

ORIGINAL ARTICLE

TREND OF VIRAL HEPATITIS CASES NOTIFIED IN THE STATE OF MATO GROSSO – BRAZIL

HIGHLIGHTS

1. Mato Grosso presented an increasing trend for Hepatitis C.
2. Hepatitis B had the highest notification and prevalence rates in the period.
3. The decreasing hepatitis trend is an evaluative parameter.
4. Measures to combat viral hepatitis should be intensified.

Débora Aparecida da Silva Santos¹ 
Jayne Soares de Oliveira¹ 
Vitória Carolina Ferreira Benevenuto¹ 
Letícia Silveira Goulart¹ 
Ricardo Alves de Olinda² 

ABSTRACT

Objective: to analyze the time trends of viral hepatitis cases notified from 2010 to 2019 in Mato Grosso - BR. **Method:** an epidemiological study of the ecological type, with data collection in the Notifiable Diseases Information System. For the analysis of the time trend, a logarithmic transformation of the coefficients and the Prais-Winsten procedure for generalized linear regression analysis were performed. **Results:** 9,043 viral hepatitis cases were recorded: Hepatitis A (13.62%), Hepatitis B (67.19%), Hepatitis C (18.07%) and Hepatitis D (0.49%), with no Hepatitis E records. The prevalence of cases notified was higher in 2014 (12.36%) and lower in 2018 (8.16%). Hepatitis C (95% CI: 2.5; 3.4) was the only one with an increasing trend, while Hepatitis A (95% CI: -4.8; -4.6), Hepatitis B (95% CI: -0.9; -1.2) and Hepatitis D (95% CI: -0.2; -3.9) presented a decreasing trend. **Conclusion:** in view of their trends and incidence, it is concluded that it is indispensable to continue and improve coping actions to eradicate these diseases in the state.

DESCRIPTORS: Human viral hepatitis; Epidemiology; Public health; Hepatitis B; Hepatitis C.

HOW TO REFERENCE THIS ARTICLE:

Santos DAS, Oliveira JS de, Benevenuto VCF, Goulart LS, Olinda RA de. Trend of viral hepatitis cases notified in the state of Mato Grosso – Brazil. *Cogitare Enferm.* [Internet]. 2023 [cited in “insert year, month, day”]; 28. Available from: <https://dx.doi.org/10.1590/ce.v28i0.91125>.

¹Universidade Federal de Rondonópolis, Curso de Enfermagem, Rondonópolis, Mato Grosso, Brasil.

²Universidade Estadual da Paraíba, Campina Grande, Paraíba, Brasil.

INTRODUCTION

The types of viral hepatitis are diseases caused by different etiological agents, which affect proper functioning of the liver; they are classified as health problems of compulsory notification, having global reach and relevance. Such problems are characterized into types A, B, C, D and E according to their peculiarities. The presentations of each type vary from asymptomatic manifestations to severe acute liver failure, acute and/or chronic clinical forms¹.

Viral hepatitis prevention and control is through the vaccine against the Hepatitis A and B viruses, highly efficient and guaranteed in children's immunization schedule. In addition to vaccination, proper hand hygiene is recommended after performing physiological needs and before handling food, washing food before consumption, drinking filtered or boiled water, and avoiding fecal-oral transmission²⁻³.

As for transmissions through body fluids, it is advisable to safely screen blood for transfusions and proper hygiene before and after sexual practices, ensuring safe relationships with the use of barriers (condoms) that reduce contact with contaminated fluids, safe and proper use and disposal of sharps and waste, as well as proper sterilization of tools in health services, offices, manicurist and tattoo parlors; in addition to wide awareness of the population and professionals about transmission and prevention of these infections²⁻³.

According to the World Health Organization (WHO), viral hepatitis is an international public health challenge, comparable to other communicable diseases such as the Human Immunodeficiency Virus, tuberculosis and malaria³. It is estimated that, in the world in 2019, there were approximately 296 million people living with chronic infection by the Hepatitis B Virus (HBV) and 58 million by the Hepatitis C Virus (HCV), in addition to triggering nearly 1.5 million new infections by these two etiological types, reaching three million new cases in 2019⁴.

In Brazil, the prevalence and distribution of the different types of viral hepatitis show considerable disparity between the regions of the country¹. According to the 2020 Viral Hepatitis Epidemiological Bulletin, in Brazil and from 1999 to 2019, 673,389 viral hepatitis confirmed cases were recorded in the Notifiable Diseases Information System (*Sistema de Informação de Agravos de Notificação*, SINAN), of which 168,036 (25%) were infections by Hepatitis A, 247,890 (36.8%) by Hepatitis B, 253,307 (37.6%) by Hepatitis C and 4,156 (0.6%) by Hepatitis D. Among the Brazilian regions, the Northeast region concentrates the highest proportion of infections by the A type virus (30.1%), in the Southeast region, infections by the B (34.5%) and C (59.3%) types, and 74.4% of the total Hepatitis D cases predominate in the North region⁵.

In the Midwest and between 1999 and 2019, 18,693 Hepatitis A, 22,330 Hepatitis B, 8,883 Hepatitis C and 140 Hepatitis D cases were recorded in the SINAN, with no data related to Hepatitis E. In the state of Mato Grosso and in the same period, Hepatitis A infected 3,878 people, Hepatitis B affected 8,751 individuals, Hepatitis C 1,875 and 60 people had Hepatitis D⁵.

In some Brazilian states and municipalities, the trend in the incidence of viral hepatitis was addressed, pointing out the relevance of such data in devising measures to face these problems. The scarcity of studies addressing the issue in the state of Mato Grosso is noted, turning this research into an indispensable document to analyze the viral hepatitis trend and the adoption of more effective control actions by the epidemiological surveillance services and Primary Care interprofessional health team in the municipalities.

Thus, the objective of this study is to analyze the time trends of viral hepatitis cases notified from 2010 to 2019 in Mato Grosso - BR.

METHOD

An epidemiological study of the ecological type with a quantitative and descriptive approach. The study covers the data collected in the state of Mato Grosso (MT), from January 2010 to December 2019.

The study universe consists of all viral hepatitis cases in the state of Mato Grosso (MT) and its municipalities, whose notifications comprised the Notifiable Diseases Notification System (SINAN), from 2010 to 2019. These data are from a secondary source and are available at the Informatics Department of the Unified Health System (DATASUS), with public and free access. Selection of this historical series is justified by the fact that it is necessary for robust statistics, with a delimited ten-year period.

The instrument used in data collection was a form prepared from data from the Hepatitis notification and investigation form on the SINAN, standardized by the Ministry of Health and which has sociodemographic and clinical information that must be filled-in by health professionals from the health units that diagnose and confirm viral hepatitis cases.

All the viral hepatitis cases recorded in the state of Mato Grosso (MT) during the study period were included. As this is a disease of compulsory notification, cases that were not filled in correctly, unknown and/or blank were excluded.

Initially, the data from the SINAN database, with storage in *Excel*, were exported to the *Tabwin* software. Subsequently, the database was debugged and the variables were categorized. Descriptive analysis was performed using the R software⁶, with variables being selected according to records of annual cases under study.

Regarding the characterization of the time trends, a logarithmic transformation of the coefficients was carried out, as it favors a reduction in heterogeneity of the variance of the linear regression analysis residuals, that is, of the values of the difference between the mean line points and the time series points. To estimate the regression coefficients with first-order time autocorrelation correction, the Prais-Winsten procedure was used for generalized linear regression analysis.

It was possible to calculate the Annual Percent Change (APC) and confidence interval (95% CI) using the following formulas: $APC = -1 + 10^b$ and $95\% \text{ CI of this rate} = -1 + 10^{(b \pm t * SE)}$, where "t" is the tabulated value of *Student's t* distribution. When the rate was positive, the time series was considered increasing; when negative, it was considered decreasing; and, if there was no significant difference between its value and zero, it would be considered stationary.

This research presents minimal risks because it is a study with diverse information from records of databases available in the public domain. This research is part of the project called "Viral Hepatitis: An epidemiological study in the state of Mato Grosso", and was approved by the Research Ethics Committee of the Federal University of Mato Grosso, Rondonópolis University Campus, with opinion No. 3,613,618, in agreement with Resolution No. 466/2012⁷.

RESULTS

Based on the data collected from the SINAN, the state of Mato Grosso recorded 9,043 viral hepatitis confirmed cases from 2010 to 2019. These cases were divided into 1,232 Hepatitis A (13.62%), 6,076 Hepatitis B (67.19%), 1,691 Hepatitis C (18.7%) and 44 Hepatitis D (0.49%) cases, without, however, presenting recorded notifications for Hepatitis E. Of the total number of viral hepatitis cases, there was prevalence in 2014 (12.36%) and

fewer notifications in 2018 (8.16%) (Table 1).

Table 1 - Viral hepatitis confirmed cases in Mato Grosso between 2010 and 2019, by etiological classification. Mato Grosso, Brazil, 2021

Years	Hepatitis A		Hepatitis B		Hepatitis C		Hepatitis D		Total
	N	%	N	%	N	%	N	%	N
2010	142	11.52	586	9.65	62	3.67	6	13.64	796
2011	231	18.75	694	11.42	129	7.63	7	15.91	1,061
2012	92	7.47	678	11.16	131	7.75	6	13.64	907
2013	153	12.42	683	11.24	117	6.92	9	20.45	962
2014	333	27.03	671	11.04	113	6.68	1	2.27	1,118
2015	164	13.31	631	10.39	245	14.49	1	2.27	1,041
2016	43	3.49	571	9.4	218	12.89	4	9.09	836
2017	24	1.95	555	9.13	242	14.31	4	9.09	825
2018	34	2.76	497	8.18	204	12.06	3	6.82	738
2019	16	1.3	510	8.39	230	13.6	3	6.82	759
Total	1,232	100	6076	100	1691	100	44	100	9,043

Source: Notifiable Diseases Information System (SINAN) (2021)

Among the five types of Hepatitis, the Type B etiological classification was the most notified in the state of Mato Grosso ($n=6,076$; 67.19%), with the highest incidence rate in 2011 (22.6 cases/inhabitants) and the lowest rate in 2018 (8.18 cases/inhabitants). Hepatitis D had the lowest detection rate over the years ($n=44$; 0.49%), with the highest incidence rate in 2013 (0.3 cases/inhabitants) and the lowest rate, equally, in 2014 and 2015 (0.03 cases/inhabitants) (Table 2).

Table 2 - Incidence rate of viral hepatitis in Mato Grosso between 2010 and 2019, by etiological classification. Mato Grosso, Brazil, 2021

Etiological classification	Hepatitis A	Hepatitis B	Hepatitis C	Hepatitis D
Years	Incidence rate	Incidence rate	Incidence rate	Incidence rate
2010	4.7	19.3	2	0.2
2011	7.5	22.6	4.2	0.23
2012	3	21.8	4.2	0.2
2013	4.8	21.5	3.7	0.3
2014	10.3	20.8	3.5	0.03

2015	5	19.3	7.5	0.03
2016	1.3	17.3	6.6	0.13
2017	0.7	16.6	7.2	0.13
2018	1	14.4	5.9	0.1
2019	0.5	14.8	6.7	0.1

Source: Notifiable Diseases Information System (SINAN) (2021).

Table 3 presents the data referring to the viral hepatitis A, B, C and D trends between 2010 and 2019 in Mato Grosso. It was possible to observe that only Hepatitis C presents an increasing trend over the years.

Table 3 - Trend and Annual Percent Change (APC) in the viral hepatitis detection rate between 2010 and 2019 in Mato Grosso. Mato Grosso, Brazil, 2021

Variable	Mean detection rate	APC (%)	95% CI	Trend
Hepatitis A	3.88	-4.7	[-4.8; -4.6]	Decreasing
Hepatitis B	18.84	-1.1	[-0.9; -1.2]	Decreasing
Hepatitis C	5.15	2.9	[2.5; 3.4]	Increasing
Hepatitis D	0.14	-2.8	[-0.2; -3.9]	Decreasing

Source: The authors (2021).

DISCUSSION

In this research and over 10 years of study, the state of Mato Grosso had a mean of 904.3 viral hepatitis confirmed notifications per year, with predominance of cases in 2014 (12.36%) and Hepatitis B (67.19%). A fact that is similar to what happened in Brazil between 2014 to 2018, in which all viral hepatitis cases totaled 216,397 notifications, with the highest percentage in 2014 (22%) and the lowest in 2018 (18%)⁸.

One study, in the state of Minas Gerais, covered all hepatitis cases (23,821) notified from 2005 to 2014, showing a relevant reduction from 3,724 cases in the first year evaluated to 1,666 in the last year⁹. This decrease in the number of notifications over the years was observed in this study.

In the state of Ceará, the viral hepatitis cases from 2010 to 2015 (n=3,228) varied greatly over the years, with the lowest prevalence in 2011 (n=380) and the highest in 2013 (n=749), with a reduction from then on (2015; n=473)¹⁰. When compared to other states analyzed in a study, such as Minas Gerais, the state of Mato Grosso has a low notification rate; unlike Ceará.

This is a low notification rate, which can be explained by the possible underreporting of undiagnosed cases in the state or by the effectiveness of health service actions with regard to the prevention of viral hepatitis, requiring a critical perspective on the part of health managers and professionals towards the data and the actions taken, so that undiagnosed asymptomatic cases are not neglected, with consequent persistence of the

transmission chain.

In the state of Tocantins, the study by Gomes et al. (2020) showed a significant reduction in the incidence rate of Hepatitis A in 2001, from 21.3 cases per 100,000 inhabitants to 0.6 cases in 2018; subtly, in relation to Hepatitis B, there was also a reduction from 12.2 to 7.3 cases, while Hepatitis C had an increase from 1.8 to 2.6 cases, when compared to the same period¹¹. As in Tocantins, in the state of Mato Grosso, there was a periodic decrease in the incidence rate of viral hepatitis A, B and D (Table 2), with a significant increase in the incidence of Hepatitis C, from 2 to 6.7 cases, in 2010 and 2019, respectively.

Another study, covering the state of Minas Gerais, obtained a total of 14,308 viral hepatitis cases, comprised from 2010 to 2017, in which Hepatitis C accounted for the involvement of most of the population under study (7,105 cases in the period; 50% of the total), followed by Hepatitis B (5,621; 39%) and, finally, Hepatitis A (1,582; 11%)¹².

In the period from 2001 to 2013, the B and C etiological classifications in Bahia were reported as follows: 51.3% Hepatitis C and 26.7% Hepatitis B. An increase was observed for both types of hepatitis, with 19.08% and 25.14% respectively¹³. On the other hand, in this research there was prevalence of Hepatitis B (67.19%), followed by Hepatitis C (18.7%), However, viral Type C shows an increasing trend (APC: 2.9%) that distinguishes it from Hepatitis B, which is decreasing (APC: -1.1%).

In the state of Santa Catarina, two different trends for Hepatitis B over an eight-year period stood out; the first trend, between 2002 and 2006, presented a significant increase of 5.9% per year (95% CI: 3.6; 8.3) and the second, from 2006 to 2009, presented a decrease of 6.4% per year (95% CI: -9.7; -3.1)¹⁴. Such findings differ from the current study, given that Hepatitis B comprises only a 1.1% decreasing trend over the years (95% CI: -0.9; -1.2).

The finding of this progressive evolution (APC: 2.9%) referring to Hepatitis C in MT is also perceived in the state of Sergipe, with a general increasing trend of Hepatitis C cases in the period from 2007 to 2015 (APC: 15.08%)¹⁵.

Between 2001 and 2013 there was a difference between the trends in Hepatitis B and C in the state of Acre, both in the capital city and in the inland municipalities. There was a constant increase in Hepatitis B in the Rio Branco capital city and, consequently, in the trend in Acre as a whole. As for Hepatitis C, there was a constant increase in the inland cities, but no upward trend was found in the incidence of cases in the capital or in the state as a whole¹⁶.

In Mato Grosso, an inversion is seen with regard to the aforementioned trends, as Hepatitis B has a decreasing trend and Hepatitis C presents an increasing trend. Such data show the versatility regarding the paradigm of viral hepatitis incidence in the different Brazilian regions and show progress in achieving the WHO targets by 2030. The existence of vaccines against Hepatitis A and B, as well as of antiviral medications that prevent Hepatitis B transmission and promote cure in up to 95% of the Hepatitis C cases are the efficient means that should be reinforced for prevention and treatment in health services¹⁷.

Vaccination coverage against Hepatitis A in the state of MT from 2014 to 2018 varied from 58.67% (2014) to 99.49% (2015), making it possible to correlate the efforts achieved annually from 2015 to 2018 with a vaccination coverage target $\geq 70\%$ of the expected population against Hepatitis A, which may have been a determining factor in reducing the incidence rate of Hepatitis A cases in the state from 2015¹⁸.

Regarding vaccination coverage against Hepatitis B in the period from 2015 to 2020 in Mato Grosso, it was heterogeneous across years, varying from 100% (2015) to 73.8% (2020), with a considerable reduction over the period, not reaching from 2016 the immunization coverage target of 95% of children up to 30 days of life¹⁹. However, even with the reduction in vaccination coverage, the incidence rate of Hepatitis B cases in the state continued to fall over the years, information that can be explained by the change in

the information system of the National Immunization Program in 2014, which may have reduced the number of notifications of the doses applied due to the difficulty feeding this system¹⁸, considering that the vaccination recommended in the calendar of the population over 30 days of life is also effective in protecting against the disease.

The World Health Organization claims that nearly 80% of the people infected with the Hepatitis B or C virus in the world remain undiagnosed, or lack access to affordable treatments; therefore, it is highly important to increase the number of diagnostic actions for these infections and effectively monitor the treatment of these users in order to achieve the proposed targets, which is diagnosing 90% of those infected worldwide and for 80% of those diagnosed to be undergoing treatment by 2030¹⁷.

In this way, it is important to consider the possibility of underreporting of cases, due to lack of proper filling-in of the viral hepatitis investigation and notification forms; as some data in the SINAN may be underestimated. A number of studies conducted in Teresina-PI and in the state of Pernambuco found low adherence to filling in the "Transmission means/ Source of infection" and other fields in the hepatitis notifications in the states evaluated, presenting a limitation to reliability of the data assessed, as they are unknown or left blank when filling-in the notification, making it difficult to accurately inform the epidemiological reality of the cases, assuming that there is underreporting²⁰⁻²¹.

It is indispensable that the diagnosed cases are accurately evaluated for the notification is consistent and reliable for good quality health information and truthful to the reality of the municipalities and states, so that the coping, prevention and control measures are coherent and assertive to the epidemiological profile of infections in the region, enabling the diagnosis of asymptomatic chronic cases that may be a transmission source. The need to train health professionals regarding the importance of investigating cases and adequately filling-in the compulsory notification is therefore demonstrated.

As a limitation of the current study, no literature was found that addressed the theme in the Brazilian Midwest region, making it impossible to compare the states from the same region, only with states from other regions of the country, representing a suggestion to the researchers devoted to the theme.

CONCLUSION

This study analyzed the viral hepatitis reporting trend in the state of Mato Grosso over a period of 10 years, which presented results that corroborate the findings of studies carried out in other Brazilian states with the same theme. The nonexistence of studies that show the trend of these diseases in Mato Grosso and the knowledge about the importance of epidemiological data in the definition or revision of strategies make this paper unprecedented in this region.

The data referring to the decreasing trend of viral types A, B and D positively indicate the Department of Chronic Diseases and Sexually Transmitted Infections priorities for the 2019-2020 biennium, which focuses on more incisive combat measures in the face of viral hepatitis. The Hepatitis C growing trend in different states reinforces the importance of these actions at all the care line stages, aiming to achieve the goal of eradicating this important public health problem by 2030.

Although the prevalence of viral hepatitis, in general, has presented a significant reduction, it is essential to have continuity of actions to face these diseases, starting with the qualified performance of professionals who carry out epidemiological surveillance at the municipal and state levels, with the elaboration of targeted strategies, expansion of diagnosis and treatment, and monitoring of the users, in order for them not to abandon the therapy.

REFERENCES

1. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Vigilância, Prevenção e Controle das Infecções Sexualmente Transmissíveis, do HIV/Aids e das Hepatites Virais. Manual técnico para o diagnóstico das hepatites virais. [Internet] Brasília: Ministério da Saúde; 2018 [cited on 2022 jan 25]. Available in: https://qualitr.paginas.ufsc.br/files/2018/08/manual_tecnico_hepatites_08_2018_web.pdf.
2. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Doenças de Condições Crônicas e Infecções Sexualmente Transmissíveis. Protocolo Clínico e Diretrizes Terapêuticas para Atenção Integral às Pessoas com Infecções Sexualmente Transmissíveis (IST). [Internet] Brasília: Ministério da Saúde; 2022 [cited on 2023 jan 30]. Available in: https://www.gov.br/aids/pt-br/centrais-de-conteudo/pcdts/2022/ist/pcdt-ist-2022_isbn-1.pdf/view.
3. World Health Organization (WHO). Global health sector strategy on viral hepatitis, 2016-2021: towards ending viral hepatitis. [Internet]. Geneva: World Health Organization; 2016 [cited on 2022 jan 25]. Available in: <https://apps.who.int/iris/bitstream/handle/10665/246177/WHO-HIV-2016.06-eng.pdf>.
4. World Health Organization (WHO). Criteria for validation of elimination of viral hepatitis B and C: report of seven country pilots. [Internet] Geneva: World Health Organization; 2022 [cited on 2023 jan 31]. Available in: <https://apps.who.int/iris/rest/bitstreams/1462490/retrieve>.
5. Ministério da Saúde (BR). Boletim Epidemiológico de Hepatites Virais. Boletim Epidemiológico Especial. Secretaria de Vigilância em Saúde. Número especial. [Internet] Brasília: Ministério da Saúde, 2020 [cited on 2022 feb 05]. Available in: https://bvsms.saude.gov.br/bvs/boletim_epidemiologico/hepatites_virais_2020.pdf.
6. R Core Team. A language and environment for statistical computing. R Foundation for Statistical Computing, [Internet]. Vienna, Austria; 2020. [cited on 2022 feb 05]. Available in: URL <http://www.R-project.org/>.
7. Ministério da Saúde (BR). Conselho Nacional de Saúde. Diretrizes e normas regulamentadoras de pesquisa envolvendo seres humanos. Resolução n. 466, de 12 de dezembro de 2012. Diário Oficial da União [Internet]. 2013 [cited on 2022 feb 15]; 13. Available in: <https://conselho.saude.gov.br/resolucoes/2012/Reso466.pdf>.
8. Timóteo MVF, Araujo FJ da R, Martins KCP, Silva HR da, Neto GAS da S, Pereira RAC, et al. Perfil epidemiológico das hepatites virais no Brasil. RSD. [Internet]. 2020 [cited on 2022 feb 22]; 9(6). Available in: <http://dx.doi.org/10.33448/rsd-v9i6.3231>.
9. Ferreira AM, Gonçalves E, Gonzaga LMO. Hepatites virais: epidemiologia dos casos notificados no estado de Minas Gerais entre 2005 e 2014. RUC. [Internet]. 2017 [cited on 2022 feb 22]; 19 (1):71-8. Available in: <https://www.periodicos.unimontes.br/index.php/unicientifica/article/view/2053>.
10. Marques JVS, Alves BM, Marques MVS, Parente CC, Sousa NA de, Feijão TMP. Análise sociodemográfica das hepatites virais no estado do Ceará. SANARE. [Internet]. 2019 [cited on 2022 mar 03]; 18 (2) 26-33. Available in: <https://doi.org/10.36925/sanare.v18i2.1371>.
11. Gomes AM, Souza TF de, Silva LLD da, Carvalho YCG de, Filgueira MJP. Hepatites virais: uma análise clínico-epidemiológica no estado do Tocantins nos últimos 18 anos. Rev Tocantins [Internet]. 2020 [cited on 2022 mar 03]; 7(2) 107-13. Available in: <https://doi.org/10.20873/uft.2446-6492.2020v7n2p107>.
12. Bandeira LLB, Souza CS de, Marques D dos R, Peruzini GA, Guedes LV, Neto JD de S. Epidemiologia das hepatites virais por classificação etiológica. Rev Soc Bras Clin Med [Internet]. 2019 [cited on 2022 mar 05]; 16 (4) 227-231. Available in: <https://www.sbcm.org.br/ojs3/index.php/rsbcm/article/view/376>.
13. Vasconcelos ACP de. Aspectos epidemiológicos das hepatites B e C em Salvador (Bahia, Brasil) de 2001 a 2013 [Monografia]. Salvador: Faculdade de Medicina da Bahia (FMB), da Universidade Federal da Bahia (UFBA); 2015. [cited on 2022 mar 05]. 38 p. Available in: <http://repositorio.ufba.br/ri/handle/ri/17501>.

14. Marcon CEM, Schneider IJC, Traebert J. Temporal trends in the detection rates of hepatitis B in the Santa Catarina State, Brazil. *Rev Inst Med Trop São Paulo* [Internet]. 2014 [cited on 2022 mar 05]; 56(20):151-5. Available in: <https://doi.org/10.1590/S0036-46652014000200011>.
15. Santos AD dos, Araújo D da C, Lima SVMA, Góes MA de O, Menezes AF de, Araújo KCGM de. Dinâmica espacial e temporal da infecção pelo vírus da hepatite C. *Rev Arq Ciênc. Saúde* [Internet]. 2017 [cited on 2022 mar 08]; 24(4):14-19. Available in: <https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1046683>.
16. Fujimoto DE, Warden CF, Koifman RJ. Tendência temporal da incidência de hepatite viral B e C no estado do Acre, no período de 2001 a 2013. *Rev DêCiência Foco* [Internet]. 2019 [cited on 2022 mar 08]; 03(2) 81-96. Available in: <http://revistas.uninorteac.com.br/index.php/DeCienciaemFoco0/article/view/322>.
17. World Health Organization (WHO). Global health sector strategies on, respectively, HIV, viral hepatitis and sexually transmitted infections for the period 2022-2030. [Internet] Geneva: World Health Organization; 2022 [cited on 2023 jan 31]. Available in: <https://www.who.int/publications/i/item/9789240053779>
18. Brito WI, Souto FJD. Vacinação universal contra hepatite A no Brasil: análise da cobertura vacinal e da incidência cinco anos após a implantação do programa. *Rev Bras Epidemiol* [Internet]. 2020. [cited on 2023 feb 28]; v.23: e200073. Available in: <https://doi.org/10.1590/1980-549720200073>.
19. Nunes L. Panorama da Cobertura Vacinal no Brasil 2020. Instituto de Estudos para Políticas de Saúde. Relatórios do IEPS. [Internet]. 2021. [cited on 2023 feb 28]; 1-65. Available in: https://ieps.org.br/wp-content/uploads/2021/05/Panorama_IEPS_01.pdf.
20. Barbosa DA, Barbosa AMF. Avaliação da completude e consistência do banco de dados das hepatites virais no estado de Pernambuco, Brasil, no período de 2007 a 2010. *Epidemiol. Serv. Saúde* [Internet]. 2013 [cited on 2023 feb 28]; 22(1): 49-58. Available in: http://scielo.iec.gov.br/scielo.php?script=sci_arttext&pid=S1679-49742013000100005&lng=pt.
21. Evangelista CB de A, Carvalho GD, Silva KC de O, Oliveira T da R, Neta NBD, Rodrigues ACE, *et al.* Aspectos epidemiológicos da hepatite B no município de Teresina. *REAS* [Internet]. 2021 [cited on 2023 feb 28]; 13(5):e7029. Available in: <https://acervomais.com.br/index.php/saude/article/view/7029>.

Received: 14/07/2022

Approved: 17/03/2023

Associate editor: Dra. Luciana Nogueira

Corresponding author:

Débora Aparecida da Silva Santos

Universidade Federal de Rondonópolis - MT

Av. dos Estudantes, n 5.055, CEP 78736-900 Bairro Cidade Universitária, Rondonópolis-MT Fone: (66) 34104093 (66) 999943908

E-mail: deboraassantos@hotmail.com

Role of Authors:

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - **Santos DAS, Oliveira JS de, Benevenuto VCF, Goulart LS, Olinda RA de**; Drafting the work or revising it critically for important intellectual content - **Santos DAS, Goulart LS**; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - **Santos DAS, Oliveira JS de, Benevenuto VCF, Goulart LS**. All authors approved the final version of the text.

ISSN 2176-9133



This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).