

RESEARCH ARTICLE

Cervical Cancer Trends in Mexico: Incidence, Mortality and Research Output

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Abstract

Purpose: To evaluate the recent incidence and mortality of and scientific research trends in cervical cancer in Mexican females. **Materials and Methods:** Data between 2000 and 2010 from the Department of Epidemiology of the Ministry of Health, and International Agency for Research on Cancer (IARC) of World Health Organization were analyzed, and age-standardized rates (ASRs) were calculated. In addition, scientific research data were retrieved from the Web of Science database from 2003 to 2012, using different terms related to cervical cancer. **Results:** The incidence rate decreased during last five years, while mortality rates showed an annual decrease of 4.93%. A total of 780 articles were retrieved, and the institutions with the majority of publications were National Autonomous University of Mexico (34.87%), Social Security Mexican Institute (16.02%), and National Institute of Cancerology (15%). The main types of research were treatment, diagnosis, and prevention. **Conclusions:** The above results show that incidence of cervical cancer decreased over time in Mexico during last five years; similarly, the downturn observed in mortality mainly reflects improved survival as a result of earlier diagnosis and cancer treatment. Also, this article demonstrates the usefulness of bibliometrics to address key evaluation questions and to establish priorities, define future areas of research, and develop cervical cancer control strategies in Mexico.

Keywords: Cervical cancer - incidence - mortality - bibliometric - control strategies - Mexico

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Introduction

Currently, cervical cancer is the fourth leading cause of cancer death in women worldwide, causing more than 275,000 deaths annually (Arbyn et al., 2008). Cervical cytology screening has been proven to decrease the incidence and mortality of cervical squamous cell cancer and to increase the cure rate of cervical cancer (Andrae et al., 2012; Ito et al., 2013; Nessa et al., 2013). Despite this, it has been considered that the risk of developing invasive cervical cancer is much higher among low-income populations (Parikh et al., 2003; Raychaudhuri and Mandal, 2012; Simayi et al., 2013). In Mexico, a high percentage of women of reproductive age have never had a Pap smear (Conde-Ferrández et al., 2012).

On the other hand, research evaluation consists of monitoring of ongoing research initiatives to assess the efficiency and effectiveness with which they are being implemented, to determine the extent to which they are achieving their targeted objectives, and to recommend adjustments. Additionally, cervical cancer may well also be considered a neglected disease in terms of scientific research, considering the proportion of articles dealing with a particular type of cancer with respect to its impact (Fajardo-Ortiz et al., 2014).

In order to better gauge and interpret the changing cervical cancer incidence and mortality in Mexico, we studied the trends in incidence and mortality rates from 2000 to 2010. Additionally, a bibliometric method was used to analyze cervical cancer Mexican research trends and performances, from 1994 to 2013, in order for focus on areas of weaknesses and future avenues to improve cervical-cancer care in Mexico.

Materials and Methods

We obtained the incidence data on cervical cancer from Incidence Database of the Department of Epidemiology of the Ministry of Health. The mortality data on cervical cancer was obtained from Mortality Database of the International Agency for Research on Cancer (IARC) of World Health Organization. Registered cervical cancer new cancer cases and deaths were extracted on restricting the analysis from 2000 through 2010, in order to examine recent trends over the 11-year period. We excluded cases below 25 years because of paucity of new cancer cases and deaths. The incidence and mortality data was grouped in following age groups: women aged 25-44 years, 45-49 years, 50-59 years, 60-64 years, and 65 years and older. The data was exported to Microsoft Excel® for analysis.

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We computed the number of new cancer cases and deaths, and presented together with age-standardized rates.

On the other hand, Web of Science was used to produce statistics on the scientific production of the Mexican researchers. Mexican papers (articles, research notes, and review articles) in the field of cervical cancer were downloaded for the 20 publication years, 1994-2013. In order to approximate the overall number of published items on cervical cancer, the following search strategy was employed; (1) CU=mexico, (2) TS= ((cervical) OR (cervix)), (3) TS= (cancer OR onco* OR carcino* OR tumor OR neopl*); (1) AND (2) AND (3). Document information included names of authors, titles, years of publication, source journals, contact addresses, and subject categories of journals. The records were downloaded using Microsoft Excel® software, and additional coding was manually performed for the number of authors, origin countries and institutes of the collaborators.

Results

Analysis of cervical cancer absolute incidence and mortality in Mexico, registered between 2000 and 2010, shows that there were 82090 and 46173 new cases and deaths, respectively. The number of new cases has remained constant, with a slight peak in 2007, but with a decline starting in that year. Meanwhile, the number of deaths of cervical cancer has decreased substantially (Table 1).

Incidence rate has decreased throughout the last five years. Figure 1 shows the cervical cancer incidence and mortality rates. The incidence decreased by 8.15% from 2006 to 2010. In the other hand, mortality rates showed

Table 1. The Incidence of Cervical Cancer and Deaths Cases, 2000-2010

Year	Incidence	Deaths
2000	6584	4615
2001	6169	4492
2002	7603	4312
2003	8090	4318
2004	7991	4233
2005	8163	4266
2006	8285	4130
2007	8800	3947
2008	7628	3974
2009	6860	4022
2010	5917	3864

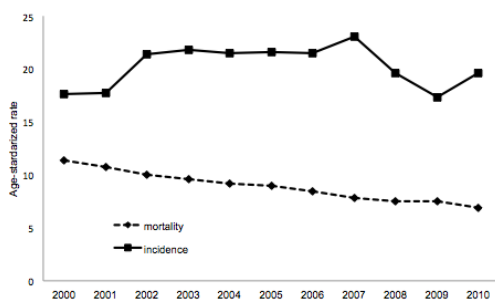


Figure 1. Age-standardized Rates Incidence and Mortality Curves of Cervical Cancer, 2000-2010. Age-standardized rates per 100,000

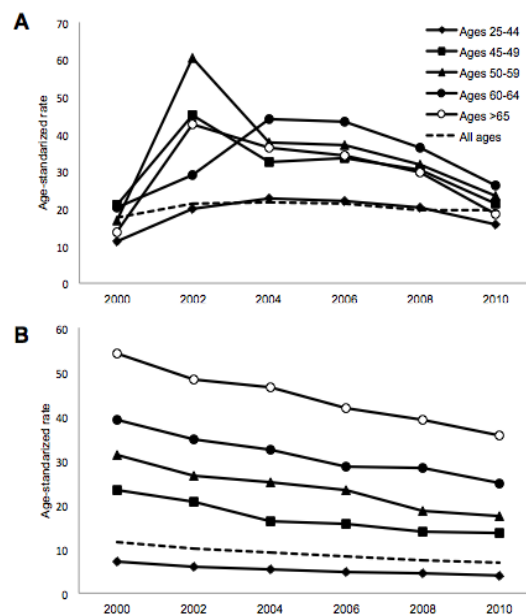


Figure 2. Age-standardized Rates Incidence (A) and Mortality (B) Curves of Cervical Cancer According to Age Group, 2000-2010. Age-standardized rates per 100,000

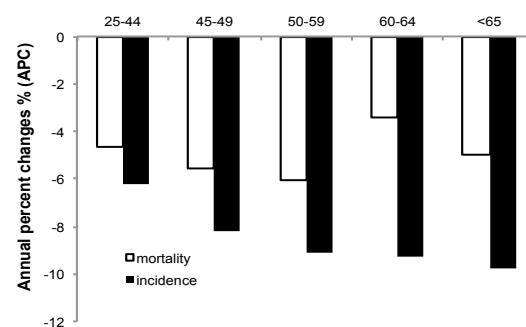


Figure 3. Annual Percent Changes (APCs) in the Incidence and Mortality of Cervical Cancer, 2000-2010

an annual decrease of 4.93% in the same period. Figure 2 shows annual percentage changes (APCs) to the incidence and mortality rates during 2000-2010, where a decrease is observed in both rates.

Figure 3 shows the trends of age-stratified incidence and mortality rates of women over the 11-year period. The incidence was increased until 2002 in 45-49, 50-59 and >65 age groups (Figure 2A). For 25-44 and 60-64 age groups, the incidence peaked in the period 2004-2006. However, a decrease in incidence began in 2006 in all age groups. The lowest incidence was seen in the 20-44 age group (11.06 per 100,000 women in 2000) and the highest (60.27 per 100,000 women in 2002) in the 50-59 age group. Furthermore, in the time period analyzed, mortality in all age groups studied had a substantial decrease (Figure 2B). Figure 3 shows annual percentage changes (APCs) to the incidence and mortality rates during 2006-2010, where a decrease is observed in both rates.

Regarding the Mexican research on cervical cancer, a total of 780 Mexican items published in Web of Science from 2003 to 2012 was counted (Figure 4). A development trend was found for all documents and articles, which increased from 4 in 1994 to 74 publications in 2013. The 780 indexed items have been cited 12,533 times since

1995. Figure 4 demonstrates the parallel increase in the number of citations in conjunction with the increase in published items.

The contributions of Mexican different institutes were estimated by the affiliation of at least one author. The top 10 institutes were ranked by the number of items (Table 2). The National Autonomous University of Mexico had the most total (34.87%), followed by The Social Security Mexican Institute (16.02 %), National Institute of Cancerology (15 %), National Institute of Public Health (10.89 %), and Center for Research and Advanced Studies (10.38 %).

In total, 780 articles were published in 309 journals. Salud Publica de Mexico published the most articles with 47 articles comprising 6.01% of all the articles, followed by Archives of Medical Research (4.35%), International Journal of Gynecological Cancer (2.94%), Revista de Investigación Clínica (2.94%), and BMC Cancer (2.69%) (Table III). 89.5% of the publications were in English, followed the Spanish (10.3%), and one in Portuguese

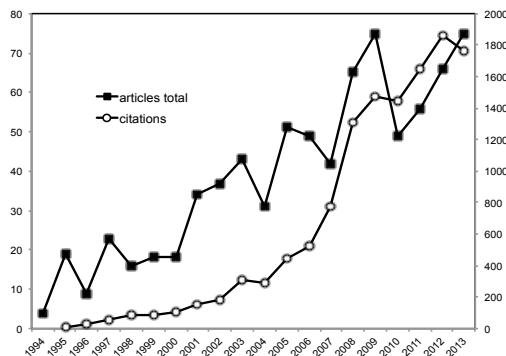


Figure 4. Mexican Cervical Cancer Research Outputs in the Web of Science. Items (solid line) and cites per paper (dashed line)

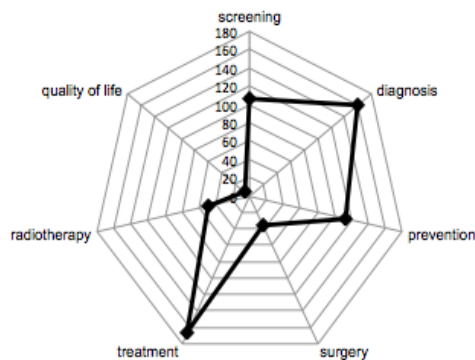


Figure 5. Mexican Cervical Cancer Research Output by Research Types

(data not shown)

Finally, we examine the types of research. The main types of research are shown in Figure 5, treatment and diagnosis dominate with 41.66 % of the total output between them.

Discussion

Our study analyzes the trends in incidence and mortality rates of cervical cancer among women in Mexico from 2000 to 2010. The main finding of the study is that the incidence rate has decreased over the period of last five years. Similarly, several reports in countries of North America (Mosavi-Jarrahi and Kliewer, 2013; Adegoke et al., 2012), Latin America (Muñoz and Bravo, 2012), and Asia (Jung et al., 2014) show a decreasing incidence rate.

On the other hand, cervical cancer mortality was stable or slightly decrease during period analyzed. Mortality data were similar to other countries with a middle income, e.g. Korea (Kim et al., 2013), Chile (Vidal et al., 2013), and Brazil (Gonzaga et al., 2013). In this study, cervical cancer incidence and mortality trends remained at same level in all age groups. This decrease in both incidence and mortality rates is perhaps because to the development and implementation of policies and programs against cervical in Mexico (Ruiz-Moreno et al., 2011; Lazcano-Ponce et al., 2009; Lazcano-Ponce et al., 2006).

However, despite the decrease in incidence and mortality rates is necessary to establish new public health policies, including prioritization in certain areas of scientific research. In this study dealing with cervical cancer Web of Science journal papers, we obtained some significant points on Mexican cervical cancer research trends and performances from 1994 to 2013. Our findings suggest a growing interest in cervical cancer research in Mexico as shown by the increased number of items each

Table 2. The Top Ten Most Productive Mexican Research Institutions in Cervical Cancer

Institution	No. of items
National Autonomous University of Mexico	272
Social Security Mexican Institute	125
National Institute of Cancerology	117
National Institute of Public Health	85
Center for Research and Advanced Studies	81
National Polytechnic Institute	69
Autonomous University of Nuevo Leon	45
General Hospital of Mexico	42
University of Guadalajara	37
National Institute of Medical Sciences and Nutrition	27

Table 3. Visibility of Cancer Scientific Production by Core Journals, 1994-2013

Journal Title	Number of papers	Percentage %	5-year impact factor
Salud Publica de Mexico	47	6.01%	1.13
Archives of Medical Research	34	4.35%	2.133
International Journal of Gynecological Cancer	23	2.94%	2.152
Revista de Investigación Clínica	23	2.94%	0.436
BMC Cancer	21	2.69%	3.591
International Journal of Cancer	20	2.56%	5.474
Gynecologic Oncology	19	2.43%	3.923
Journal of Clinical Oncology	13	1.66%	17.255
Cancer Epidemiology Biomarkers & Prevention	12	1.54%	4.703
Cirugia y Cirujanos	10	1.28%	0.238

year. With respect to scientific production, the National Autonomous University of Mexico was the leader in cervical cancer research in Mexico, distinctly followed by the Social Security Mexican Institute, and National Institute of Cancerology. However, a problem of cervical cancer scientific research is that over 90 percent of such research is concentrated in only three cities: Mexico, Monterrey and Guadalajara (data not shown). One of the crucial policy issues in Mexico is how to enhance cancer research across all union territories.

On the other hand, studies of treatment, diagnosis and prevention are the dominant work in the Mexican cervical cancer research community and receive more than 55% of total research output. The range of research domains correlate with those noted worldwide.

Several papers have examined cancer research in individual countries: in Italy (Micheli et al., 2009), Peru (Mayta-Tristán et al., 2013), and Turkey (Dursun et al., 2011). However, this analysis represents the first bibliometric research of cervical cancer, and is consistent with other studies that have shown an increased interest in the countries in scientific research of certain cancers, such as breast (Perez-Santos and Anaya-Ruiz, 2013), lung (Ho et al., 2010), and ovary (Guler et al., 2013).

This work represents the first bibliometric assessment of Mexican cervical cancer research. Cervical cancer research in Mexico is still developing, although some research has attained an international level. The findings of this study should provide useful information for those who will be performing research and studying cervical cancer for Mexican.

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