Disease Burden of Gastric Cancer in Disability-Adjusted Life Years in Colombia

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Abstract

Objective: Gastric cancer is the second most common cause of cancer death and the fifth most common neoplasm in the world. In Colombia, it is the leading cause of cancer mortality. The annual incidence and mortality are 16.3/100,000 and 14.2/100,000 inhabitants respectively. The aim of this study was to estimate the disease burden in Colombia as measured in disability-adjusted life years (DALYs). **Methods:** This study focuses on prevalence in 2014. To estimate prevalence, a search was made in the registries of the Social Protection Information System (SISPRO) and the National Administrative Department of Statistics (DANE). The average duration of cases and estimated survival were obtained from the local literature. DALYs were calculated by adding the years of life lost due to premature death (YLLs) and years of life lived with disability (YLD) according to the methodology of the World Health Organization (WHO). **Results:** Prevalences estimated for five years in the population older than 15 years were 40.9/100,000 for women and 62.5/100,000 for men. The total DALY was 293,418, with a rate of 623/100,000 inhabitants; 97.4% correspond to YLL. The YLD and YLL for Colombia were 16/100,000 and 607/100,000, respectively. **Conclusions:** Data obtained from SISPRO and DANE estimate a high disease burden in Colombia. It is necessary to implement early cancer detection strategies to reduce the burden of disease and improve patient prognosis.

Keywords

Gastric neoplasms; cost of illness; prevalence; factual databases.

INTRODUCTION

Gastric cancer causes a considerable global burden: it is the second cause of cancer death in the world after lung cancer and the fifth most frequent neoplasm for both sexes. (1, 2)

The disease's epidemiology varies considerably by region and sex, due to the difference in dietary habits, age and other risk factors of the population (3). The regions with the highest incidence are Asia and Eastern Europe, followed by South America. In North America and South Africa the incidence is lower. (3) Generally, the 5 year survival rate is less than 20%. (4) Late diagnosis of gastric cancer is due in large part to nonspecific initial symptoms.

However, in Japan and Korea survival has increased to 90% due to early diagnosis and endoscopic resection of lesions. (1, 4)

In Colombia, gastric cancer is the leading cause of cancer death. It has an annual incidence of 16.3/100 000 inhabitants and a calculated mortality of 14.2/100 000 inhabitants. (5) According to Colombian literature, 41% of the patients are in stage III at the time of diagnosis while 21% are in stage IV according to the criteria of the American Joint Committee on Cancer (AJCC). (6) According to an observational study of 1,039 patients with gastric cancer, survival is lower than that reported worldwide, and a 5-year survival rate of 11% has been calculated. (7)

The disease burden attributable to cancer is 7.8% of the total DALYs worldwide within which gastric cancer contributes 0.7% of the total DALYs. (8, 9) In Brazil, a cancer disease burden study has estimated that of the total DALYs caused by cancer, 95.4% corresponded to YLL. (10) This figure is considerably higher than that registered in developed countries, where YLL are around 80% for cancer, in general. This shows the relevance of disease burden of gastric cancer and the needs for early diagnoses and development of programs for early detection of the disease. (10)

The objective of this study was to use Colombian prevalence data and the methodology established by WHO to estimate the country's disease burden from gastric cancer measured in DALYs. (11-13)

MATERIALS AND METHODS

The study used data on the prevalence of gastric cancer in Colombia for 2014. To estimate the prevalence of gastric cancer in Colombia, a search was made of the SISPRO records. The main source of SISPRO is the Individual Registry of Health Services Provision (RIPS), which centralizes all data related to individual health care in Colombia and which is managed by the Ministry of Health and Social Protection.

Five years of RIPS' data, from 2010 to 2014, for International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) which is related to gastric cancer from C160 to C166 and which includes C169 (malignant tumors of the cardia, gastric fundus, stomach body, pyloric antrum, pylorus, minor curvature and greater curvature of the stomach, and malignant tumor of the stomach, unspecified part) were used for this study. These diagnoses were scrutinized with two diagnostic filters: confirmed new and confirmed repeated cases excluding the type of diagnosis, diagnostic impression and unspecified.

In order to quantify the number of patients with this diagnosis, the function "people served" was used, which includes each person only once even if that person has been attended more than once during the 5 years. After obtaining these data, they were classified according to sex, age group (by five-year periods) and geographic location by department.

To estimate the prevalence of gastric cancer in 2014, the DANE information was used as a population denominator, grouping the population by five-year periods, estimated for the year in question.

The DANE data are based on the population census conducted in 2005 in Colombia (www.dane.gov.co) and its projections, although there is evidence that it may underestimate the older population. (14, 15) Prevalence was estimated by sex and by age group in the same way as the general prevalence, using the population estimate according to the DANE for these subgroups as the denominator.

ESTIMATION OF DALYS

DALYs were calculated from the sum of the YLL and the *years lived with disability* (YLD) according to the WHO methodology proposed in 2013. (11, 12) This method allows YLL to consider the mortality attributable to a disease while YLD considers the morbidity attributable to that disease. An expectation of life at birth of 86 years was used for men and women, and life expectancies for each five year age range were used, so that, for example, the life expectation used for the 75 to 79 year age group was 12.9 years while that used for those 80 and over was 9.3 years. No age adjustments were made. (11) Although other studies of disease burden use the real life expectancy for each country, (16) the WHO recommends standardization to allow international comparisons.

Although the new methodology has opened up a debate about whether incidence or prevalence should be used for calculation of DALYs, researchers have adopted the approach based on prevalence to allow calculation of YLD in the surviving population with chronic outcomes. The disability weights (on a scale between 0 and 1, where 0 is perfect health) for health statuses secondary to gastric cancer were based on the studies of Salomon et al. and Murray et al. (8, 11) The use of prevalence rather than incidence causes an increase in total DALYs for all causes. (12)

The YLD estimation was based on the estimated prevalence with different disability weights for gastric cancer according to the Murray methodology. The proportion of patients estimated to be in each of the four health statuses from oligosymptomatic to terminal was obtained from a study conducted from 2004 to 2008 in Colombia and from an expert panel of gastroenterologists with experience in the management of patients with gastric cancer. (6) The YLD were categorized according to the following age groups: 0-4 years, 5-14 years, 15-29 years, 30-44 years, 45-59 years, 60-69 years, 70-79 years and 80 years or more. Since this study is based on prevalence, the average duration of the disease was not included in the YLD calculation.

The YLL were calculated on the basis of the differences between the ages of death of patients and the life expectancies proposed by the WHO (86 years for men and women) and on prevalences obtained from RIPS and DANE. No weighting was used. The information was organized into the same age ranges.

DATA ANALYSIS

All data obtained from all sources (RIPS, DANE and literature) were organized into Excel® spreadsheets for analysis and calculation of five-year prevalences of gastric cancer, survival, average gastric cancer patient survival times

in years and annual case-fatality rates. Subsequently, the WHO template for calculation of disease burden was used to obtain DALYs. (13)

RESULTS

The data consulted from RIPS for 2010 to 2014 showed that 15,972 patients with confirmed diagnoses of gastric cancer were treated in Colombia: 9,467 men (59.3%) and 6,495 women (40.7%), see Table 1. According to these data, the estimated prevalences in the over-15-year old population for those five years were 40.9/100,000 women and 62.5/100,000 men, see Table 2.

The four five-year periods from 55 years of age to 74 years of age showed significant numbers of patients beyond the overall total treated. Since number of times patients were seen or treated during the years 2010 to 2014 was 96,805, it can be estimated that, on average, each patient was seen or treated six times.

The total number of deaths obtained indicated by the mortality rate was 10,797. These data were classified into five-year periods and grouped into eight age groups: 0-4 years, 5-14 years, 15-29 years, 30-44 years, 45-59 years, 60-69 years, 70-79 years and 80 years or more. Of the total deaths, 3,057 occurred in 2014. The total YLL (81,069) and the YLL per 100,000 inhabitants (170.1) were calculated on the basis of these data.

The total YLD was calculated from cases determined for each age group and the average survival time for the disease reported in Colombian literature (21 months). (7) Four health statuses for gastric cancer were used to calculate YLD: diagnosis and primary therapy (disability weight of 0.294), metastatic stage (disability weight of 0.484), terminal stage (weight of disability of 0.508) and controlled phase (disability weight of 0.031). (8, 11) The analysis of the panel of experts and reports in the literature were used to establish the percentage of the average survival time hypothetically remaining for patients in each health status. Applying 15% for diagnosis and primary therapy, 30% for metastatic stage, 15% for terminal stage and 40% for controlled phase, a disability weight of 0.278 was calculated for the time lived with gastric cancer.

The total DALY was 82,326, with a rate of 172.7/100 000 inhabitants, 98.5% of which corresponds to YLL (Table 3). The rate of YLD for the Colombian population was 2.6/100,000 inhabitants. The age group with the most DALYs, 45-59 years old, accounts for 38.7% of the total. It is followed by the 60-69 year group.

DISCUSSION

Although gastric cancer is first among cancers as a cause of death in Colombia, (2) it has received less attention than cervical cancer, breast cancer and prostate cancer. In terms

Table 1. Number of patients treated whose primary diagnosis was gastric cancer from 2010 to 2014 by age groups. RIPS data

Age	2010	2011	2012	2013	2014	Overall total *
0 to 4 years	3			1	7	10
5 to 9 years	3			3	1	7
10 to 14 years	2		1	2	2	5
15 to 19 years	42	9	8	11	28	93
20 to 24 years	19	11	22	22	28	95
25 to 29 years	41	27	32	41	53	180
30 to 34 years	72	68	79	86	106	329
35 to 39 years	105	130	144	133	178	546
40 to 44 years	205	242	262	241	279	943
45 to 49 years	273	344	385	366	431	1363
50 to 54 years	344	409	505	496	567	1756
55 to 59 years	379	467	604	550	675	2039
60 to 64 years	395	566	598	583	723	2171
65 to 69 years	391	486	592	540	727	2183
70 to 74 years	427	541	597	539	694	2214
75 to 79 years	296	405	475	434	579	1769
80 years or more	296	437	502	474	606	1925
Overall Total	3180	4048	4664	4412	5471	15 972

* The Overall Total column shows the total number of people served at some point in the period, not necessarily the amount of people served per year.

Table 2. Prevalence for 5 year age-periods between 2010 and 2014 for gastric cancer in men and women, using primary diagnoses

Quinquennium	Women			Men			Overall Total *		
	Population	Cases	Prevalence	Population	Cases	Prevalence	Population	Cases	Prevalence
0- 4 years	2 104 983	3	0,1	2 205 140	7	0,3	4 310 123	11	0,3
5-9 years	2 082 905	4	0,2	2 178 087	3	0,1	4 260 992	7	0,2
10-14 years	2 104 802	4	0,2	2 196 672	1	0,0	4 301 474	7	0,2
15-19 years	2 135 740	49	2,3	2 231 913	44	2,0	4 367 653	98	2,2
20-24 years	2 081 630	51	2,5	2 182 627	43	2,0	4 264 257	102	2,4
25-29 years	1 927 690	93	4,8	1 961 986	87	4,4	3 889 676	194	5,0
30-34 years	1 778 575	174	9,8	1 700 271	153	9,0	3 478 846	411	11,8
35-39 years	1 616 660	294	18,2	1 525 194	252	16,5	3 141 854	690	22,0
40-44 years	1 491 010	465	31,2	1 378 539	478	34,7	2 869 549	1229	42,8
45-49 years	1 505 806	579	38,5	1 373 306	783	57,0	2 879 512	1799	62,5
50-54 years	1 371 402	739	53,9	1 245 714	1017	81,6	2 617 116	2321	88,7
55-59 years	1 126 190	751	66,7	1 008 294	1286	127,5	2 134 484	2675	125,3
60-64 years	876 569	783	89,3	782 667	1387	177,2	1 659 236	2865	172,7
65-69 years	666 944	797	119,5	583 881	1385	237,2	1 250 825	2736	218,7
70-74 years	485 493	852	175,5	406 288	1360	334,7	891 781	2798	313,8
75-79 years	381 431	697	182,7	293 335	1072	365,5	674 766	2189	324,4
80 years or more	392 287	847	215,9	277 356	1076	387,9	669 643	2315	345,7
Total	24 130 117	6495	26,9	23 531 670	9467	40,2	47 661 789	15 972	35,5

* The Overall Total column does not correspond to the sums of the other columns but rather to the number of people treated at some point in the five-year period. Prevalence is calculated by using the average population of the period as the denominator.

Table 3. Distribution of DALYs, YLL and YLD due to gastric cancer in Colombia, according to five-year periods, for the year 2013. Rates per 100,000 inhabitants

Quinquennium	Population	DALYS	Rate of DALYs	YLL Rate	YLD Rate
0-4	4 310 122	57	1.3	1.3	0.0
5-14	8 562 463	261	3.0	3.0	0.0
15-29	12 521 536	3084	24.6	24.5	0.2
30-44	9 489 938	14 805	156.0	154.7	1.3
45-59	7 630 157	32 842	430.4	425.2	5.1
60-69	2 909 302	17 970	617.7	606.8	10.7
70-79	1 565 889	10 192	650.9	633.3	17.3
80 or more	669 323	3116	465.6	445.7	19.7
Total	47 658 730	82 326	172.7	170.1	2.6

of incidence, it is the first among men, followed by prostate cancer; while among women it occupies fourth place after breast, cervical and colorectal cancer. (2) According to these figures, its age-adjusted incidence is 26.5/100,000 person-years for men and 15.4/100,000 person-years for women. (17) According to data from the National Cancer Institute, Colombia is considered to be a country with a high incidence and mortality rate due to gastric cancer.

The data obtained from SISPRO were originally collected by the Ministry of Health and Social Protection of Colombia. However, the registration of RIPS is subject completion of diagnoses by doctors and placed in medical records according to the ICD-10. It is sensible to assume that some of these records have not been recorded optimally, and it is especially like that they have been subject to underreporting. The implication is that this database contains errors. Previous studies

from our group have suggested that the diagnostic accuracy of RIPS improves for diseases like multiple sclerosis that are diagnosed by a selected group of specialists and whose treatment requires the allocation of important resources by the health care system. (18)

Taking possible underreporting in the RIPS into account, this study found a higher prevalence of gastric cancer than that predicted by the 2012 Globocan initiative for Colombia of 20.6 for women and 37.5 for men, but our finding was similar to the one provided by the International Agency for Research in Cancer (IARC) of the WHO which estimates the prevalence and incidence for Colombia based on data from a surveillance system that covers less than 10% of the population. (2, 14, 19) Although these data were the best available for Colombia, they only come from regional records taken from four cities: Cali, Pasto, Manizales and Bucaramanga. (20-23)

It is important to note the a preliminary analysis of figures reported by DANE on showed 23,253 deaths directly caused by gastric cancer in Colombia from 2010 to 2014. This exceeds the total number of reported cases in the RIPS. (24) These official figures are of significant value as an objective reference for the number of patients with gastric cancer at the time of death and reinforce the need to improve cancer surveillance systems at the national level.

DANE projections for 2014, based on the 2005 census, were used to calculate DALYs in Colombia because there were the most reliable projections that were available for the whole country. The most important great majority DALYs were calculated on the basis of YLL due to lethal nature of this disease for which only one out of nine patients survives for five years after diagnosis. (7) A good comparison for the results of our study is found in regional studies from Chile, a country with an epidemiological behavior similar to that of Colombia, which showed that 9.6% of these patients survived for five years. (25) These numbers are also comparable to the 11% found in the de Vries study in Bucaramanga. (7) In developing countries, total DALYs are more than 90% dependent on YLL. In contrast, in developed countries, the proportion is close to 80%. (10)

The gastric cancer disease burden reported in the literature for Colombia is lower than those of other countries with similar incidences. Although Colombia is one of the countries with the highest incidences of gastric cancer in the world, the reported DALY rate of 304/100,000 inhabitants is similar to that of countries with intermediate incidences. (9) Countries such as South Korea and Japan with high incidences but strict screening programs and early cures of gastric cancer, and where the proportion of YLL in DALYs is lower than in Colombia, have rates that are much higher than those of Colombia where diagnosis is late and there are more premature deaths among young

adults. (26). Although the mortality data obtained by our study from the SISPRO and DANE databases estimate a higher disease burden, they may still be underestimating the true magnitude of the problem. (27)

In conclusion, Colombia has a significant incidence of gastric cancer that indicates a need for more work in areas such as proper registration since, as this study shows, more deaths from this disease are reported than the reported number of consultations per patient in the health system for this disease. Other relevant issues linked to the evaluation of this study's data which require greater emphasis include screening, early diagnosis, periodic monitoring of the evolution of the disease and timely treatment in order to reduce the disease burden and thus improve the prognoses of patients.

Conflict of Interest

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