

IMPACT OF VACCINATION COVERAGE ON THE NUMBER OF HEPATITIS B CASES IN THE STATE OF PARÁ BETWEEN 2010 AND 2020

Lucas Oliveira Mota

<https://orcid.org/0000-0002-4912-0287>

Elisa Carmo Viana

<https://orcid.org/0000-0002-5583-4729>

Maria Clara Fonseca Santos

<https://orcid.org/0000-0001-7011-0190>

Evellyn Stephane Saraiva Silva

<https://orcid.org/0000-0001-6325-6722>

Camila Nascimento Braga Santos

<https://orcid.org/0000-0002-4376-9210>

Carlos Henrique Bohne

<https://orcid.org/0000-0002-3113-1420>

João Gabriel Silva Valença

<https://orcid.org/0000-0001-8655-9902>

Cléa Nazaré Carneiro Bichara

<https://orcid.org/0000-0002-2995-0136>

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



Abstract: Hepatitis B is a chronic infection with high prevalence and morbidity and mortality worldwide, with cases progressing to cirrhosis and hepatocellular carcinoma. However, it is immunopreventable, achieving good vaccination coverage rates when the vaccination plan is correctly used. Thus, studies are needed that correlate the vaccination status and the incidence of hepatitis B cases. The study analyzed the vaccination status in comparison with the number of notified cases of hepatitis B in the state of Pará, in the period between 2010 and 2020, from data obtained from the DATASUS platform. In general, during the analysis period, the state of Pará was below the vaccination coverage rate set as a goal by the Ministry of Health of 95%, ranging from 100.64% to 55.54%, especially in 2020 (only 55, 54%), with an impact on the period with an increase in cases of hepatitis B, especially among women. The biggest drops in coverage rates were among children (81.63%-55.25%) and the smallest among those aged 15-19 years. It was also observed that Pará was below the disease detection rates (5.2 – 1.9) when compared to the rates in the North Region (18.8 – 5.5) and by the national parameter (8.4 – 2.9). There are several gaps in the data obtained, such as stratification by age group and underreporting of cases, a fact more observed in the years coinciding with the COVID-19 pandemic, creating an obstacle for a more accurate analysis. During the analysis period, vaccination coverage was deficient at all ages, which possibly favored the increase in the case detection rate. In addition, a higher incidence of the disease in the female public was evidenced. There is a need to update the data on the platform, as well as greater rigor in the notification and control of vaccine and disease data, in order to guarantee more appropriate health interventions, such as advertising campaigns.

Keywords: Hepatitis B, Vaccine Coverage,

Epidemiology.

INTRODUCTION

Hepatitis B virus (HBV) damages the liver through acute and chronic infection, with most of the morbidity and mortality arising from the long-term consequences of the infection, mainly due to cirrhosis and hepatocellular carcinoma (SHEENA et al, 2022). Hepatitis B remains one of the major public health problems, with the global seroprevalence estimated at 3.9% in 2016, and in 2019, approximately 296 million people were living with chronic infection, with 1.5 million new infections annually (MARJENBERG, 2022).

HBV is an incomplete double-stranded DNA virus, member of the Hepadnaviridae family, transmitted through exposure to infected blood, semen, and other body fluids (horizontal transmission), and may occur at the time of delivery (vertical transmission). In addition, it has a silent evolution, with an incubation period between 60 and 90 days and a variable clinical picture, including asymptomatic patients or patients with nonspecific symptoms, common to other liver diseases, supporting the diagnosis to be made years after the first contact with the virus (OLIVEIRA et al, 2020).

There are advances in terms of therapy, an important fact because, in theory, therapeutic inhibition of any stage of the HBV cycle would interrupt viral replication and cure infected individuals, but the virus recovers even after interruption of long-term antiviral therapy, with activated replication mainly in conditions of immunosuppression until decades after the resolution of the condition (BLOCK et al, 2021). In addition, chronically infected carriers have difficulty mounting a sustained immune response to eliminate the virus (REVILL et al, 2019). Therefore, in most cases, treatment must continue for life, and even when there is successful viral suppression,

patients may develop liver cancer, especially in the presence of cirrhosis.

Among the preventive measures, in addition to the use of condoms, correct handling and disposal of sharp objects, the vaccine against hepatitis B stands out, present in the National Immunization Program (PNI) of the Ministry of Health since 1998 (BRASIL, 2021).

Immunization against hepatitis B is safe and has been accepted worldwide as a routine practice, and with regard to HBV it has been found that both monovalent and combination vaccines provide equivalent seroprotection rates (DAS et al, 2019), and have proven to be effective when administered to infants, children, adolescents and adults by many clinical trials (YUAN, 2019). The vaccine currently used against hepatitis B is available in three-dose regimens, which induce protective antibody titers (anti-HBs greater than or equal to 10 mIU/mL) in more than 90% of healthy adults and young people (CASTRO et al. 2018). However, the HBV virus is still responsible for an estimated 800,000 deaths worldwide, despite the vaccination campaigns implemented in most countries (BRACANCCIO et al, 2023).

Studies show that in regions where universal vaccination against hepatitis B has been adopted, the incidence of the disease has significantly reduced (ZHAO et al, 2020). In addition, the currently available vaccine is safe and highly effective in prophylaxis of HBV infection, but the implementation of this universal vaccination and timely dose at birth is still suboptimal (ZHAO et al, 2020).

Regarding the national prevalence, the data do not behave homogeneously, since there is a concentration of cases in the Amazon region and in some places in the South region. Between 1999 and 2018, 233,027 confirmed cases of hepatitis B were reported in Brazil, a period with little variation in the detection

rate, reaching 6.7 cases per 100,000 inhabitants in the country in 2018. Detection rates for the South regions and North have been shown to be higher than the national rate (BRASIL, 2021).

Despite the enormous human and economic cost of chronic hepatitis B, HBV research remains largely underfunded, to the point that it has recently been compared to a neglected tropical disease. Therefore, one can see the relevance of this condition compared to other chronic viral diseases, considering the heterogeneity of the national prevalence, with the possibility of worse prognoses if not correctly treated, diagnosed, and mainly prevented with vaccination. Therefore, studies are needed to correlate vaccination coverage and prevalence of hepatitis B cases

METHODOLOGY

Within ethical precepts, a retrospective and cross-sectional study was carried out, based on the collection and analysis of data available by the Department of Informatics of the Unified Health System (DATASUS), a public domain database, through the Program Information System Nacional de Imunização (SI-PNI) and the Department of Diseases, Chronic Conditions and Sexually Transmitted Infections (DCCI) of the Ministry of Health (MS), including the number of confirmed cases notified of hepatitis B, of both genders and all age groups, data regarding vaccination coverage for Hepatitis B and clinical epidemiological information on the vaccinated population from 2010 to 2020 in the State of Pará.

The data were submitted to descriptive statistical analysis using the BioStat 5.3 program, with a confidence level of $p < 0.05$, with the elaboration of graphs and tables in the Microsoft Office Excel 2016 and Microsoft Office Word 2016 programs.

RESULTS

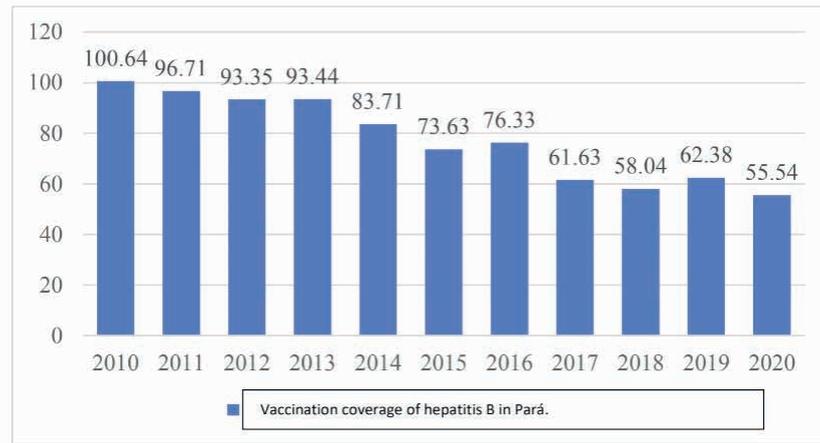


FIGURE 1 – Hepatitis B vaccination coverage (in %) in the state of Pará between 2010 and 2020

SOURCE: DATASUS - National Immunization Program Information System (SI-PNI/CGPNI/DEIDT/SVS/MS)

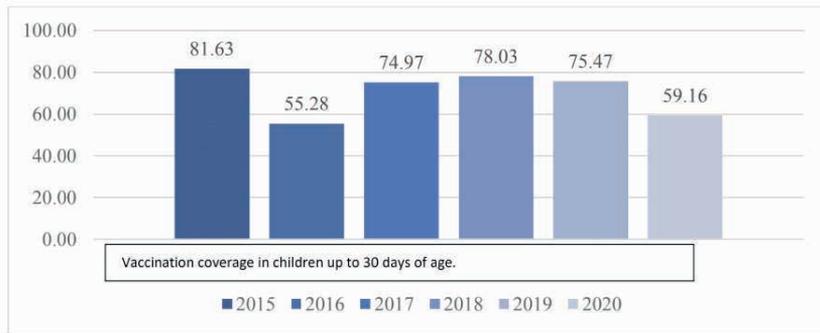


FIGURE 2 – Hepatitis B vaccination coverage (in %) in children aged up to 30 days, in the state of Pará, between 2015 and 2020.

SOURCE: DATASUS - National Immunization Program Information System (SI-PNI/CGPNI/DEIDT/SVS/MS)

Notes: (1) The DataSUS platform does not have data computed between the period 2010-2014

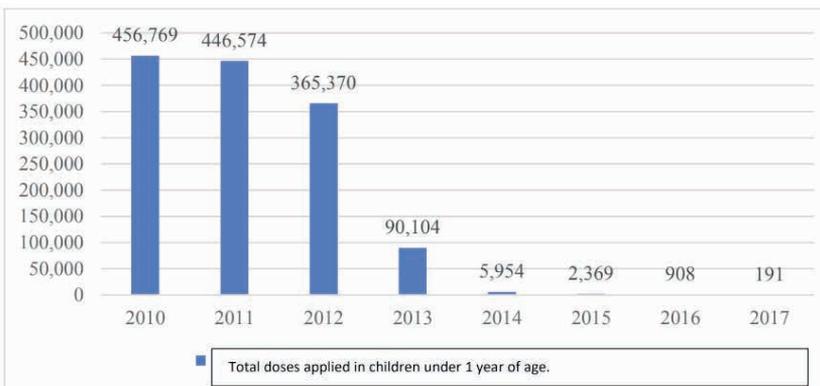


FIGURE 3 – Applied doses of Hepatitis B in children under 1 year old, in the state of Pará, between 2010 and 2017

SOURCE: DATASUS - National Immunization Program Information System (SI-PNI/CGPNI/DEIDT/SVS/MS)

Notes: (1) The DataSUS platform does not have data computed between 2018-2020.

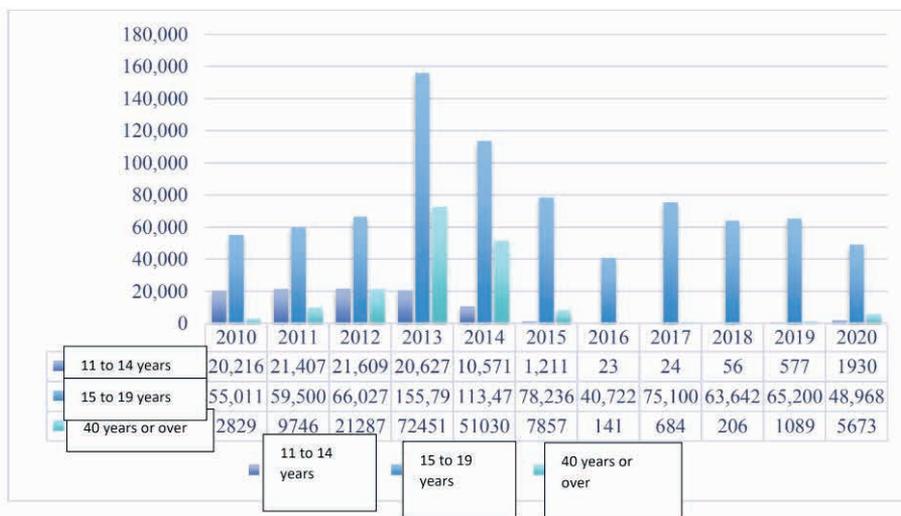


FIGURE 4 – Total applied doses of Hepatitis B, by age group, in the state of Pará between the years 2010 and 2020.
SOURCE: DATASUS - National Immunization Program Information System (SI-PNI/CGPNI/DEIDT/SVS/MS)

Hepatitis B	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Men	117	82	103	132	120	143	130	168	178	246	78
Rate (male gender)	3,1	2,1	2,6	3,3	2,9	3,4	3,1	4	4,2	5,7	1,8
Women	118	117	153	148	152	148	151	167	185	202	91
Taxa (female gender)	3,1	3,1	3,9	3,7	3,8	3,6	3,6	4	4,4	4,7	2,1

TABLE 1 - Hepatitis B cases and incidence rate (per 100,000 inhabitants) by sex and year of notification, in the state of Pará, between 2010 and 2020.

SOURCE: DATASUS - MS/SVS/DCCI - Department of Chronic Diseases and Sexually Transmitted Infections.

Notes: (1) Data up to 12/31/2020; (2) Preliminary data for the last 5 years.

Hepatitis B	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Pará	3.1	2.6	3.3	3.5	3.3	3.5	3.4	4.0	4.3	5.2	1.9
North	12.4	14.2	13.4	18.8	16.4	11.9	11.5	11.8	12.3	13.2	5.5
Brazil	7.2	8.4	8.0	8.2	7.9	7.1	6.8	6.5	6.7	6.3	2.9

TABLE 2 - Hepatitis B detection rates (per 100,000 inhab.) by location and year of diagnosis, 2008-2020.

SOURCE: DATASUS - MS/SVS/DCCI - Department of Chronic Diseases and Sexually Transmitted Infections.

Notes: (1) Data up to 12/31/2020; (2) Preliminary data for the last 5 years.

DISCUSSION

The present study analyzed hepatitis B vaccination coverage in the state of Pará between 2010 and 2020, and showed a downward trend in the last decade, with the highest coverage observed in 2010 (100.64%) and the lowest in 2020 (55.54%). As of 2012 (93.35%), Pará was below the target recommended by the Ministry of Health of 95% coverage for the hepatitis vaccine (BRASIL, 2021). In addition, low vaccination coverage compromises the World Health Organization's goal of eliminating the threat to public health generated by viral hepatitis by 2030 (W.H.O., 2021).

There are questions about such a scenario for a vaccine-preventable disease made available in the public health network. One study highlighted that the main reason reported by unvaccinated participants was lack of guidance, in addition, other factors related to low adherence are lack of knowledge about the pathology and low education (SANTANA et al, 2019). Therefore, it is possible to conclude that the lack of information leads to a cascade effect, culminating in a lower protection against hepatitis B infection (LOPES et al, 2020), thus demonstrating the importance of adopting specific communication strategies.

Vaccination coverage in children aged up to 30 days ranged from 81.63% in 2015 to 55.28% in 2016. Although the hepatitis B vaccine is available to the entire population from birth, a study carried out in São Paulo shows that it is observed vaccine delay in up to one fifth of the population. Vaccination of adolescents, therefore, represents a second chance for those who did not start or complete the vaccination schedule during childhood (VIEGAS et al, 2019). Based on these data, it is noteworthy that, in Pará, the total number of doses applied per age group is precisely higher between 15 and 19 years old.

Regarding the total number of doses applied

to children under one year of age, data analysis showed a sharp drop between 2012 (365,370) and 2013 (90,104), in 2017 only 191 doses were computed. Worrying data, considering that HBV infection during early childhood has a > 90% risk of leading to chronic hepatitis and is responsible for the highest number of chronic carriers, despite the availability of an effective prophylactic vaccine (HU et al, 2019). It is important to highlight the great possibility of underreporting, as evidenced by noting the absence of data on the DataSUS platform between 2018 and 2020.

In this sense, it is evident that the decline in vaccination coverage in the period from 2010 to 2020 had an impact on the increase in the incidence rate as observed. Thus, non-vaccination leads to the accumulation of individuals susceptible to infection by the disease, which in turn poses a risk to individual and collective protection.

A significant decrease was noticeable, modifying the behavior of case records in the period studied until 2019, which allows inferring that this drop may have been affected by underreporting of this condition by health services (BRITO et al, 2022), with emphasis on the year 2020. In addition, it is observed that in most years within the period from 2010 to 2020, the female incidence coefficient was mostly higher. This result may be justified by the lower demand for health services by the male population and, therefore, fewer opportunities for detecting the disease (BALBINO et al, 2020).

There is previous evidence to show that routine immunization programs are highly vulnerable to interruptions resulting from epidemics, political upheavals or economic crises (PLEY et al, 2020), so it is also extremely relevant to highlight the impact of the pandemic on vaccine coverage. Preliminary data from the Institute for Health Metrics and Evaluation indicate that global immunization

coverage levels in 2020 have fallen to levels last seen in the 1990s, threatening 25 years of progress in the first 6 months of the pandemic (GATES, B; GATES, M, 2020).

Reducing immunization coverage could have particularly strong effects on the incidence of HBV in childhood and early childhood, contributing to the increased burden of chronic infection and providing a source of progressive transmission that threatens progress towards the 2030 elimination targets (PLEY, 2020). It is also worth noting that acceptance of vaccination is closely linked to fear of the disease and trust in government agencies, unstable factors due to COVID-19 (MESCH, 2019).

It is undeniable that vaccination is a powerful instrument in combating the various infectious and contagious diseases, since it will reduce the number of susceptible individuals and, therefore, will affect the entire chain of transmission of a disease. In this sense, there is a need to invest not only in offering the HIB vaccine, but also in disseminating information to the population about the benefits and the number of doses required for complete immunization.

Likewise, it is imperative that communication be more assertive, expanded and capillarized, initially using the Family Health Strategy, for the active search of mothers of children with an incomplete vaccination schedule, as well as acting to clarify false information propagated about side effects that may end up disturbing the vaccination process in children. Finally, it is extremely important that the notification system be valued within the health services environment, so that reliable data can be obtained about the scenario of Hepatitis B cases and, therefore, investments are made in improvements in the process of vaccination.

CONCLUSION

There was a decrease in vaccination coverage for hepatitis B in the State of Pará, subsequently in the analyzed period, with more emphasis in the last decade. Likewise, it was observed that between 2019 and 2020 there was a sharp drop in the detection rate of hepatitis B cases, which was not accompanied by an increase in vaccination coverage in the same interval. A greater number of women affected by the disease was also noticeable. The lack of commitment to case notification and adequate data completion compromises more reliable studies of the regional and national reality.

It is concluded that there has been an increase in Hepatitis B detection rates in the population of the State of Pará, accompanied by a decline in vaccination coverage in the last decade. In this sense, with the vaccine as the main instrument for preventing the disease, it is observed that the decrease in vaccination coverage directly impacts on the increase in cases of hepatitis B in the population.

REFERENCES:

- BALBINO, C. M. et al. Os motivos que impedem a adesão masculina aos programas de atenção a saúde do homem. **Research, Society and Development**, v. 9, n. 7, p. e389974230, 18 maio 2020.
- BRASIL. **Ministério da Saúde**. Departamento de Doenças de Condições Crônicas e Infecções Sexualmente Transmissíveis. Disponível em: <<http://www.aids.gov.br/pt-br/publico-geral/hv/o-que-sao-hepatites/hepatite-b#:~:text=Qual%20o%20agente%20causador%20da,viral%20por%20enzima%20transcriptase%20reversa.>>. Acesso em: 17 Mar. 2021.
- BLOCK, T. M.; CHANG, K.-M.; GUO, J.-T. Prospects for the Global Elimination of Hepatitis B. **Annual Review of Virology**, v. 8, n. 1, p. 437–458, 29 set. 2021.
- BRANCACCIO, G. et al. Trends in chronic hepatitis B virus infection in Italy over a 10-year period: Clues from the nationwide PITER and MASTER cohorts toward elimination. **International Journal of Infectious Diseases**, v. 129, p. 266–273, abr. 2023.
- BRITO, C. V. B.; FORMIGOSA, C. DE A. C.; NETO, O. S. M. Impacto da COVID-19 em doenças de notificação compulsória no Norte do Brasil. **Revista Brasileira em Promoção da Saúde**, v. 35, p. 1–11, 2022.
- CASTRO, F. C. et al. Conhecimento sobre situação vacinal e perfil de imunoproteção para hepatite B de trabalhadores da assistência hospitalar. **Revista de Epidemiologia e Controle de Infecção**, v. 8, n. 4, p. 435–441, 8 out. 2018.
- DAS, S. et al. Hepatitis B Vaccine and Immunoglobulin: Key Concepts. **Journal of Clinical and Translational Hepatology**, v. 7, p. 1–7, 28 jun. 2019.
- Gates B, Gates M. **2020 Goalkeepers Report**. COVID-19 A Global Perspective. [Internet], 2020. Available: <https://www.gatesfoundation.org/goalkeepers/report/2020-report/#GlobalPerspective> [Acesso em 05 mar 2023].
- GONÇALVES, N. V. et al. Hepatites B e C nas áreas de três Centros Regionais de Saúde do Estado do Pará, Brasil: uma análise espacial, epidemiológica e socioeconômica. **Cadernos Saúde Coletiva**, v. 27, n. 1, p. 1–10, mar. 2019.
- GUPTA, Satya Prakash. **Studies on hepatitis viruses: life cycle, structure, functions, and inhibition**. Academic Press, 2018.
- HU, J.; PROTZER, U.; SIDDIQUI, A. Revisiting Hepatitis B Virus: Challenges of Curative Therapies. **Journal of Virology**, v. 93, n. 20, 15 out. 2019.
- LOPES, K. A. DE M. et al. Revisão sistemática: Cuidados de Enfermagem no enfrentamento à Hepatite B no âmbito da atenção primária / Systematic review: Nursing care in the fight against Hepatitis B in primary care. **Brazilian Journal of Development**, v. 6, n. 12, p. 95682–95695, 2020.
- MARJENBERG, Z. et al. Hepatitis B surface antigen prevalence and the rates of mother-to-child transmission of hepatitis B virus after the introduction of infant vaccination programs in South East Asia and Western Pacific regions: a systematic review. **International Journal of Infectious Diseases**, v. 124, p. 65–75, nov. 2022.
- MESCH, Gustavo S.; SCHWIRIAN, Kent P. Vaccination hesitancy: fear, trust, and exposure expectancy of an Ebola outbreak. **Heliyon**, v. 5, n. 7, p. e02016, 2019.
- MORAES, P. M. DE O. et al. Controle e prevenção das hepatites B e C na gravidez segundo profissionais da saúde. **Research, Society and Development**, v. 11, n. 3, p. e6511326160, 12 fev. 2022.
- OLIVEIRA, C. M. A. DE et al. Contágio intradomiciliar e status vacinal entre comunicantes de portadores do vírus da hepatite B. **Enferm. Foco**, v. 11, n. 3, p. 144–151, 2020.
- OMS. **Organização Mundial de Saúde**. Disponível em: <<https://www.paho.org/pt/noticias/27-7-2021-interruptao-dos-servicos-saude-durante-pandemia-covid-19-ameaca-eliminacao-das>> Acesso em: 14 mar. 2023.

PENA, J. B. T. et al. Avaliação do Perfil Epidemiológico de Hepatites Virais na Região Norte do Brasil do período de 2016 a 2020: Estudo Descritivo. **REVISTA FOCO**, v. 16, n. 3, p. e802, 8 mar. 2023.

PIMENTA, R. DE S. M. et al. Hepatite B na Amazônia: revisão integrativa. **Revista Eletrônica Acervo Saúde**, v. 13, n. 2, p. e6203, 19 fev. 2021.

PLEY, Caitlin M. et al. The global impact of the COVID-19 pandemic on the prevention, diagnosis and treatment of hepatitis B virus (HBV) infection. **BMJ Global Health**, v. 6, n. 1, p. e004275, 2021.

REVILL, P. A. et al. A global scientific strategy to cure hepatitis B. **The Lancet Gastroenterology & Hepatology**, v. 4, n. 7, p. 545–558, jul. 2019.

SANTANA, José Elisomar Silva de. **Hepatite B e HPV: fatores associados à vacinação dos adolescentes no Município de São Paulo**. 2019. Tese de Doutorado. Universidade de São Paulo.

SHEENA, B. S. et al. Global, regional, and national burden of hepatitis B, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. **The Lancet Gastroenterology & Hepatology**, v. 7, n. 9, p. 796–829, set. 2022.

SILVA, T. P. R. DA et al. Análise espacial da vacinação contra hepatite B em gestantes em área urbana no Brasil. **Ciência & Saúde Coletiva**, v. 26, n. 3, p. 1173–1182, mar. 2021.

VIEGAS, S. M. DA F. et al. A vacinação e o saber do adolescente: educação em saúde e ações para a imunoprevenção. **Ciência & Saúde Coletiva**, v. 24, n. 2, p. 351–360, fev. 2019.

YUAN, Q. et al. Hepatitis B vaccination coverage among health care workers in China. **PLOS ONE**, v. 14, n. 5, p. e0216598, 7 maio 2019.

ZHAO, H.; ZHOU, X.; ZHOU, Y.-H. Hepatitis B vaccine development and implementation. **Human Vaccines & Immunotherapeutics**, v. 16, n. 7, p. 1533–1544, 2 jul. 2020.