Burden Of Epilepsy In Colombia

Article in Neuroepidemiology · April 2015
DOI: 10.1159/000381424 · Source: PubMed

11 Citations
137 Reads

3 authors:

Alejandro Méndez-Ayala
Hospital Universitario Clinica San Rafael
3 Publications · 15 Citations

Daniel Nariño
Hospital Universitario San Ignacio
19 Publications · 107 Citations

Diego Rosselli
Pontificia Universidad Javeriana
308 Publications · 1,006 Citations

Some of the authors of this publication are also working on these related projects:

Project: Agression al personal en salud View project

Project: Burden of disease View project

All content following this page was uploaded by Diego Rosselli on 18 April 2016.

The user has requested enhancement of the downloaded file.
Burden of Epilepsy in Colombia

Alejandro Méndez-Ayala\textsuperscript{a}  Daniel Nariño\textsuperscript{a}  Diego Rosselli\textsuperscript{b}

\textsuperscript{a}Neurosciences Department, Neurology Unit, Pontificia and \textsuperscript{b}Clinical Epidemiology and Biostatistics Department, Pontificia Universidad Javeriana, Medical School, Bogota, Colombia

Introduction

Disability adjusted life years (DALYs) have been developed as a strategy to measure and compare different health conditions, combining mortality and morbidity in a single indicator. One DALY corresponds to one year of healthy life, and the measurement of ‘burden of disease’ quantifies, in DALYs lost, the gap between current health status of a population, and the ‘ideal’ situation, in which each member of that population would reach old age, free of disease and disability [1].

In Colombia, two studies have quantified the global burden of disease, one in 1994 [2] and the other one in 2008 [3]. The latter was based on data from 2005, and concluded that epilepsy, together with other psychiatric disorders such as depression, bipolar disorder and schizophrenia, was responsible for 21% of the global burden of healthy years lost per thousand people in Colombia. For epilepsy, in particular, the estimation was 2.07 DALYs lost per thousand person-years in the Colombian population. Given that the country has close to universal coverage and a single centralized reimbursement fund, information on main diagnosis, particularly for serious diseases, has been considered reliable, and has been validated against other information sources, at least in the capital city of Bogota [4].

This study aimed to take advantage of a new source of information that has been improving both coverage and quality in recent years, known as RIPS (Individual Record of the Provision of Health Services, in Spanish); we also incorporated death rate figures of DANE (National Statistical Administration Department, in Spanish) to
estimate age-adjusted attributable mortality. With this information and extrapolating from local and regional neuroepidemiological studies, we estimated the impact epilepsy has on our society.

**Methods**

**Mortality**

Different studies showed that epilepsy is associated with a decrease in life expectancy. To estimate Colombian attributable mortality, we applied the relative risk increase described in the British cohort followed for more than a decade by Lhatoo et al. [5]. We applied their 2.1 (95% CI: 1.8–2.4) standardized mortality ratio to the number of persons with epilepsy in each age group, multiplied by the age-adjusted Colombian annual mortality rate [6]. Another cohort study, in Netherlands [7], showed an even higher relative risk, of 3.2 (95% CI: 2.9–3.5). A cohort study from the neighboring country of Ecuador [8] showed a standardized mortality ratio of 6.3 (95% CI: 2.0–10.0). We chose the more conservative of these three estimates. We also compared these results with national mortality figures that state ‘epilepsy’ as the main cause of death, by age group, from individual death certificates over the years 2009 to 2011, recognizing that these underestimate deaths with epilepsy as a coexisting cause.

**‘RIPS’ National Database**

Colombia has been progressively implementing an information system known as RIPS (stands for Individual Registry of Healthcare Provision), which is required for reimbursement of any health intervention. The RIPS has been used previously, for example, in research in the field of cancer epidemiology [9] or in national infectious disease incidence and geographical distribution [10]. Authors who have done research on the quality of this information [4] have found that, despite underreporting of many conditions, the overall quality of information has been improving over time. To give an idea of the magnitude of this database, the total ‘encounters’ of the health system registered for the years of interest increased from 154,117,618 in 2009 to 183,462,986 in 2012. For each of these records, there is a primary diagnosis, age and gender of the patient, as well as the geographic location where the service was provided. Diagnoses of RIPS are grouped into categories according to the International Classification of Diseases-10th version (ICD-10). The diagnoses that were considered for this analysis were those for codes between G400 and G409. We excluded patients with febrile seizures and with status epilepticus (because of the risk of double counting). A main assumption of our study is that underreporting affects all age groups in a similar way; therefore, the database is used not as accurate information but as a factor to adjust previous epidemiological data.

**Burden of Disease Estimation**

We used the same standard DALY methodology to estimate the burden of disease [1] that has been employed in two previous studies in Colombia [2,3]. DALYs are estimated with the formula expressed in figure 1.

The DALYs are the sum of YLL (years of life lost due to premature mortality) and YLD (years of life lost due to disability). The formula incorporates three fundamental assumptions: r is the annual discount rate (we used the usual 3%), and K and β are the parameters weighting function of age, which means that a greater weight is given to years lost in youth compared with older ages.

**Incidence**

To calculate DALYs, the incidence of epilepsy by gender and age group is required, and there are no previous epilepsy incidence estimations in Colombia. To start with, we used the data reported in a systematic review of the literature on global incidence of epilepsy [11]. This paper reviewed 33 studies (only 9 of which came from lower- and middle-income countries); their average was 81.7 per 10^5 person-years. This value is in the low range of the estimate for Latin America done by Burneo et al. [12], which ranged between 77.7 and 190.0 per 10^5 person-years. We therefore used the data of patient encounters from the RIPS database pertaining to the period 2009 to 2012, with the assumption that the number of encounters reflects the relative incidence of the disease, adjusted by the overall Colombian population in each age group. This way, the weighted average incidence would be 81.7 per 10^5 person-years, but would vary around this figure depending on the number of persons with epilepsy as the main diagnosis in each age group in 2012.

**Disability Weight**

Since the disability weight for epilepsy in Colombia has not been estimated locally, we used the figures reported in the 2004 update of global burden of disease [13]. This disability weight is 0.113 (disability weight ranges from 0 to 1, with 0 being the absence of any disability). We assumed an average disease duration of 20 years based on Annegers et al. [14], whose cohort study showed that at 20 years follow-up, 70% of patients were seizure-free, but only half of them (35%) were not taking anticonvulsants.

---

**Formulas used to estimate DALYs.**

Total DALYs lost correspond to the sum of YLL (years of life lost due to premature mortality) and YLD (years of life lost due to disability). We assumed an average disease duration of 20 years based on Annegers et al. [14], whose cohort study showed that at 20 years follow-up, 70% of patients were seizure-free, but only half of them (35%) were not taking anticonvulsants.

**Disability Weight**

Since the disability weight for epilepsy in Colombia has not been estimated locally, we used the figures reported in the 2004 update of global burden of disease [13]. This disability weight is 0.113 (disability weight ranges from 0 to 1, with 0 being the absence of any disability). We assumed an average disease duration of 20 years based on Annegers et al. [14], whose cohort study showed that at 20 years follow-up, 70% of patients were seizure-free, but only half of them (35%) were not taking anticonvulsants.
Ethical Issues

The study had local ethics committee approval at our university hospital. We had no access to individual records or any personal information, so no breach of confidentiality was possible.

Results

Mortality

Based on official death certificates it was found that the number of Colombians for whom epilepsy was the main cause of death was slightly over five hundred per year (563 in 2009, 545 in 2010 and 514 in 2011). This figure perhaps reflects only those who had epilepsy as a direct cause of death [15], like in seizure-related injuries or status epilepticus. According to our calculation (applying standardized mortality ratios to Colombian age-adjusted mortality and to prevalent epilepsy cases in each age group), deaths attributable to epilepsy in 2012 would actually be 12,837, which correspond to 0.88% of all deaths in that year (table 1). Death certificates clearly underestimate epilepsy mortality. The relative figure was highest in the 75–79 years age-group, where epilepsy was responsible of 1.41% of all deaths (1,927 of 136,712).

Table 1 shows the number of patients who attended during 2012, the number of encounters, as well as our estimation of the number of people with epilepsy in each age group. The number of patients who attended and patients with encounters of epilepsy as the main diagnosis has been progressively increasing over the last few years. The ratio for patients to encounters for each of the years analyzed were 79,712:291,941 for 2009; 87,260:325,289 for 2010; and 93,288:351,150. This would mean that each patient would have close to 4 encounters along a given year. The number of patients, however, is low compared to our estimate, which is based on the 10.3 per thousand prevalence established by previous Colombian neuroepidemiologic studies [16]. We adjusted based on the age group with the same strategy that we used for incidence. Despite no formal validation for the prevalence figures derived from the RIPS, our age group distribution based on patient contacts is probably more correct than the uniform distribution assumed by previous studies.

Burden of Disease

Based on the previous results, we have estimated epilepsy incidence and prevalence by age group, as shown in table 1. As mentioned, these estimations are based on the assumption that the number of patients who contacted the health system in a given year correlates with the incidence of epilepsy in each age group. Table 2 shows the final calculation of DALYs lost, discriminated by years.

<table>
<thead>
<tr>
<th>Age, years</th>
<th>Encounters</th>
<th>Patients attended</th>
<th>Estimated incidence*</th>
<th>Estimated prevalence*</th>
<th>Estimated patients</th>
<th>Attributable mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–4</td>
<td>19,840</td>
<td>4,686</td>
<td>39.3</td>
<td>4.9</td>
<td>21,266</td>
<td>149</td>
</tr>
<tr>
<td>5–9</td>
<td>33,805</td>
<td>7,803</td>
<td>65.5</td>
<td>8.3</td>
<td>35,412</td>
<td>57</td>
</tr>
<tr>
<td>10–14</td>
<td>33,076</td>
<td>8,500</td>
<td>70.1</td>
<td>8.8</td>
<td>38,575</td>
<td>69</td>
</tr>
<tr>
<td>15–19</td>
<td>41,171</td>
<td>11,014</td>
<td>90.6</td>
<td>11.4</td>
<td>49,984</td>
<td>257</td>
</tr>
<tr>
<td>20–24</td>
<td>37,487</td>
<td>9,515</td>
<td>82.6</td>
<td>10.4</td>
<td>43,181</td>
<td>373</td>
</tr>
<tr>
<td>25–29</td>
<td>34,377</td>
<td>8,566</td>
<td>82.2</td>
<td>10.4</td>
<td>38,874</td>
<td>332</td>
</tr>
<tr>
<td>30–34</td>
<td>35,254</td>
<td>8,541</td>
<td>91.1</td>
<td>11.5</td>
<td>38,761</td>
<td>338</td>
</tr>
<tr>
<td>35–39</td>
<td>30,700</td>
<td>7,595</td>
<td>90.1</td>
<td>11.4</td>
<td>34,468</td>
<td>352</td>
</tr>
<tr>
<td>40–44</td>
<td>30,365</td>
<td>7,548</td>
<td>93.3</td>
<td>11.8</td>
<td>34,255</td>
<td>427</td>
</tr>
<tr>
<td>45–49</td>
<td>31,045</td>
<td>7,594</td>
<td>97.6</td>
<td>12.3</td>
<td>34,463</td>
<td>598</td>
</tr>
<tr>
<td>50–54</td>
<td>26,378</td>
<td>6,658</td>
<td>98.0</td>
<td>12.4</td>
<td>30,215</td>
<td>793</td>
</tr>
<tr>
<td>55–59</td>
<td>19,168</td>
<td>4,930</td>
<td>89.8</td>
<td>11.3</td>
<td>22,373</td>
<td>873</td>
</tr>
<tr>
<td>60–64</td>
<td>13,602</td>
<td>3,719</td>
<td>87.0</td>
<td>11.0</td>
<td>16,878</td>
<td>1,034</td>
</tr>
<tr>
<td>65–69</td>
<td>10,026</td>
<td>2,747</td>
<td>86.0</td>
<td>10.8</td>
<td>12,467</td>
<td>1,217</td>
</tr>
<tr>
<td>70–74</td>
<td>7,615</td>
<td>2,248</td>
<td>93.1</td>
<td>11.7</td>
<td>10,202</td>
<td>1,560</td>
</tr>
<tr>
<td>75–79</td>
<td>7,118</td>
<td>1,770</td>
<td>101.6</td>
<td>12.8</td>
<td>8,033</td>
<td>1,927</td>
</tr>
<tr>
<td>&gt;80</td>
<td>8,656</td>
<td>2,298</td>
<td>130.9</td>
<td>16.5</td>
<td>10,429</td>
<td>2,481</td>
</tr>
</tbody>
</table>

lost due to premature death (YLL), and years lost due to disability (YLD) both in males and females. Globally, we could conclude that each year our country loses 5.25 years of healthy living for every 1,000 Colombians.

Discussion

Like all burden of disease studies, this one is based both on a series of assumptions, and on datasets with less than perfect information [17]. This paper has improved the calculation on age-specific incidence using an adjustment based on our official nationwide health information system. We have also done a different type of adjustment on mortality figures, which results in an increase in years of life lost (YLL) due to premature death, as compared with previous estimations. Using the standardized mortality ratio instead of the official ‘cause of death’ as mentioned in the death certificates, leads to completely different conclusions. We find that 5.25 DALYs per 1,000 are lost each year because of epilepsy, instead of the 2.07 estimated by Acosta Ramírez et al. [3]. According to them, 19.4% of DALYs lost were due to early mortality; however, we believe the true figure to be 74.6%. Other studies, like Ding et al., in China [18], have described a similar ratio between YLL and total DALYs. These higher mortality rates in patients with epilepsy have different direct and indirect explanations, which include status epilepticus, sudden unexplained death, aspiration, as well as higher accident and suicide rates [5, 7, 15].

In a relative ranking of disease burden, with 2.07 DALYs lost per 1,000, epilepsy was ranked 19 in the league table of the main causes of DALYs lost in all age groups in Colombia, below hepatic cirrhosis (3.25 DALYs per 1,000), cerebrovascular disease (3.12 DALYs), lower respiratory tract infections (2.79 DALYs) or schizophrenia (2.65 DALYs) [3]. If our estimations are correct, the real position of epilepsy in this list is in the 12th place, above traffic accidents (3.79 DALYs) and right below ischemic cardiopathy (6.01 DALYs) and bipolar disorders (5.42 DALYs).

Other intermediate calculations of our study also have interesting implications. Based on our estimated prevalence and on the patients reported on the RIPS information system, around one quarter (22%) of all epilepsy patients have at least one encounter with the health system in a given year. There could be several explanations for this finding: underreporting probably explains part of it, but patients may also get a different main diagnosis on a visit to their physician. There are important geographical differences in the number of epilepsy encounters, adjusting both for local population and for total encounters, which could mean that the coverage of neurologic disorders is still far from ideal, and many patients with epilepsy receive no medical attention in a given year. This paper adds a new perspective to the analysis of epilepsy in Colombia, and will require, no doubt, further studies to validate and give more precision to our findings.

Conclusions

We conclude that the disease burden of epilepsy in Colombia is more than double the figure previously reported in the literature based on new, and we believe more precise, estimations on disease incidence and prevalence by age group.

Disclosure Statement

Prof. Rosselli has been a speaker for different pharmaceutical laboratories, but not in the field of epilepsy.

In the last two years Dr. Nariño has been a speaker for Sanofi, Aventis, Janssen, GSK, Biopas and Abbot in academic topics without any relation with a specific drug or another economic relationship.

The study received no external funding and all expenses were covered by the authors and their institution (Pontificia Universidad Javeriana).

Acknowledgments

None.

Table 2. DALYs lost in each age group per 1,000 Colombians, discriminated by years lost due to premature death (YLL), and years lost due to disability (YLD) both in males and females

<table>
<thead>
<tr>
<th>Age, years</th>
<th>YLL males</th>
<th>YLD males</th>
<th>DALYs males</th>
<th>YLL females</th>
<th>YLD females</th>
<th>DALYs females</th>
<th>Total males</th>
<th>Total females</th>
<th>Total DALYs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–4</td>
<td>1.2</td>
<td>0.9</td>
<td>0.7</td>
<td>1.4</td>
<td>1.8</td>
<td>2.3</td>
<td>2.1</td>
<td>2.0</td>
<td>4.1</td>
</tr>
<tr>
<td>5–14</td>
<td>0.5</td>
<td>0.3</td>
<td>1.1</td>
<td>1.4</td>
<td>1.6</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
<td>3.4</td>
</tr>
<tr>
<td>15–29</td>
<td>3.3</td>
<td>0.9</td>
<td>1.4</td>
<td>1.4</td>
<td>4.8</td>
<td>2.3</td>
<td>3.6</td>
<td>3.0</td>
<td>6.6</td>
</tr>
<tr>
<td>30–44</td>
<td>4.1</td>
<td>1.7</td>
<td>1.6</td>
<td>1.4</td>
<td>5.7</td>
<td>3.1</td>
<td>4.4</td>
<td>4.1</td>
<td>8.5</td>
</tr>
<tr>
<td>45–59</td>
<td>7.5</td>
<td>4.8</td>
<td>1.6</td>
<td>1.4</td>
<td>9.1</td>
<td>6.2</td>
<td>7.6</td>
<td>6.3</td>
<td>13.9</td>
</tr>
<tr>
<td>60–69</td>
<td>14.1</td>
<td>9.8</td>
<td>1.1</td>
<td>1.1</td>
<td>15.2</td>
<td>10.9</td>
<td>12.9</td>
<td>11.9</td>
<td>24.8</td>
</tr>
<tr>
<td>70–79</td>
<td>24.7</td>
<td>19.5</td>
<td>1.1</td>
<td>0.9</td>
<td>25.8</td>
<td>20.5</td>
<td>22.9</td>
<td>21.8</td>
<td>44.7</td>
</tr>
<tr>
<td>&gt;80</td>
<td>22.7</td>
<td>17.7</td>
<td>1.3</td>
<td>0.8</td>
<td>24</td>
<td>18.5</td>
<td>20.8</td>
<td>19.3</td>
<td>40.1</td>
</tr>
<tr>
<td>Total</td>
<td>4.80</td>
<td>3.06</td>
<td>1.33</td>
<td>1.35</td>
<td>6.12</td>
<td>4.41</td>
<td>5.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Downloaded by: Fudan University Library 61.129.42.30 - 5/3/2015 5:49:43 AM
References