighted average of local rates. To describe incidence and mortality time trends, we calculated the estimated annual percent change (EAPC) using the method proposed by Esteve et al. [19]. Registries that provided formal consent to use data by individual year of diagnosis for $\geq$10-years were included in the time-trend analysis. Trends in incidence and mortality and EAPCs were estimated for four countries (Table 1). All of the EAPCs were tested for equality to zero by using the corresponding standard errors. We considered EAPCs statistically significant if the P-value ≤ 0.05. We conducted the data analysis in Stata version 12.1 (StataCorp) [20].

Information on the country's capacity for CRC screening was obtained from the WHO 2013 non-communicable diseases country capacity survey [21] and complemented with information from the Latin American expert summit for metastatic CRC [22] and from the Ministry of Health for the pertinent countries.

3. Results

3.1. Incidence and mortality rates

CRC was among the five most common cancers diagnosed in males and females (except in El Salvador, where it ranked seventh and ninth, respectively) and one of the eight most frequent causes of cancer deaths in the Central and South American region (Table 2). Males had higher CRC incidence and mortality rates than females (male-to-female ratios between 1 and 1.5:1 and 1–1.8:1, respectively), except in Cuba, Ecuador and French Guyana (male-to-female ratio 0.9:1).

During the most recent period evaluated (i.e., 2003–2007), the incidence of CRC for most countries was between 10.3 and 16.8 for males and females. The highest incidence rates for males and females were observed in Uruguay (34.2 and 24.7, respectively), Brazil (27.7 and 21.5) and in males in Argentina (25.2), whereas the lowest rates were in El Salvador (1.5 and 1.3). Overall, mortality rates were below 10 for both males and females, except in Uruguay (17.7 for males and 12.0 for females), Cuba (10.0 for males and 11.3 for females) and males in Argentina (14.6).

3.2. Time trends

In the four countries evaluated, the incidence of CRC increased steadily in Brazil (1997–2007), Chile (1997–2008), and Costa Rica (1985–2007) in both sexes since the mid-1990s or early 2000s (Fig. 1). In the most recent 10-year period, the largest increase in incidence of CRC was observed in Chilean (EAPC = 4.1, $P < 0.05$) and Costa Rican (EAPC 3.1, $P > 0.05$) males and Argentinean females (EAPC = 3.6, $P > 0.05$) (Fig. 2).

The highest increase in mortality was observed in Costa Rican males and Brazilian males and females, with average increases of about 2% per year ($P > 0.05$) (Figs. 1 and 2).

3.3. Countries' capacity for CRC screening

Effective screening programs can reduce CRC incidence by detection and removal of precursor lesions (adenomatous polyps) and can reduce mortality by early detection of localized disease (confined to the mucosa) if accompanied by effective diagnostic follow-up procedures and treatment [23–25]. CRC screening with fecal occult blood tests (FOBTs) is associated with a 16% decrease in CRC mortality [24,25].

According to the official country response to the WHO 2013 non-communicable diseases country capacity survey [21], Argentina, Brazil, Costa Rica, Cuba, Ecuador, Guyana, Honduras, Suriname, Uruguay and Venezuela reported that bowel cancer screening was generally available, either by digital rectal exam or by colonoscopy, at the primary healthcare level. Several Central

Table 1
Countries included in the analysis of time trends.

Country	Name of registries included	Period	% of the population covered
Argentina	Bahia Blanca	1993–2007	0.8
Brazil	Aracaju, Fortaleza, Goiania, Sao Paulo	1997–2006	8.0
Chile	Valdivia	1993–2008	2.2
Costa Rica	National registry	1985–2007	100.0