Original article

Hepatitis B infection in Mexican adults: Results of a nationally representative survey

Martha Carnalla[a], Dèsirée Vidaña-Pérez[a], Celia Alpuche-Aranda[b], Norberto C. Chávez-Tapia[c], Martín Romero-Martínez[d], Teresa Shamah-Levy[d], Tonatiuh Barrientos-Gutiérrez[a,*]

[a] Centro de Investigación en Salud Poblacional, Instituto Nacional de Salud Pública, Cuernavaca, Morelos, Mexico
[b] Centro de Investigación en Enfermedades Infecciosas, Instituto Nacional de Salud Pública, Cuernavaca, Mexico
[c] Fundación Clínica Médica Sur, Ciudad de México, Mexico
[d] Centro de Investigación en Evaluación y Encuestas, Instituto Nacional de Salud Pública, Cuernavaca, Morelos, Mexico

ARTICLE INFO

ABSTRACT

Introduction and objectives: Hepatitis B virus (HBV) infection can lead to cirrhosis, hepatocellular carcinoma, and death if untreated. In Mexico, HBV vaccination for all children and adolescents was implemented in 1999. In 2000 the estimated HBV was 0.21% in the population aged 20 years and older. We estimated the national prevalence for hepatitis B surface antigen (HBsAg) and its association with sociodemographic characteristics, including sexual behavior information for those aged 20 to 49 years.
Materials and methods: From the 2018 National Health and Nutrition Survey, blood samples were collected from a subsample of 2,280 adults to determine HBsAg. We estimated the national prevalence for HBsAg and evaluated its association with sociodemographic characteristics, adding sexual behavior information for those aged 20 to 49 years. We performed a multiple logistic regression to estimate the association of HBsAg and relevant variables.
Results: The 2018 estimated prevalence of HBsAg in the Mexican adult population was 0.51% (95%CI 0.19, 2.33), which represents 411,000 cases. This prevalence was higher than previously estimated and it was higher in women than in men (0.54% versus 0.46%, respectively). We did not find an association between HBsAg and sociodemographic characteristics or sexual behaviors.
Conclusions: Vaccination and screening strategies towards the elimination of viral hepatitis should be reinforced to further reduce the prevalence over the next years.

1. Introduction

In 2015, 3.5% of the world's population were living with hepatitis B virus (HBV) chronic infection. If untreated, HBV infection can lead to cirrhosis, hepatocellular carcinoma, and death; currently, 66% of all viral hepatitis deaths are attributable to HBV [1]. HBV transmission can be perinatal or horizontal, through needlesticks, exposure to infected blood, or sexual transmission. The main preventive measure for HBV is vaccination [2].

In Mexico, HBV vaccination for all children and adolescents was implemented in 1999 [3]. By 2012, the prevalence of immunity attributable to vaccination was 44.7% in the Mexican population aged 10 to 25 years [4]. By 2000, the estimated HBV prevalence was 0.21% and since then there have been no updates [5]. In 2015, the Global Health Sector Strategy on viral hepatitis 2016-2021, proposed to reduce the incidence of viral hepatitis by 90% and mortality by 65% [6]. To achieve this goal, we need information on HBV infection in the population. Therefore, we aimed to estimate the prevalence of hepatitis B surface antigen (HBsAg) in the Mexican population.

2. Material and methods

Data were obtained from the 2018-19 National Health and Nutrition Survey (ENSANUT, for its Spanish acronym). The survey is nationally representative of the population living in community households using a probabilistic, stratified, two-stage, and cluster sampling. Research procedures were approved by the Ethical, Research, and Biosecurity Committee of the National Institute of Public Health. More details about the design of ENSANUT are available

* Corresponding author at: Centro de Investigación en Salud Poblacional, Instituto Nacional de Salud Pública, Avenida Universidad 655, Santa María Ahuacatitlán, Cuernavaca, Morelos 62100, Mexico.
E-mail addresses: martha.carnalla@insp.edu.mx (M. Carnalla), desiree.vidana@insp.edu.mx (D. Vidaña-Pérez), celia.alpuche@insp.mx (C. Alpuche-Aranda), chavez.ntc@gmail.com (N.C. Chávez-Tapia), martin.romero@insp.mx (M. Romero-Martínez), tshamah@insp.mx (T. Shamah-Levy), tbarrientos@insp.mx (T. Barrientos-Gutiérrez).

elsewhere [7]. A probabilistic sample of 2,280 adults aged 20 years and older (18.4% of the total sample) was obtained for HBsAg determination, representing a total population of 81,445,000 individuals.

3. Questionnaire

Using the ENSANUT 2018 questionnaire, we collected sociodemographic characteristics and risk factors for viral hepatitis, such as age, sex, marital status, country region, urban area, and socioeconomic status. The population aged 20 to 49 years had additional questions about sexual behaviors: age of sexual initiation, condom use in the first and last sexual intercourse.

3.1. Blood sample collection

A 5 ml blood sample was collected in vacutainer SST tubes (Becton Dickinson and Company, New Jersey, USA) with eight hours of fasting, according to the technique recommended by WHO.[14] Afterwards, the sample was centrifuged at 3500 rpm for 15 minutes. Serum was stored in a cryovial in liquid nitrogen (-80°C) until analysis.

3.2. HBsAg determination in serum

HBsAg determination was conducted with the ARCHITECT HBsAg (1P97, Abbot, Germany) assay, a two-step immunoassay, using chemiluminescent technology for the qualitative detection of HBsAg in human serum with a sensitivity of 99.52% (95% CI 98.29-99.94%) and a specificity of 99.8% (95% CI 99.74-99.94%) [8].

3.3. Statistical analysis

Prevalence and 95% confidence intervals were calculated for the total population and by age groups. Descriptive analyses were performed for sociodemographic characteristics in the total population and including sexual behaviors for the population aged 20 to 49 years. All analyses were completed by November 2020 using STATA 13.0 (College Station, TX), using the svy suite to consider the sampling design.

4. Results

The prevalence of HBsAg was 0.51% (95% CI 0.19, 2.33), which represents 411,000 cases. The prevalence was 0.54% (95% CI 0.14-2.51%) in women and 0.46% (95% CI 0.12-1.67%) in men. There were no cases of hepatitis B in the population aged 20 to 39 years nor aged 50-59 years. All cases in the 40-49 age group were women (0.24%, 95% CI 0.03-1.68%), conversely, all cases in the ≥70 age group were men (0.77, 95% IC 0.24-2.45%).

Table 1 presents the national prevalence of HBsAg in the Mexican population according to sociodemographic characteristics. Participants aged 60-69 years, people with middle or high-school education, and widows had the highest prevalence of HBsAg. Mexico City reported a higher prevalence of HBsAg compared to other regions. Sociodemographic characteristics such as sex, socioeconomic status, condom use in the first and last sexual intercourse, and age of sexual initiation were not associated with HBV infection (Table 1).

Table 1
National prevalence of HBV antigen in serum in the Mexican population according to sociodemographic characteristics. ENSANUT 2018.

	%	95% CI	Weighted n	P value
Age group (years)				0.11
20-39	0	-	0	
40-49	0.12	0.02, 1.09	13 000	
50-59	0	-		
60-69	2.09	0.66, 5.74	354 000	
≥70	0.36	0.02, 0.88	44 000	
Marital status				0.29
Single	0		0	
Cohabitating	0.56	0.16, 1.92	287 000	
Separated	0.06	0.01, 4.00	5 000	
Widowed	1.38	0.31, 5.95	119 000	
Education				0.54
Elementary or less	0.47	0.14, 1.58	149 000	
Middle/High school	0.65	0.15, 2.67	249 000	
Graduate/Postgraduate	0.12	0.02, 0.84	13 000	
Country region				0.20
Center	0.15	0.05, 0.47	42 000	
North	0	-	0	
Mexico City*	1.52	0.21, 10.33	150 000	
South	0.82	0.24, 2.73	219 000	
Sex				0.86
Men	0.46	0.12, 1.67	156 000	
Women	0.54	0.14, 2.51	255 000	
Area				0.12
Rural	0.17	0.04, 0.68	29 000	
Urban	0.59	0.21, 1.69	382 000	
Socioeconomic status				0.90
Low	0.45	0.09, 2.34	119 000	
Medium	0.64	0.14, 2.98	191 000	
High	0.39	0.07, 2.22	101 000	
Condom use: last sexual intercourse**				0.55
No	0.04	0.01, 2.00	13 000	
Yes	0	-		
Condom use: first sexual intercourse**				0.36
No	0.06	0.01, 0.40	13 000	
Yes	0	-	-	
Onset of active sexual life**				0.76
Have not initiated	0	-	-	
<18 years	0	-	-	
≥18 years	0.06	0.01, 4.0	13 000	

* Includes surrounding urban municipalities
** Includes just the 20 to 49 years age group. Total weighted N=81,445,000

5. Discussion

In 2018, the prevalence of HBsAg was 0.51% (95% CI 0.19, 2.33) among the Mexican adult population. This represents an increase with respect to the 2000 National Health Survey when the estimated HBsAg prevalence was 0.21% (95% CI: 0.11−0.37) in the same age group [5]. Unfortunately, surveys are not comparable because in year 2000 HBsAg determination was restricted to those with positive antibodies against HBV core antigen (anti-HBVc), while in 2018, HBsAg was determined in all samples.

Sociodemographic characteristics and sexual behaviors were not associated with HBV prevalence [2]; however, this finding should be interpreted carefully, given the sample size limitations. Our results suggest that HBsAg is more prevalent in people over 60 years. While it is difficult to provide a clear explanation for this finding, the low prevalence for the group aged 20 to 39 years could be related to access to HBV vaccination, which was estimated to cover 44.7% of those aged 10 to 25 years in 2012, six years prior to this new survey [4].

ENSANUT 2018 did not collect detailed information on sexual practices or needle exposure. In addition, only HBsAg was determined, thus, we cannot assess if infection was resolved [2]. We could be

underestimating the real prevalence because HBV DNA can be detectable in serum or hepatic tissue in the absence of HBsAg. However, hidden hepatitis infection is rare and has been reported in specific immunocompromised subgroups [9]. Finally, ENSANUT is a household community survey and may fail to capture groups at higher risk of HBV infection, leading to an underestimation of the prevalence.

The 2018 estimated prevalence of HBsAg in the Mexican adult population might be higher than previously reported. Vaccination and screening strategies towards the elimination of viral hepatitis should be reinforced to further reduce the prevalence over the next years. Studies that monitor the prevalence of HBV in key groups are needed.

Conflicts of interest

The authors have no conflicts of interest associated with this manuscript.

Acknowledgment

References

[1] World Health Organization. Global hepatitis report 2017. Geneva: World Health Organization; 2017 License: CC BY-NC-SA 3.0 IGO.

[2] World Health Organization. Hepatitis B, https://www.who.int/news-room/fact-sheets/detail/hepatitis-b; 2020 [accessed 21 September 2020].

[3] Programa Sectorial de Salud. Programa de Acción Específico. Vacunación Universal 2013-2018, http://www.censia.salud.gob.mx/contenidos/descargas/transparencia/especiales/PAE_Vacunacion_Universal_PAE_final_final.pdf; 2018 [accessed 22 September 2020].

[4] López-Gatell H, García-García L, Echániz-Avilés G, Cruz-Hervert P, Olamendi-Portugal M, Castañeda-Desales D, et al. Hepatitis B seroprevalence in 10-25-year-olds in Mexico - the 2012 National Health and Nutrition Survey (ENSANUT) results. Hum Vaccin Immunother 2019;15:433–9 https://doi.org/. https://doi.org/10.1080/21645515.2018.1533617.

[5] Valdespino JL, Conde-González CJ, Olaiz-Fernández G, Palma O, Sepúlveda J. Prevalencia en México de la infección y el estado de portador de la hepatitis B en adultos. Salud Publica Mex 2007;49:s404–11 https://saludpublica.mx/index.php/spm/article/view/4778.

[6] World Health Organization. Global health sector strategy on viral hepatitis 2016-2021. Towards ending viral hepatitis. World Health Organization; 2016 https://apps.who.int/iris/handle/10665/246177[accessed 21 September 2020].

[7] Romero-Martínez M, Shamah-Levy T, Vielma-Orozco E, Heredia-Hernández O, Mojica-Cuevas J, Cuevas-Nasu L, et al. National Health and Nutrition Survey 2018-19: methodology and perspectives. Salud Publica Mex 2019;61:917–23 https://doi.org/. https://doi.org/10.21149/11095.

[8] ARCHITECT System HBsAg, https://www.ilexmedical.com/files/PDF/HBsAg_ARC.pdf; [accessed 3 November 2020].

[9] Yip TC, Wong GL. Current knowledge of occult hepatitis B infection and clinical implications. Semin Liver Dis 2019;39:249–60 https://doi.org/. https://doi.org/10.1055/s-0039-1678728.