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RESEARCH

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ANALYSIS OF SPACE AND EPIDEMIOLOGICAL DISTRIBUTION OF HEPATITIS B AND C CASES IN MUNICIPALY MARANHÃO

Análise da distribuição espacial e epidemiológica dos casos de hepatite B e C em município maranhense

Análisis del espacio y distribución epidemiológica de los casos de hepatitis B y C en el municipio de maranhense

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ABSTRACT

Objective: analyze spatial and epidemiological distribution of reported cases of hepatitis B and C, from 2012 to 2016 in the municipality of Caxias, Maranhão. **Methods:** cross-sectional, retrospective, descriptive and analytical study, applying geoprocessing techniques of the region. Secondary data from viral hepatitis reporting forms were used with positive serology for Hepatitis B, Hepatitis C and Hepatitis B/Hepatitis C. **Results:** people of race/color brown, aged 15 to 29 years, not vaccinated, pregnant women and those undergoing invasive treatment are more likely to have positive serological markers for hepatitis. The spatial analysis showed that the northern region concentrates the largest number of cases. **Conclusion:** the northern region, being classified as a low infrastructure area and relatively poorer than the others, favors the establishment of these diseases in the population. Spatial analysis can assist services in consistent planning for hepatitis control and prevention. **DESCRIPTORS:** Spatial analysis; Epidemiological monitoring; Hepatitis, viral, human; Public health; Social determinants of health.

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RESUMO

Objetivo: analisar a distribuição espacial e epidemiológica dos casos notificados de hepatite B e C, de 2012 a 2016 no município de Caxias, Maranhão. **Métodos:** estudo transversal, retrospectivo, descritivo e analítico, aplicando-se técnicas de geoprocessamento da região. Utilizaram-se dados secundários das fichas de notificação de hepatites virais com sorologia positiva para Hepatite B, Hepatite C e Hepatite B/Hepatite C. **Resultados:** pessoas da raça/cor parda, entre 15 a 29 anos, não vacinados, as gestantes e os submetidos a tratamentos invasivos tem maiores chances de apresentar marcadores sorológicos positivos para hepatites. A análise espacial evidenciou que a região norte concentra o maior número de casos. **Conclusão:** a região norte por ser classificada como área de baixa infraestrutura e relativamente mais pobre que as outras favorece o estabelecimento dessas doenças na população. A análise espacial pode auxiliar os serviços no planejamento consistente para o controle e prevenção das hepatites.

DESCRITORES: Análise espacial; Monitoramento epidemiológico; Hepatites virais humanas; Saúde pública; Determinantes sociais da saúde.

RESUMEN

Objetivo: analizar la distribución espacial y epidemiológica de los casos notificados de hepatitis B y C, período de 2012 a 2016, de 2012 a 2016 en el municipio de Caxias, Maranhão. **Métodos:** estudio transversal, retrospectivo, descriptivo y analítico, aplicando técnicas de geoprocesamiento de la región. Se utilizaron datos secundarios de los formularios de notificación de hepatitis viral con serología positiva para Hepatitis B, Hepatitis C y Hepatitis B/Hepatitis C. **Resultados:** las personas de raza/color mixta, de 15 a 29 años, no vacunadas, las mujeres embarazadas y las que se someten a un tratamiento invasivo tienen más probabilidades de tener marcadores serológicos positivos para la hepatitis. El análisis espacial mostró que la región norte concentra el mayor número de casos. **Conclusión:** la región norte, clasificada como un área de baja infraestructura y relativamente más pobre que las demás, favorece el establecimiento de estas enfermedades en la población. El análisis espacial puede ayudar a los servicios en la planificación coherente para el control y la prevención de la hepatitis.

DESCRIPTORES: Análisis espacial; Monitoreo epidemiológico; Hepatitis viral humana; Salud pública; Determinantes sociales de la saúde.

INTRODUCTION

Viral hepatitis is caused by different etiological agents and have tropism for the liver tissue, presenting diversified clinical pictures and own transmission mechanisms, being the types B and C parenteral, especially sexual.[1-12]

Currently, hepatitis is a serious public health challenge worldwide, highlighting the types B and C for presenting a tendency to increase incidence.[2] According to the 2019 epidemiological bulletin of viral hepatitis, in recent decades Brazil has notified more than 632,814 confirmed cases of hepatitis and of these, a total of 233,027 (36.8%) were type B (HBV) and 228,695 (36.1%) type C (HCV).[2-3]

Since the Alma-Ata (1978) and Otawa (1986) conferences, it has become clear that there is a relationship between social determinants and population health, while researchers have been reinforcing the idea of a strong relationship between these determinants and sexually transmitted infections (STIs) due to changes in the socioepidemiological profile and failures in prevention strategies for these diseases.[4-5]

However, there are still difficulties in establishing a direct cause-and-effect relationship between these determinants and the socio-political and economic factors that affect people's health.[6]

To circumvent this problem, the spatial analysis of diseases has been used, because this method allows the evaluation of the places of greatest epidemiological pressure, helping to understand the factors that contribute to the situation.[7-8] The objective is not to investigate the disease in individuals, but to answer the causes of disease incidence by comparing different contexts in order to understand how a social determinant affects the health of a population group.[8]

From this perspective, this study was designed to analyze the spatial and epidemiological distribution of reported cases of hepatitis B and C from 2012 to 2016 in the municipality of Caxias, Maranhão, so that it can offer professionals and managers the vision of how the use of new technologies during health planning can assist in decisions consistent with the population needs of regions with higher prevalence for these diseases.

METHODS

This is a cross-sectional, descriptive, retrospective and analytical study through a quantitative approach. Secondary data were observed through the evaluation of the viral hepatitis notification forms of the Sistema de Informação de Agravos de Notificação (SINAN) obtained by the Epidemiological Surveillance of Caxias, Maranhão corresponding to the years 2012 to 2016 with positive serology for HBV, HCV and HBV/HCV.

The total sample included 381 notification forms evaluated, of this total, 52 forms presented positive serology for the desired markers - 38 for hepatitis B and 14 for hepatitis C. The inclusion criterion was all cases reported in SINAN from 2012 to 2016, residents of the city of Caxias, and the exclusion criterion was all cases reported outside the years 2012 to 2016.

After reviewing the files, the data obtained were entered into a specific database generated in Epi-Info 3.5.3™ version 2011. When pertinent, the Chi-Square, Chi-Square Trend, or Fisher's Exact Test were used to compare proportions.

The statistical significance level of 5% ($p<0.05$) was considered for all tests. The Statistical Package for the Social Science®, version 21, and Microsoft Office Excel 2010® programs were used to perform the analysis and tabulation of data. For map creation and spatial analysis the Qgis 2.14 Essen® and TerraView® programs were used.

The study followed the recommendations of Ordinance No. 466/2012 and was approved by the Research Ethics Committee according to opinion No. 2.010.956, of 11/04/2017.

RESULTS

In those years, 381 viral hepatitis investigations were performed. Of these, 38 were confirmed positive for hepatitis B and 14 for hepatitis C. It was possible to extract information regarding socio-demographic and clinical characteristics,

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exposure factors, and epidemiological characteristics from the investigated files.

In table 1, regarding sociodemographic and clinical characteristics, it was observed that brown people were 5.67 times more likely to present the Anti-HCV marker than white and black people.

Table 1 - Frequency, percentage distribution of the number of hepatitis C cases, considering serological markers, and risk factors, according to sociodemographic characteristics in the period from 2012 to 2016. Caxias, MA, Brazil, 2018

Sociodemographic and Clinical Characteristics	Hepatitis C (Anti-HCV and/or Anti-HCV-RNA)			
	reagent/ total	%[a]	p-value	OR (CI95%)
Raça/CorRace/ Color			0,048[e]	
Brown	5/168	41,7		5,67

a. Proportion in relation to total exams performed
e. Chi-square test. Statistically significant values (p<0.05)
OR= Odds Ratio
CI= Confidence Interval

In Table 2, people aged 30 to 39 years and 50 to 59 years were less likely to have Total Anti-HBc antigen; people who did not receive hepatitis B vaccine were more likely to have Total Anti-HBc antigen than people who did get vaccinated; pregnant women were 7.67 times more likely to have Total Anti-HBc marker than non-pregnant women, and also pregnant women were 5.67 times more likely to have HBsAg marker than non-pregnant women.

Table 2 - Frequency, percentage distribution of the number of hepatitis B cases, considering serological markers, and risk factors, according to sociodemographic characteristics in the period from 2012 to 2016. Caxias, MA, Brazil, 2018

Sociodemographic and Clinical Characteristics	Hepatitis B (Anti-HBc Total)			
	reagent/ total	%[a]	p-value	OR (CI95%)
Age Groups			0,010[c]	
30 to 39	32/37	32,7		0,27
50 to 59	15/16	15,3		0,12
Vaccine Status			0,002[e]	
Yes	24/43	25,8		0,28
No	69/84	74,2		1
Pregnant			0,005[e]	
Yes	21/23	44,7		7,67
No	26/45	55,3		1
Features Sociodemographic and Clinical	**Hepatitis B (HBsAg)**			
Pregnant			0,013[d]	
Yes	6/29	60,0		5,67
No	4/91	40,0		1

a. Proportion in relation to total exams performed
c. Chi-Square Test for Trend. Statistically significant values (p<0.05)
d. Fisher's Exact Test. Statistically significant values (p<0.05)
e. Chi-square test. Statistically significant values (p<0,05)
OR= Odds Ratio
CI= Confidence Interval

In Table 3, regarding exposure factors, people who had surgical/dental treatment were 3.5 times more likely to have chronic hepatitis B infection.

Table 3 - Frequency, percentage distribution of the number of hepatitis B cases, considering serological markers, and risk factors, according to exposure in the period from 2012 to 2016. Caxias, MA, Brazil, 2018

Exposure Factors	Hepatitis B (Reactive for Anti-HBc IgG and non-reactive for Anti-HBc IgM)			
	reagent/ total	%[a]	p-value	OR (CI95%)
Surgical/ odontological treatment	9/27	64,3	0,040[d]	3,50

a. Ignored cases were excluded from the analysis
d. Chi-square test. Statistically significant values (p<0.05)
OR= Odds Ratio
CI= Confidence Interval

In Table 4, the percentage frequency of the number of hepatitis B and C cases according to epidemiological characteristics in the years 2012 to 2016 can be seen.

Table 4 - Frequency and percentage distribution of the number of cases of hepatitis B and C, according to epidemiological characteristics in the period from 2012 to 2016. Caxias, MA, Brazil, 2018

Epidemiological characteristics	Hepatitis B n=38 %		Hepatitis C n=14 %	
Probable source of infection				
Surgical/ odontological treatment	3	7,9	4	28,6
Sexual	5	13,2	2	14,3
Ignored	26	68,4	6	42,9
Clinical form				
Acute	4	10,5	1	7,1
Chronic/ asymptomatic Carrier	19	50,0	11	78,6
Ignored	15	39,5	2	14,3
Final standings				
Sorologic scar	12	31,6		
Laboratory confirmation	23	60,5	12	85,7
Clinical-epidemiological				
Discarded	3	7,9	1	7,1
Inconclusive				
Ignored			1	7,1

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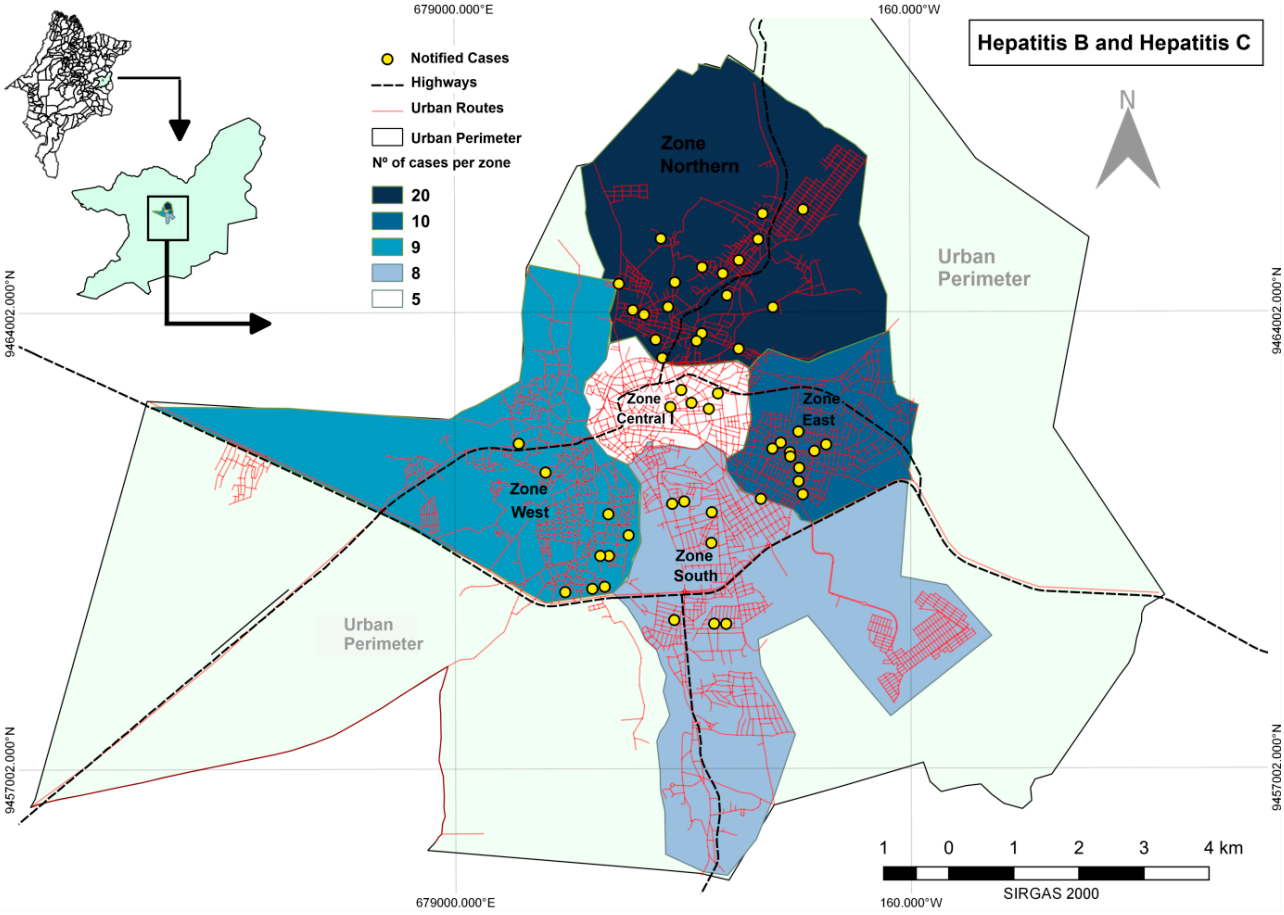
Etiologic classification				
Hepatitis B	23	60,5		
Hepatitis C			12	85,7
Ignored	15	39,5	2	14,3

Source: Research data.

Among the variables, there is a high number of items in the forms that were ignored and/or left blank during the epidemiological investigation.

Figure 1 shows the spatial distribution of hepatitis in the city. The northern neighborhoods, such as Antenor Viana, Cohab, Salobro and São Pedro had the highest concentration of hepatitis B and/or C cases in relation to the others, 20 cases (38.5%). Of these, the highest proportion for hepatitis B is in the Antenor Viana neighborhood, five cases (13.2%) and for Hepatitis C Cohab neighborhood, three cases (21.4%).

Figure 1 - Spatial distribution of reported cases of hepatitis B and C in the period from 2012 to 2016, in the urban area. Caxias, MA, Brazil, 2018



Source: Research data.

DISCUSSION

The present study allowed us to know the characteristics of the epidemiological, clinical, sociodemographic profile and the spatial distribution of hepatitis B and C cases. Table 1 shows that people of mixed race/color have a 5.67 times greater chance of presenting the serological marker for hepatitis C. Not many studies do this type of investigation, but this result is attributed to the Brazilian sociodemographic differences.

Hepatitis B and C are more concentrated in the southern and southeastern regions, making their predominance in the white race; however, in more focused studies, especially those in the north and northeast, a higher number of cases can be observed in the brown and/or black race, which prevail in these regions.[3, 13-15]

As for the age group, it is observed that people aged 30 to 39 years and 50 to 59 years had lower chances of presenting the Total Anti-HBc antigen. It is thus implied that people in the age group of 15 to 29 years have higher chances of presenting the Total Anti-HBc antigen.

However, other studies identify the Total Anti-HBc antigen more present in age groups from 30 to 39 years, contradicting the findings of this study.[15-16] This phenomenon is explained by the fact that the hepatitis B vaccine was introduced in the vaccination schedule only after 1998, making the age profile important in the investigation of cases with positive markers.[15]

As for the presence of the Total Anti-HBc antigen and hepatitis B vaccination, it was observed that people who did not receive hepatitis B vaccination had a higher chance

of presenting the antigen than those who were vaccinated, Table 2. It is known that besides the use of condoms and not sharing syringes and other perforating objects, vaccination is the most efficient and safest way to prevent hepatitis B.[17]

Pregnant women were more likely to have positive markers for HBV (HBsAg and Total Anti-HBc). The rate of HBV infection in women in Brazil is high, the sex ratio is almost 1:1, making the infection in pregnant women high - prevalence of 11.1% (23,563 cases).[3] Therefore, the vaccination of pregnant women against HBV is indicated since the first prenatal visit and/or at any stage of it, since vertical transmission is still a Brazilian reality, even though the introduction of the vaccine has helped to prevent this disease.[18]

Individuals undergoing surgical/dental treatment were 3.5 times more likely to present serological marker for HBV (Anti-HBc IgG) (table 3). In the last 10 years the number of confirmed cases of hepatitis B and C in Brazil has increased for people who were exposed to surgical and/or dental treatments.[3] It is known that the best known means of transmission of HBV is the sexual route; however, performing dental or surgical procedures without proper sterilization of the equipment also represents a route of transmission.[18]

The results of this study corroborate with national data and focal studies regarding the probable source of infection, the clinical form of the disease, and final classification (table 4).[9, 14, 19] However, it is important to highlight the large proportion of ignored or blank data present in the notification forms.

Therefore, it is advisable to routinely evaluate these parameters to ensure the excellence of essential information.[20-21] The importance of properly filling out the notification forms is due to the fact that the information collected serves to monitor spatial and temporal monitoring and guide the planning of prevention and control of diseases.[22] The non-completion of information in the notification form and its updating compromises the surveillance of health services and makes it impossible to objectively analyze the health situation.[23]

With regard to spatial analysis, geoprocessing provides a good overview of the social determinants of the health-disease process, contributing to the identification of "hot areas" where there is greater density of cases and, therefore, greater need for interventionThe present study allowed us to know the characteristics of the epidemiological, clinical, sociodemographic profile and the spatial distribution of hepatitis B and C cases. Table 1 shows that people of mixed race/color have a 5.67 times greater chance of presenting the serological marker for hepatitis C. Not many studies do this type of investigation, but this result is attributed to the Brazilian sociodemographic differences.

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With regard to spatial analysis, geoprocessing provides a good overview of the social determinants of the health-disease process, contributing to the identification of "hot areas" where there is greater density of cases and, therefore, greater need for intervention.[6]

A higher concentration of cases is observed in the northern zone, which is considered to have a low socioeconomic level. It is known that social inequalities are determining and conditioning

factors of population health by influencing, affecting and/or determining the health of people and citizens.[24-25]

Studies explain that low socioeconomic conditions, restricted access to health and education services make health education interventions difficult, reducing self-care patterns, increasing risk behaviors, and vulnerability to STIs.[25-26]

Therefore, in addition to specific control measures for these viral hepatitis, it is necessary to improve these health determinants with health education actions and provision of resources for care services in order to have a greater impact on them.[26]

Countries with good indicators of their health determinants when compared to countries with the opposite reality reveal that restricted access to health services and education reduces knowledge of hepatitis infection behavior and, therefore, its control and prevention.[27]

It is imperative that these determinants be improved and should receive top priority as economic, environmental, and lifestyle factors are intertwined with problems related to access and health care.[28]

Although the use of geoprocessing is still incipient in the analysis of health indicators, its use expands the knowledge of health determinants, adding an important gain to the instruments and indicators already used in epidemiological studies, health policies, and actions focused on regions of greater distribution of cases.[7, 29]

It is worth mentioning here that: since the database is based on the notification forms of viral hepatitis from SINAN, the large amount of ignored or blank information, and the incompleteness of the information (many of them essential) made data analysis difficult, weakening the methodological and statistical rigor.

CONCLUSION

The spatial analysis of reported cases of HBV and HCV in Caxias showed a high concentration of cases in the neighborhoods Antenor Viana and Cohab, located in the northern part of the city and considered neighborhoods of low socioeconomic status, warning that the health determinants of this region may be weakened and related to the establishment of these diseases in the populations.

As for the epidemiological analysis, there were greater chances of presenting positive serological markers in individuals of mixed race/race, those aged 15 to 29 years, unvaccinated individuals, pregnant women, and those who underwent dental and/or surgical procedures. Future research with data from subsequent years is needed to strengthen the accuracy of this information.

Although the large number of forms with ignored and/or blank data was a limiting factor in this study, the spatial analysis contributed significantly to generate useful information about the behavior of the disease, as well as to support local surveillance, professionals and managers in consistent planning for the control and prevention of hepatitis.

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