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Short Communication

The burden of hepatitis C infection in a Southern Brazilian State

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Abstract

Introduction: The study aimed to estimate the burden of hepatitis C in Santa Catarina, Brazil. **Methods**: An ecologic study was carried out to estimate the disability-adjusted life years (DALY) by summing the number of years of life lost and the number of years lived with disability. **Results**: A rate of 1,075.9 DALY/100,000 population was estimated, and was similar by sex. The highest burden was between the ages of 45 to 59 years and in the *Grande Oeste* region. **Conclusions**: The burden of hepatitis C was high and concentrated in adult age groups with variations among regions.

Keywords: Epidemiology. Hepatitis C. Impact. Burden of disease.

Hepatitis C is highly infectious and has a high potential for progression to cirrhosis or hepatocellular carcinoma. In most cases, hepatitis C is a chronic and silent disease with an asymptomatic course, which implies an unclear prognosis[1].

Hepatitis C virus (HCV) infection is a growing epidemic worldwide, currently considered as one of the most important public health problems, with high personal, social and economic impact[2]. Estimates of the number of people living with hepatitis C infection in the world vary widely. This is, in part, because some authors estimate the number of people with anti-HCV antibodies, indicating exposure to the virus, while others estimate the number with hepatitis C virus-ribonucleic acid (HCV RNA), which indicates chronic infection[3].

There are 110 million people with anti-HCV antibodies, indicating past or current infection and 80 million with HCV RNA, indicating current or chronic infection[4]. This corresponds to a global prevalence of chronic infection of 1.1%. The prevalence of HCV in Brazil is not known; however, the estimated total prevalence of hepatitis C was estimated at approximately 1,450,000 in 2014[5].

HCV-associated liver disease is the seventh leading cause of years of life lost (YLL) among men, and the twelfth among women. It is the number one indication for liver transplantation and the leading cause of cirrhosis, competing with alcoholic hepatitis as a major cause of chronic liver disease[5].

Some studies have estimated the burden of disease associated with hepatitis C. In Spain, about 76,000 disability-adjusted life years (DALY) were estimated for the year 2006[6]. In Europe, about 1.2 million DALY were attributed to HCV in 2002, which corresponded to a rate of 135.5 DALY per 100,000 population. Rates higher than 155 DALY per 100,000 population were observed in Eastern European countries[7].

Considering the characteristics and severity of the disease, health policies need to be implemented based on data that incorporate not only mortality rates but also disability caused by the disease. Thus, the present study aimed to estimate the burden of hepatitis C in the State of Santa Catarina.

An epidemiological study with ecological design was carried out covering all the nine health macro-regions of the State of Santa Catarina. Mortality data were obtained from the Mortality Information System [*Sistema de Informações sobre Mortalidade* (SIM)] of the Brazilian National Health System [*Sistema Único de Saúde* (SUS)]; [International Classification of Diseases (ICD) code B18.2] for the year 2009.

The number of reported cases of hepatitis C in the Notifiable Diseases Information System [*Sistema de Informação de Agravos de Notificação* (SINAN)] is extremely low in all Brazilian states, given that the clinical characteristics of the disease can lead to underreporting[1].

Due to the lack of specific data on hepatitis C prevalence rate for the State of Santa Catarina, in this study, we used the prevalence rates from the Acute Hepatitis C Study Group of

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the Brazilian Society of Hepatology related to the southern region. A detection rate of 0.65% in a sample of 377,066 people was obtained from that study[8]. Using that rate to estimate the hepatitis C prevalence in Santa Catarina in 2009, the prevalence amounted to 39,772 cases.

However, the above-mentioned study recorded no distribution of hepatitis C cases by gender and age group. Considering the similarity of transmission between hepatitis B and C, we followed the methodology used in the study of the global burden of disease in Brazil[9]. So, we took the distribution of hepatitis B cases by gender and age group in Santa Catarina obtained from the SINAN and use it in the estimated cases of hepatitis C. Using this approach, the estimated cases distributed by sex, age group, and health macro-regions.

For the categorization of estimated cases of hepatitis C according to the clinical condition, the parameters of the study on the burden of viral hepatitis carried out in Spain were used[6]. In that study, 60% of the cases of hepatocellular carcinoma were attributed to hepatitis C. To estimate the number of hepatocellular carcinoma cases in Santa Catarina, the records of population-based cancer incidence in Florianópolis, the capital City, for the year 2008 were used: an incidence of 5.3 cases per 100,000 for women and 9.75 cases per 100,000 for men[10], which totaled 163 and 297 cases, respectively. Considering that 60% of the hepatocellular carcinoma cases were due to HCV, 276 cases were estimated.

Using the parameters of the Spanish study[6] mentioned above, 75% of the remaining cases of hepatitis C were considered as mild or moderate hepatitis, and cirrhosis. Cirrhosis cases were categorized into compensated and decompensated conditions. Twenty percent of the cases of cirrhosis were attributed to decompensated liver disease[6].

The duration of cases used in this study for estimating years lived with disability (YLD) were the same parameters used in the Spanish study[6], as shown in **Table 1**. The weight of hepatitis C was determined by the Burden of Disease Project in Brazil[9] as shown in **Table 1**.

The DALY for a disease or health condition were calculated by summing the YLL due to premature death, and YLD.

The YLL for an individual is given by the difference between the age at death and life expectancy. This study used the same parameters of the Burden of Disease Study in Brazil[9], i.e., 80 years for men and 82.5 for women. A discount rate of 3% per annum was applied for the YLL in the future with the purpose of estimating the YLL in the present. This prevented the excessive weight given to deaths at very young ages. The YLD was calculated on the estimated prevalence of HCV infection in the state, by multiplying the weight of 0.075 and the disease duration (**Table 1**).

This study involved only analysis of secondary data, available in the public domain, maintaining the highest ethical standards in research.

In all, 171 cases of deaths from hepatitis C were identified in 2009, which generated a specific mortality rate of 2.79 deaths/100,000 people. The mortality distribution by gender and age group is shown in **Table 2**. According to the proposed methodology, 39,772 cases of hepatitis C were estimated. They were categorized by clinical condition as shown in **Table 1**.

In all, 65,832.52 DALY attributable to HCV were estimated, which generated a rate of 1,075.92 DALY/100,000 population. The YLL accounted for 4% of DALY or 2,600.43 YLL, and a rate of 42.50 YLL/100,000 population. The YLD accounted for 96% of DALY or 63,232.09 YLD, and a rate of 992.59 YLD per 100,000 population. The highest rates were found among men. Individuals in the 45–59 year age brackets showed the highest burden, with 1,728.52 DALY/100,000 population. Concerning the health regions, the highest rates were found in the *Grande Oeste*, with 3,024.80 DALYs/100,000 population, and *Sul*, with 1,212.22 DALYs/100,000 population (**Table 2**).

This study represents the first effort to estimate, although indirectly, the burden of disease attributed solely to hepatitis C in Brazil, more specifically in the State of Santa Catarina.

Few studies have estimated the burden of hepatitis C in the world. A study conducted in Spain in 2006 showed that hepatitis C was contributing to the increased burden of communicable diseases, which prompted health officials to require more thorough screening of this type of hepatitis, ensuring early diagnosis and wider access to treatment in that country[6]. In addition, it was observed that around 1.2 million DALY attributable to HCV were estimated in Europe in 2002. About 81% of the DALY were attributed to HCV-related cirrhosis[7]. A

TABLE 1: Distribution of hepatitis C cases, and disease weight and duration to calculate the number of the YLD.

Clinical condition	Cases		Weight	Duration (years)
	n	%		
Hepatocellular carcinoma	276	0.7	0.075	1.02
Mild/moderate hepatitis	30,412	76.5	0.075	25
Compensated cirrhosis	7,570	19.0	0.075	10
Decompensated cirrhosis	1,514	3.8	0.075	4.5
Total	**39,772**	**100.0**	**-**	**-**

YLD: years lived with disability.

TABLE 2: Distribution of the YLD, YLL and DALY rates by gender, age group, and health macro-regions of Santa Catarina, 2009.

Variables	YLD			YLL			DALYs		
	n	%	rate	n	%	rate	n	%	rate
Gender									
female	30,667.56	48.5	996.0	500.4	19.2	16.5	31,168.0	47.3	1,012.2
male	32,564.53	51.5	1,071.3	2,100.0	80.8	69.1	34,664.6	52.7	1,140.4
Age groups (years)									
< 1	386.9	0.6	497.7	-	-	-	386.9	0.6	497.7
1–4	663.3	1.0	195.3	-	-	-	663.3	1.0	195.3
5–14	2,128.0	3.4	215.5	29.0	1.1	5.8	2,157.0	3.3	432.0
15–29	15,020.4	23.7	920.3	-	-	-	15,020.4	22.8	1,364.9
30–44	21,528.8	34.0	1,549.5	421.0	16.2	30.5	21,949.8	33.3	1,592.8
45–59	17,106.9	27.0	1,615.3	1,396.0	53.7	130.4	18,502.9	28.1	1,728.5
60–69	4,380.4	6.9	1,211.1	502.3	19.3	138.9	4,882.7	7.4	1,350.0
70–79	1,395.6	2.2	732.6	252.0	9.7	132.3	1,647.7	2.5	864.9
≥ 80	621.8	0.9	764.4	-	-	-	621.8	0.9	764.4
Health macro-regions									
Foz do Rio Itajaí	4,609.7	7.6	899.3	36.5	1.4	7.1	4,646.2	7.3	906.4
Grande Florianópolis	7,871.1	12.9	805.3	965.9	37.1	98.8	8,836.6	13.9	904.1
Grande Oeste	22,003.9	36.2	3,007.3	127.9	4.9	17.5	22,131.8	34.9	3,024.8
Meio Oeste	5,174.5	8.5	871.2	-	-	-	5,174.5	8.2	871.2
Nordeste	6,419.6	10.6	773.4	518.2	19.9	62.4	6,937.7	10.9	835.8
Planalto Norte	103.2	0.2	28.4	-	-	-	103.2	0.2	28.4
Serra Catarinense	261.2	0.4	86.5	-	-	-	261.2	0.4	86.5
Sul	9,887.5	16.3	1,105.7	952.4	36.6	106.5	10,839.9	17.1	1,212.2
Vale do Itajaí	4,403.2	7.2	482.1	-	-	-	4,403.2	6.9	482.1
Total	**63,232.1**	**100.0**	**992.6**	**2,600.4**	**100.0**	**42.5**	**65,832.5**	**100.0**	**1,075.9**

YLD: years lived with disability; **YLL**: years of life lost; **DALY:** disability-adjusted life years.

study conducted in Karachi, Pakistan in 2012 showed a disease burden that ranged from 48 to 81 thousand DALY due to the hepatitis C infection[11]. A recently published study on the Global Burden of Diseases for the year 2010 estimated a 44.4% increase in the burden of hepatitis C compared to the 1990 rates. The same study showed a 92.4% increase in the burden of hepatitis C in the United Kingdom[12].

The high DALY rates found in the *Grande Oeste* of Santa Catarina reflect the endemic situation experienced in that macro-region. However, high rates were also found in the *Sul*. Corroborating this finding, a study of adults in the City of Criciúma/SC (*Sul*) in 2008 showed that the HCV incidence was higher in the city compared with southern Brazil. According to the authors of that study, the HCV incidence might be associated with a greater number of sexual partners than in other regions[13]. Nevertheless, it can be inferred that the greater burden of disease found in these regions can be attributed, at least in part, to the structuring of services with more resources for diagnosis and monitoring, compared with other regions, which facilitated the disease detection and sensitized the healthcare professionals to notify the cases.

Regarding gender, the greatest burden was observed among men. The mortality component showed a much higher rate among men than among women. The disability component was rather balanced between genders.

In Brazil, the rates of hepatitis C differ by gender, men being more likely to become infected than women[5]. A study conducted in the City of Florianópolis/SC in 2008 showed that men were predominantly infected (69.6%) with hepatitis C[14]. A study conducted in the City of Criciúma/SC, aiming to determine the prevalence of HCV among adults in 2008, found a prevalence of 2.2% among men[13].

The burden found in this study may hypothetically be reflecting the risk related to the use of illicit drugs, unprotected

sex, not seeking adequate health care, and the use of improperly sterilized materials[14]. In addition, the State of Santa Catarina shows a high incidence of human immunodeficiency virus infection, which can be derived from the coinfection with HCV[15]. In addition, the fact that the largest number of reports comes from blood banks, coupled with the fact that men account for the most blood donations, may help to explain this phenomenon.

The age group of 45-59 years showed the highest burden of disease, whereas the age group of 60-69 years was the most affected by early death. With regard to disability, the age group of 45-59 years contributed the most. These findings could be explained, in the field of ideas, by the late discovery of the disease. In addition, it is well known that aging brings significant comorbidities, which hinder or delay diagnosis and treatment. Furthermore, the gender- and age-related findings may be associated with the use of illicit drugs, parental neglect prevention, and sexual behavior, despite some public campaigns focused on the use of condoms[1]. The results may also be associated with the use of improperly sterilized sharps or instruments, transfusion of contaminated blood or blood products, and through surgical or dental procedures without appropriate biosafety standards[1].

Considering the characteristics and severity of hepatitis C, studies on the burden of disease gain special relevance by incorporating data on mortality and morbidity into a single indicator. This can subsidize and improve the implementation of public health policies aimed at prevention and early detection. However, the published literature reveals that data on the impact of the disease are scarce, outdated and inconclusive in Europe as well, indicating that hepatitis C is still neglected even in developed countries because it is a relatively new disease regarding diagnostic screening.

The main limitations of this study include the deficiencies of the data available in the official health information systems, which prevented direct estimation of the burden of disease. The hepatitis C notification database has several weaknesses that require prudent analysis. Thus, morbidity data made available here have the limitation of being estimated, given that the mandatory notification records are still precarious. However, this study presents a significant contribution to knowledge about the impact of hepatitis C on the population of the State of Santa Catarina.

It can be concluded that there is a high HCV-related burden of disease in Santa Catarina. This burden is concentrated among adults and shows variations across the health macro-regions of the state.

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Conflicts of interest

The authors declare that there is no conflicts of interest.

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Erratum

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