Cancer Mortality in Older Mexican Individuals (2000 – 2010)

Omar González-Santiago1*, Sandra Castillo-Guzmán2, Dionisio Palacios-Ríos2, Mónica A. Ramírez-Cabrera1

1Universidad Autónoma de Nuevo León (UANL), Facultad de Ciencias Químicas, San Nicolás de los Garza Nuevo León, Mexico
2Universidad Autónoma de Nuevo león (UANL), Facultad de medicina, México

*Corresponding author: Omar González-Santiago, 1Universidad Autónoma de Nuevo León (UANL), Facultad de Ciencias Químicas, San Nicolás de los Garza Nuevo León, Mexico, Tel: 83.29.40.00.34; E-mail: omargs28@yahoo.com

Received date: April 15, 2014; Accepted date: May 20, 2014; Published date: May 24, 2014

Abstract

Objective: Given the trends in aging worldwide, in Mexico, we determined trends in adjusted mortality rates due to cancer and 11 cancer subtypes in older individuals (>65 years) from 2000 to 2010.

Methods: For this retrospective study, we collected data on mortality due to cancer from the registries of the National Institute of Statistics and Geography. Adjusted rates were calculated with a direct method based on the world standard population. Trend analysis was performed with a linear regression of the natural logarithm of the adjusted rate, and trends were evaluated with the Student’s t test.

Results: During the studied period, the cancer mortality rates significantly declined from 630.21 to 573.03 (per 100,000 inhabitants) in the overall population. Similar declines were observed in women (from 548.81 to 490.09) and men (from 726.03 to 672.94). Significant declines in mortality rates were observed across several cancer subtypes, including esophageal, gastric, colorectal-anal, liver-biliary, pancreatic, and tracheobronchial-lung cancers. Significant increases in mortality rates were observed in colorectal and breast cancer, but no changes were observed in mortality rates due to prostate, ovarian, bladder, and non-Hodgkin lymphoma cancers.

Conclusion: Mortality due to cancer in older Mexicans was lower than that observed in developed countries, and it significantly declined over the study period. Men had higher mortality rates than women. The highest mortality rates were due to breast and prostate cancer subtypes in older individuals.

Introduction

After cardiovascular disorders, cancer is the second leading cause of death in the world [1]. It affects both genders, and its economic impact is greater than any other cause of death in the world. The total economic impact of premature death and disability from cancer worldwide was $895 billion in 2008. This data represents 1.5% of the world’s gross domestic product [2]. Among the risk factors for cancer, age is one of the most important; cancer incidence and cancer-related mortality rises exponentially after 50 years of age [3].

Due to increases in birth rate and life expectancy, the number of older individuals is currently increasing around the world. With this trend, the prevalence of cancer is likely to rise. This has important implications for the implementation of preventive strategies and treatment for cancer in older age groups. In older individuals, some cancers may be more aggressive or more indolent than in younger adult age groups [3].

On the other hand, Mexico is considered a country of young people. However, like other countries, Mexico has experienced considerable growth in its population, both in life expectancy and in the number of individuals. Thus, we might expect modifications in the incidence and mortality of some diseases, such as cancer, in the future. Hence, surveillance is important to ensure correct allocations of economic and human resources. Given the importance of cancer in public health, and due to the few studies that have focused on this older segment of the population, the present study aimed to determine recent trends in cancer among older individuals in Mexico from 2000 to 2010.

Methods

In this observational, retrospective study, we collected information on death due to cancer in individuals ≥ 65 years old from the database of the National Institute of Statistics and Geography (INEGI in Spanish) [4]. In this database, deaths that occurred from the years 2000 to 2010 were grouped according to the International Classification of Disease, version 10 (ICD-10). For the current analysis, we stratified deaths by gender, age group, and 11 cancer subtypes. The age groups were: 65–69, 70–74, 75–79, 80–84, and > 85 years. The cancer subtypes were: esophageal, stomach, colorectal, liver, pancreatic, tracheobronchial, bladder, non-Hodgkin lymphoma, prostate, cervical, and ovarian cancers.

Analyses

Standardized rates of mortality (per 100,000 inhabitants) were calculated with the direct method, using the world standard population. The populations used in the denominators of the 2000, 2005, and 2010 mortality rates were taken from the corresponding census estimates. For the other years, the denominators were estimated by linear interpolation. Trend analysis was performed with a linear regression of the natural logarithm of the adjusted rate, and the trends were evaluated with the Student’s t test. For the annual
percentage change (APC), we used the following formula: 

$$APC = \frac{(e^m - 1) \times 100}{e^m},$$ 

where $e^m$ was the antilogarithm of the slope previously calculated with linear regression. MINITAB 16 and EXCEL were used to perform the analyses.

**Ethical considerations**

This study was based on freely available data at www.inegi.org.mx. In this public domain database, the identity, preferences, and other data of deceased individuals are maintained strictly confidential.

**Results**

During the period studied, a total of 392,081 deaths due to cancer occurred in individuals aged >65 years in Mexico. This represented 13.5% of all deaths in this particular age group. According to gender, cancer was responsible for 14.6% and 12.4% of all deaths in elderly man and women respectively. The average mortality due to cancer was 603.92/100,000 inhabitants. This rate significantly decreased over the study period, from 630.21 to 573.03 (per 100,000 inhabitants), with an APC of -1.05%. Men had higher mortality rates than women; the male/female ratio was 1.35. Despite the different magnitudes, both genders exhibited a significant decrease in mortality rates over time. In men, mortality decreased from 726.03 to 672.94 (per 100,000 inhabitants), with an APC of -0.91%; in women, it decreased from 548.81 to 490.09 (per 100,000 inhabitants), with an APC of -1.18% (Table 1). With the exception of individuals >85 years old, all age groups studied exhibited a significant decrease in mortality rates over time. The highest APC was -1.46% in the 65-69 year-old age group; the lowest APC was -0.377 in the 75 – 79 year-old age group.

| Gender       | 2000    | 2001    | 2002    | 2003    | 2004    | 2005    | 2006    | 2007    | 2008    | 2009    | 2010    | APC     | P       |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Overall      | 630.21  | 623.7   | 624.7   | 624.49  | 613.53  | 612.53  | 596.77  | 588     | 582.1   | 573.94  | 573.03  | -1.05   | 0       |
| Male         | 726.03  | 717.31  | 730.86  | 727.69  | 714.7   | 718.21  | 694.57  | 685.88  | 684.6   | 670.07  | 672.94  | -0.91   | 0       |
| Female       | 548.81  | 543.6   | 534.22  | 537.3   | 528.09  | 523.76  | 514.67  | 506.1   | 496.72  | 494.08  | 490.09  | -1.18   | 0       |

**Table 1:** Cancer mortality trends in older Mexican individuals (>65 years) according gender and age (rates are per 100,000 inhabitants)

The cancer subtypes that caused the highest mortality rates during the studied period were tracheobronchial, followed by stomach and liver cancers. The mortality rates due to these subtypes significantly decreased over time, with APCs of -5.39%, -3.16%, and -0.86%, respectively. On the other hand, only the mortality rate due to colorectal cancer showed a significant increase over the study period, with an APC of 0.94%. No changes over time were observed in mortality due to esophageal, prostate, bladder, and non-Hodgkin lymphoma cancers (Table 2).

In men, the highest mortality was due to tracheobronchial cancer, followed by prostate and stomach cancers. Of these, only deaths due to tracheobronchial and stomach cancers showed a significant decrease over time, with APCs of -3.39% and 2.88%, respectively. Mortality due to colorectal cancer showed a significant increase over time, with an APC of 1.48%. No changes over time were observed in mortality due to esophageal, prostate, bladder, and non-Hodgkin lymphoma cancers (Table 2).

| Gender       | 2000    | 2001    | 2002    | 2003    | 2004    | 2005    | 2006    | 2007    | 2008    | 2009    | 2010    | APC     | P       |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Overall      | 10.11   | 9.40    | 9.54    | 10.82   | 8.85    | 9.22    | 9.47    | 9.44    | 8.81    | 8.19    | 8.87    | -1.59   | 0.016   |
| Esophagus    | 61.58   | 58.41   | 57.83   | 57.28   | 54.55   | 53.41   | 51.99   | 48.04   | 47.19   | 45.77   | 45.19   | -3.16   | 0.000   |
| Stomach      | 58.41   | 57.83   | 57.28   | 54.55   | 53.41   | 51.99   | 48.04   | 47.19   | 45.77   | 45.19   | -3.16   | 0.000   |

Epidemiol  
ISSN:2161-1165 ECR, an open access journal  
Volume 4 • Issue 3 • 1000159
Table 2: Cancer mortality trends in older Mexican (>65 years) according cancer subtype (rates are per 100,000 inhabitants)

| Cancer Subtype                  | Male                        | Female                       |
|--------------------------------|-----------------------------|------------------------------|
|                                | APC: Annual Percentage Change | APC: Annual Percentage Change |
| colon, rectum, anus            | 29.96 30.67 29.07 30.84 31.00 32.18 31.69 32.45 33.19 30.71 31.26 0.67 0.052 | 5.73 5.35 5.40 5.97 4.62 4.72 4.51 5.04 4.28 3.97 4.95 -2.67 0.013 |
| Liver, bile duct               | 54.57 53.40 54.56 56.32 56.39 54.08 54.60 49.98 50.89 51.96 50.85 -0.86 0.020 | 51.79 49.66 48.82 48.46 46.62 46.69 43.68 40.64 39.69 37.48 36.80 -3.46 0.000 |
| Pancreas                       | 35.14 35.02 34.98 33.02 34.82 34.49 33.53 33.47 34.12 32.95 31.86 -0.74 0.005 | 28.11 29.88 28.14 30.89 30.04 30.38 29.74 31.23 31.01 27.80 27.58 -0.07 0.879 |
| Lung, bronchi, trachea.        | 86.93 85.21 86.19 83.61 83.38 82.28 76.02 72.27 69.95 66.55 64.94 -3.09 0.000 | 35.40 35.25 35.16 33.56 34.94 35.17 34.25 33.75 33.67 33.41 33.28 -0.60 0.002 |
| Bladder                        | 9.60 9.84 9.31 8.82 9.21 9.05 10.05 11.42 10.81 9.53 9.10 0.59 0.456 | 15.62 14.41 17.17 14.93 17.38 17.52 16.88 16.65 16.69 17.55 16.92 1.18 0.059 |
| Non Hodgkin Lymphoma           | 13.84 13.51 15.52 14.33 14.41 15.53 15.29 14.71 14.34 15.15 14.97 0.66 0.140 | |
Discussion

This study determined the recent trends in mortality due to cancer in older Mexican individuals, which included individuals >65 years of age. Our results indicated that mortality rates were much lower than those reported in other countries, including the United States, Japan, and Italy [5-7]. A relatively low rate has been also observed in younger Mexican individuals [8]. The reasons for these world differences, to date, remain unclear, but genetic and environmental factors may be involved. The male predominance we observed was consistent with other studies [9]. This predominance may be explained by hormonal factors and the prevalence of unhealthy behaviors among men, such as smoking and drinking alcohol [10].

We observed decreased cancer-related mortality rates over time in four out of five of the age groups studied, but not in people >85 years old (Table 1). With respect to this last age group, an Italian study [7] has reported significant decreases in their mortality rates while an USA [11] study has reported significant increases in the proportion of cancer deaths (cancer deaths in oldest old/cancer deaths in all ages). The decrease in mortality rates of those 65–84 years might be explained by increased adoption of preventative practices, like early detection of precancerous lesions, and by improvements in treating some cancer subtypes in Mexico. Although the mortality rates due to tracheobronchial-lung cancer were highest in the overall population, the mortality due to these cancer subtypes also showed the greatest decrease over time. This might be explained, in part, by an increasing number of individuals that quit smoking in the general population. On the other hand, the significant increase over time in mortality rates due to colorectal-rectal cancer suggested a Westernization of nutritional habits and life style among Mexicans [12].

As in others countries, the highest mortality in Mexico among the older population men was due to prostate cancer. Furthermore, mortality due to this subtype did not show any change in over time. Previously, it has been observed increases in crude rates of mortality in overall Mexican men [13], but studies in 65 years-old men are lacking in México. The study design did not allow us to determine whether the incidence in prostate cancer might have increased over time. In that case, the lack of change in mortality may have been due to the improvements in preventive strategies, such as monitoring PSA. The mortality rate due to tracheobronchial-lung cancer showed a major decline over time; nevertheless, it remained the second leading cause of death in this study. In general, smoking is the primary cause of lung cancer; thus, our results indicated that smoking probably continued to be an important public health problem in Mexico. In addition, smoking, together with a fat-rich diet, a sedentary lifestyle, and an overweight status, may have also contributed to the significant increase over time in mortality due to colorectal cancer among men.

The decrease over time in mortality due to cervical cancer in overall women has been also reported previously in others Mexican studies [14] but not in woman ≥ 65 years. Programs for early detection of precancerous lesions and improvements in treatment could explain these results. Recently, HPV vaccinations have been included in national vaccination campaigns [15]; therefore, this favorable tendency towards decreasing mortality due to cervical cancer is likely to continue in the future. Although different to our results, the recent increase in breast cancer mortality of Mexican woman has been also observed previously in woman ≥ 65 year-old [16]. These data indicated that much effort is needed to reverse the significant increase in mortality due to breast cancer. These efforts must include promoting self-examination and providing mammography at an accessible cost.

Conclusions

Compared to more developed countries, in Mexico, the mortality due to cancer in older individuals is low, and it has exhibited a significant decline over recent years. Men had a higher mortality rate than women. Mortality due to colorectal-rectal and breast cancer subtypes significantly increased over time. In addition, mortality rates due to breast and prostate cancer subtypes remain high in Mexico. More studies in older individuals are needed in Mexico.

Acknowledgements

We thank Sergio Lozano-Rodriguez, M.D. for review of the manuscript.

Conflict of Interests

The authors declare no conflict of interests

References

1. World Health Organization (2014) The top 10 causes of death. Fact sheet N°310.
2. Rijo J, Hana R (2010) The global economic cost of cancer. Report of Livestrong and American Cancer Society 2010 No. 005444.
3. Franceschi S1, La Vecchia C (2001) Cancer epidemiology in the elderly. Crit Rev Oncol Hematol 39: 219-226.
4. National Institute of Statistics and Geographic (INEGI in Spanish). Registros administrativos de mortalidad.
5. Yang L1, Fujimoto J, Qiu D, Sakamoto N (2010) Trends in cancer mortality in the elderly in Japan, 1970-2007. Ann Oncol 21: 389-396.
6. Tereanu C1, Balli P, Berrino F, Micheli A, Furtunescu FL, et al. (2013) Recent trends of cancer mortality in Romanian adults: mortality is still increasing, although young adults do better than the middle-aged and elderly population. Eur J Cancer Prev 22: 199-209.
7. Bidoli E1, Fratino L, Bruzzone S, Pappagallo M, De Paoli P, et al. (2012) Time trends of cancer mortality among elderly in Italy, 1970-2008: an observational study. BMC Cancer 12: 443.
8. Bosetti C1, Rodríguez T, Chatenoud L, Bertuccio P, Levi F, et al. (2011) Trends in cancer mortality in Mexico, 1981-2007. Eur J Cancer Prev 20: 355-363.
9. Levi F, Lacchini F, Negri E, Boyle P, La Vecchia C (2001) Changed trends of cancer mortality in the elderly. Ann Oncol 12: 1467-1477.
10. Kruger DJ, Nesse RM (2004) Sexual selection and the Male: Female Mortality Ratio. Evolutionary Psychology 2: 66-85.
11. Gundrum JD, Go RS (2012) Cancer in the oldest old in the oldest old in the United States: Current and projections. Geriatric Oncology 3: 299-306.
12. Haggar FA1, Boushey RP (2009) Colorectal cancer epidemiology: incidence, mortality, survival, and risk factors. Clin Colon Rectal Surg 22: 191-197.
13. Sánchez-Barriga JJ (2013) [Mortality trends and years of potential life lost from prostate cancer in the 32 states and 7 socioeconomic regions of Mexico, 2000-2010]. Gac Med Mex 149: 576-585.
14. Sánchez-Barriga JJ (2012) [Mortality trends from cervical cancer in the seven socioeconomic regions and the thirty two federative entities of Mexico, 2000-2008]. Gac Med Mex 148: 42-51.
15. Norma Oficial Mexicana NOM-036-SSA2-2012. Prevención y control de enfermedades. Aplicación de vacunas, toxoides, faboterapicos e immunoglobulinas en el humano.
16. de la Vara-Salazar E1, Suárez-López L, Angeles-Llerenas A, Torres-Mejía G, Lazcano-Ponce E (2011) [Breast cancer mortality trends in Mexico, 1980-2009]. Salud Publica Mex 53: 385-393.