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Cervical cancer in Central and South America: Burden of disease and status of disease control☆

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ABSTRACT

Rationale and objective: More than 20 years after cytology-based screening was introduced in Central and South America (CSA), cervical cancer remains a leading cause of cancer incidence and mortality in the region. Although several population-based registries exist in the region, few comprehensive analyses have been conducted to describe the status of cervical cancer control.
Methods: Population-based data from cancer registries in 13 countries and mortality data from 18 countries in CSA were analyzed. Standardized incidence and mortality rates were estimated and time trend analysis performed when information was available. In addition, a search of available data on HPV vaccination and cervical cancer screening was carried out.
Results: Cervical cancer incidence and mortality have decreased in some CSA countries, with an annual percentage change from −4.2 to −6.7 for incidence and −0.2 to −8.3 for mortality. In total, seven countries have age-standardized mortality rates over 10 per 100,000 women, generally corresponding to those with the lowest income levels. All countries have implemented screening programs with different extents of coverage and levels of organization. To date, nine countries have introduced HPV vaccination in national immunization programs.
Conclusions: Despite incidence declines observed in some countries, cervical cancer mortality remained almost stable in most countries in the region. Decreases in mortality trends in Chile and Costa Rica are probably the result of early detection programs. Better organized programs might favor greater impact on cancer incidence and mortality, but technological developments offer more suitable opportunities for prevention and alternative approaches for screening of precancerous lesions.

1. Introduction

Cervical cancer is the fourth most common cancer in women worldwide, with approximately 530,000 cases per year and 270,000 deaths occurring in 2012 [1]. Despite overall declining trends, there are significant differences between countries, and the total number of cases is expected to increase in the next few decades as a consequence of demographic change.

Cervical cancer predominantly affects families in the lower socioeconomic groups, with a very large proportion of all cases worldwide (85%) occurring in developing countries [1]. The reason for this is mainly lack of access to health services, including screening and treatment of precancerous lesions, which has largely reduced cervical cancer incidence and mortality in developed countries in the last 50 years [2].

The main cause of cervical cancer – namely persistent infection with sexually transmitted human papillomavirus (HPV) – has been clearly established, opening the way to new primary and secondary prevention strategies. Vaccination of adolescent women and screening of adult women with HPV tests followed by appropriate

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Table 1
Countries included in the analysis of time trends.

Country	Name of registries included	Period	% of the national 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

management of precursor lesions in the populations at highest risk has generated a realistic expectation for cervical cancer control in the near future, if the political will and resources are available.

Central and South America (CSA), with nearly 600 million inhabitants, continue to bear an important burden of cervical cancer. According to data from GLOBOCAN 2012 [1], there were approximately 64,000 new cases of invasive cancer and 26,000 deaths in CSA, making the disease the first or second most frequent cancer among women in many countries in the region. Recent projections indicate almost a doubling in the number of cases in the next 15 years unless active interventions are established or improved [2].

The CSA region has contributed extensively to our knowledge of cervical cancer epidemiology and control. At least three major cohort studies on the natural history of the disease have been conducted in the region [3], and numerous women from this area have participated in clinical trials during the development of HPV vaccines [4]. Cytology-based screening activities have been implemented in most CSA countries, some of which started as long as five decades ago [5]. However, the success of these programs has been very limited in a region with the highest social disparities in the world [6], where socioeconomic and health-system determinants still play a major role in the causal web of cervical cancer mortality.

We describe the trends and the current situation in cervical cancer incidence and mortality in Central and South America. We reviewed the status of preventive interventions in an effort to better understand the achievements and limitations of cervical cancer control in the region.

2. Methods

The present analysis includes cervix uteri cancer (C53), as coded by the 10th edition of the International Classification of Diseases for Oncology (ICD-10). The data sources and methods are described in detail in another article in this issue. In brief, we used the geographic boundaries for the CSA region according to the United Nations definition. All cancer registries included in the International Agency for Research on Cancer database and member organizations of the International Association of Cancer Registries (IACR) and the Red de Institutos Nacionales de Cancer (RINC) were invited to participate in this project. Although Cuba is located within the Caribbean, it was included in this project because it has member registries within the IACR and is part of the RINC. We obtained regional- and national-level incidence data from 48 population-based cancer registries in 13 countries and nationwide cancer deaths from the World Health Organization mortality database for 18 countries. Incidence and mortality data were available from most CSA countries (including Cuba) except in Honduras and Guyana where neither incidence nor mortality data were available; French Guyana and Bolivia where only incidence data were available; and Belize, Guatemala, Nicaragua, Panama, Paraguay, Suriname, and Venezuela where only mortality data were available. We estimated age-standardized incidence (ASR) and mortality (ASMR) rates per 100,000 person-years using the direct method and the world standard population [1,7,8]. We estimated national ASRs by aggregating the data from the available cancer registries using a weighted average of local rates. Registries that provided formal consent to use data by individual year of diagnosis for $\geq$10-years were included in the time-trend analysis (shown below). To describe incidence and mortality time trends, we calculated the estimated annual percentage change (EAPC) for the most recent 10-year period using the method proposed by Esteve et al. [2,9]. Trends in incidence 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 $\leq$0.05. We used reallocation methods to separate cervix and corpus uteri from imprecisely coded uterine cancer deaths [10]. We conducted the data analysis in Stata version 12.1 (StataCorp).

Using the cancer registry data, we also estimated incidence rates by histological subtype as presented in Cancer Incidence in Five Continents (CI5) volume X [11].

To describe the status of disease control we used the latest report by the Pan American Health Organization about existing programs for HPV vaccination and cervical cancer screening in the region [12]. We searched data about HPV vaccine coverage in the WHO monitoring system for immunization programs; however, no data on HPV vaccine coverage were found. Information about screening coverage was gathered from official reports of national population-based surveys; if the official reports did not contain detailed data on the subject we used scientific papers based on the surveys and published in peer-reviewed journals.

3. Results

3.1. Burden of disease

Cervical cancer was the leading female cancer diagnosis in El Salvador and Bolivia and the second leading female cancer in Mexico, Argentina, Colombia, Ecuador, French Guyana, and Peru. In five out of 20 countries, cervical cancer was the leading cause of female cancer mortality, while in most countries it was the second and third cause of cancer deaths. Notably, it was only the sixth cause of cancer death among women in Chile and the fourth in Costa Rica and Cuba.

The highest incidence was observed in French Guyana and El Salvador (ASR 29.7 and 28.9 per 100,000), while Costa Rica, Chile, Mexico and Cuba showed rates under 15 per 100,000 (Table 2). The highest mortality rates (per 100,000) were observed in Belize and Paraguay (17.4 and 15.3, respectively), and in descending order: El Salvador, Nicaragua, Venezuela, Suriname, and Ecuador, with rates between 10 and 15 per 100,000. The lowest mortality was observed in Chile, Uruguay, Brazil and Costa Rica (rates ranging from 6.0 to 7.3) (Table 2).

The age-specific pattern for incidence rates was similar for all countries investigated, with incidence increasing rapidly after the age of 30 years, a peak around the age of 40 years, and a subsequent plateau that goes into older ages. Mortality shows a similar pattern, but there is a constant increase with increasing age, particularly for