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Original Article

# Prevalence of antibodies against HCV and risk behaviors in Basic Health Units users in a small town in the Brazilian semi-arid region

*Prevalência do anticorpo para Hepatite C e comportamentos de risco em usuários de Unidades Básicas de Saúde de uma pequena cidade do Semiárido brasileiro*

*Prevalencia de anti-HCV y conductas de riesgo en los usuarios de Unidades Básicas de Salud en una pequeña ciudad de la región semiárida brasileña*

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## ABSTRACT

**Background and Objectives:** Hepatitis C virus (HCV) infection is a relevant public health problem due to its prevalence and possible progression to cirrhosis and hepatocellular carcinoma. Although the use of direct-acting antivirals has decreased the incidence in recent years, identifying those infected remains a challenge for the elimination of HCV by 2030. The objective of this study was to estimate the prevalence of HCV antibody (anti-HCV), and describe the sociodemographic and behavioral risk factors associated with HCV infection in individuals in a small town in the Brazilian semi-arid region. **Methods:** Following a non-random sampling procedure, a cross-sectional study of 800 individuals in the waiting rooms of Basic Health Units (BHU) was conducted. After formal consent, a rapid screen test for anti-HCV (Immunochromatography)was carried out, and a questionnaire was applied to collect sociodemographic, clinical and risk behavior data. **Results:** Five tests were positive (0.62%; 95%CI 0.2 – 1.4%), four women and one man. All were over 60 years old (mean age of 69.4) and some risk behaviors in the past, use of glass syringes, surgery, or blood transfusion, were statistically associated with HCV exposure. **Conclusion:** In this study, a low prevalence of anti-HCV was observed, close to that estimated in recent studies. The antibody was more frequently positive in older individuals, aged over 60 years, who reported risky past behavior. Greater attention should be given to these individuals.

**Keywords:** *Hepatitis C Antibody. Basic Health Care. Outpatient. Prevalence. Risk behaviors.*

## RESUMO

**Justificativa e Objetivos:** A infecção pelo vírus da hepatite C (HCV) é um relevante problema de saúde pública devido à sua prevalência e possível progressão para cirrose e carcinoma hepatocelular. Mesmo com a diminuição da incidência nos últimos anos, devido ao uso dos novos antivirais, a identificação dos infectados continua sendo um desafio para a eliminação do HCV até 2030. O objetivo deste estudo foi estimar a prevalência do anticorpo contra o HCV (anti-HCV) e descrever os fatores sociodemográficos e comportamentais de risco associados à infecção pelo HCV em indivíduos em uma pequena cidade no semiárido brasileiro. **Métodos:** Após procedimento de amostragem não aleatória, um estudo transversal foi realizado com 800 indivíduos em salas de espera de Unidades Básicas de Saúde (UBS). Após consentimento formal, foi realizado teste rápido de triagem para o anti-HCV (imunocromatografia) e aplicado questionário para coleta de dados sociodemográficos, clínicos e de comportamento de risco. **Resultados:** Cinco testes foram positivos (0,62%, IC95% 0,2 – 1,4%), sendo quatro mulheres e um homem. Todos tinham mais de 60 anos (média de 69,4 anos) e comportamentos de risco no passado, uso de seringas de vidro, cirurgia ou transfusão de sangue, os quais foram estatisticamente associadas à exposição ao HCV. **Conclusão:** Neste estudo, observou-se baixa prevalência do anti-HCV, próxima às estimativas em estudos recentes. O anticorpo foi mais frequentemente positivo nos indivíduos mais velhos, acima de 60 anos, e que relataram comportamento de risco no passado, sugerindo a necessidade de maior atenção para esta população.

**Descritores:** *Anticorpo para hepatite C, Atenção Primária, Unidades Básicas de Saúde, Prevalência, Comportamento de risco.*

## RESUMEN

**Justificativa y Objetivos:** La infección por el virus de la hepatitis C (VHC) es un problema relevante de salud pública debido a su prevalencia y posible progresión a cirrosis y carcinoma hepatocelular. Aunque el uso de antivirales de acción directa ha disminuido la incidencia en los últimos años, la identificación de los infectados sigue siendo un desafío para la eliminación del VHC en 2030. El objetivo de este estudio fue estimar la prevalencia de anticuerpos contra el VHC (anti-VHC) y describir los factores de riesgo sociodemográficos y comportamentales asociados a la infección por VHC en individuos de una pequeña ciudad (Arcoverde) de la región semiárida brasileña. **Método:** Después de un procedimiento de muestreo no aleatorio, se realizó un estudio transversal con 800 individuos en salas de espera de las Unidades Básicas de Salud (UBS). Después del consentimiento formal, se realizó una prueba rápida de tamizaje anti-VHC (inmunocromatografía) y se aplicó un cuestionario para recoger datos sociodemográficos, clínicos y de conductas de riesgo. **Resultados:** Cinco pruebas fueron positivas (0,62%, IC95% 0,2 – 1,4%), cuatro mujeres y un hombre. Todos tenían más de 60 años (edad media de 69,4 años) y algunas conductas de riesgo en el pasado, uso de jeringas de vidrio, cirugía o transfusión de sangre, se asociaron estadísticamente con la exposición al VHC. **Conclusión:** En este estudio se observó una baja prevalencia de anti-VHC, cercana a la estimada en estudios recientes. El anticuerpo fue más frecuentemente positivo en las personas mayores de 60 años que reportaron conductas de riesgo en el pasado. Se debe prestar mayor atención a estos individuos.

**Palabras Clave:** *Anticuerpos contra la hepatitis C. Atención Primaria de Salud. Centro de Salud. Prevalencia. Conductas de riesgo.*

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## INTRODUCTION

Hepatitis C virus (HCV) infection is a relevant public health problem, as it is one of the main causes of cirrhosis and hepatocellular carcinoma in the world.[1-3] The occurrence of HCV has been declining in recent years, with an estimated global prevalence of around 0.7% of the world's population, corresponding to approximately 50 million people infected with HCV in 2022. However, only 20% of them are aware of their condition.[1-3] The use of direct-acting antivirals since 2014 has certainly revolutionized hepatitis C treatment by providing high cure rates, few side effects and reducing the occurrence of this infection in recent years.[1-3]

Although prevalence studies are still scarce, Brazil is currently considered a country of low endemicity for HCV infection.[4] Most research on the prevalence of viral hepatitis B and C conducted in Brazil have evaluated viral markers in blood donors or addressed specific groups at greater contamination risk, such as chronic kidney disease patients on hemodialysis, sex workers and the penitentiary population, for example.[5-9]

The first broader Brazilian study on the prevalence of viral hepatitis in the general population was conducted in São Paulo city around 25 years ago, involving 1,059 individuals. The prevalence of anti-HCV was 1.42%, with an increase *pari passu* with age progression, reaching 3.8% in individuals between 50 and 59 years old.[10] Subsequently, the HCV infection rate of 1.38% was described in a study carried out in the late 2000s in the set of capitals of each macro-region of Brazil and in the Federal District.[11]

Data from the literature on the prevalence and risk factors involved in HCV transmission, especially in small cities in more remote regions, need to be better elucidated. Additionally, Brazil is one of the signatory countries of the World Health Organization (WHO) targets to eliminate viral hepatitis by the year 2030.[4] The WHO has launched a proposal to reduce new infections by hepatotropic viruses by 60% and the mortality related to them by 95% in the next few years.[12] The Brazilian Hepatitis C Elimination Plan involving Tripartite Commission (represented by the Brazilian Federal, State, and Municipal governments) was approved in October 2017, and aims to achieve this goal by expanding access to prevention, diagnosis, and treatment of HCV.[4,13]

Given this scenario, the aim of this study is to estimate the prevalence of antibodies against HCV in users of Basic Health Units in a small town (Arcoverde city) in the Brazilian semi-arid region, describing the sociodemographic profile and risk behaviors.

## METHODS

This is a cross-sectional study of 800 adult outpatients of both genders conducted between July 2022 and March 2023. Participants were selected in a non-probabilistic way by slice through voluntary agreement. A slice was established for each of the Basic Health Units of 80 individuals in 10 different basic health units in a way that encompassed all areas of the urban region of Arcoverde city.

The municipality of Arcoverde occupies a total area of 344 km$^2$, with an urban area covering 13.4 km$^2$. This town has a population of 77,586 inhabitants, of which approximately 90% live in urban areas. It is considered a small town located in the semi-arid region in the state of Pernambuco, Northeast Brazil. Twenty-three out of its 25 Basic Health Units are in the urban area and two in the rural area.[14] Ten units located in the urban area were chosen to carry out the study, according to the distribution of the units by neighborhoods in order to cover all regions of the urban center. As the municipality does not have a map with the spatial distribution of each unit, an image taken from Google Maps was used, highlighting the unit. The city was divided into four quadrants that display the distribution of the units.

Considering a prevalence (p) of HCV infection in the order of 2.0% with a margin of error (d) of 1.0% and a reliability of 95% ($Z_{alfa/2}$ = 1,96), and applying the formula $n = [z^2 \times p \times (1 - p)]/d^2$ for infinite population, the minimum sample size was 745 sample units. To correct the sample for possible losses, a correction factor of 5% [100/ (100 – 95)] was applied, making a total of 785 individuals.[15]

Individuals who accessed the units for routine consultations or other reasons were recruited by open invitation in the waiting rooms of the 10 units through voluntary agreement, establishing a slice for each Basic Health Units of 80 individuals. Individuals under 18 years or those with a diagnosed cognitive disorder described in medical records that impaired them from understanding and answering the questionnaire were excluded.

For anti-HCV antibody assessment, the rapid test from the ABON HCV kit was employed by lateral flow immunochromatography, which allows the qualitative detection of the anti-HCV antibody in 50 microliters of whole blood obtained by finger stick. The outcome of interest was the presence or absence of HCV exposure. In a reserved room in the Basic Health Units, after signing the free and informed consent form and performing the rapid test, the patients answered the sociodemographic (gender, color, education), clinical and risk behavior (use of glass syringes, blood transfusion, surgery, use of illicit drugs, presence of tattoo, piercing, hemodialysis, transplant) questionnaire,

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and these were considered as independent variables. Additional information about treatment against HCV and negative HCV-RNA detection test data were obtained at the aforementioned Treatment Centers. Then, 20 minutes after testing, the participants were informed about the result. The positive cases were referred to the specialized medical service from the Municipality to confirm the result and learn applicable conduct.

Quantitative continuous variables were described as mean ± standard deviation. An approximation of the binomial distribution to the normal distribution was performed for percentages using the 95% confidence interval. Means between groups were compared by Student's t-test for independent samples. The percentages or frequencies were compared by Fisher's exact test and linear trend chi-square test. A significance level of 5% was adopted.

This study complied with the ethical precepts of Resolution 466/12 of the National Health Council of Brazil and was approved by the Research Ethics Committee of the Universidade Federal de Pernambuco under Certificate of Presentation for Ethical Consideration 55342422.3.0000.5208 and opinion. No. 5.236.629 (Approved on March 21, 2022).

## RESULTS

In waiting rooms, 800 individuals were tested, of which 636 (79.5%) were female and 164 (20.5%) male (p= 0.684). The age of participants ranged between 18 and 88 years, mean of 46.8 ± 15.8 years. The mean age for females was 46.1 years and for males 49.2 years.

The rapid test for anti-HCV detection was positive in five individuals (0.62%; 95%CI 0.2 – 1.4%), four women and one man. Four out of the five positive tests reported previous treatment against HCV and had negative HCV-RNA detection test. These data were obtained at the aforementioned Treatment Centers, upon confirmation of the sustained virological response. The only individual with positive result for anti-HCV antibody who did not report previous treatment was referred to the specialized medical service.

In the sociodemographic profile, the mean age of the five positive cases for anti-HCV stands out, 69.4 ± 6.7 years, which was much greater than the mean age of the negative cases, 46.7 ± 15.7 years (p= 0.001). All positive cases were over 60 years of age (Table 1).

**Table 1.** Sociodemographic characteristics of the 800 outpatients evaluated in the waiting rooms of 10 Basic Health Units, according to the presence/absence of anti-HCV antibody. Arcoverde, Pernambuco, Northeast Brazil, 2023.

| Variable | Anti-HCV [ + ] N (%) | Anti-HCV [ - ] N (%) | p-value |
|---|---|---|---|
| Gender | | | 0.684* |
| Male | 1(20) | 163(20.5) | - |
| Female | 49(80) | 632 (79.5) | - |
| Mean age (years) | 69.4±6.7 | 46.7±15.7 | 0.001** |
| Color | | | 0.650*** |
| White | 19(20) | 213(28.2) | - |
| Brown | 4(80) | 448(59.3) | - |
| Black | 0 | 88(11) | - |
| Yellow | 0 | 46(5.7) | - |
| Education | | | 0.862*** |
| 0 years | 0 | 34(4.2) | - |
| 1-5 years | 3(60) | 392(49.3) | - |
| High school | 1(20) | 285(35.8) | - |
| University education | 1(20) | 74(9.3) | - |
| Postgraduate education | 0 | 10(1.2) | - |

Legend: *Fisher's exact test. ** Unpaired student's t-test. *** Linear trend chi-squared

Among the risk behaviors of the 800 outpatients evaluated, note that all five anti-HCV positive cases had at least one of the following three risk factors due to parenteral exposure, e.g., use of glass syringes (p = 0.001), blood transfusion (p = 0.001) or surgery (p = 0.001) in the past, more frequently than negative cases (Table 2). None of the positive cases reported the use of illicit drugs, tattoos, or piercings.

**Table 2.** Risk behaviors in 800 adult outpatients evaluated in the waiting rooms of 10 Basic Health Units, according to the presence/absence of anti-HCV antibodies. Arcoverde, Pernambuco, Northeast Brazil, 2023.

| Variable | Anti-HCV [+] N(%) | Anti-HCV [-] N(%) | p-value * |
|---|---|---|---|
| Use of glass syringe | 3(60) | 251(31.5) | **0.001** |
| Use of illicit drugs | 0 | 14(1.7) | - |
| Presence of tattoo and/or piercing | 0 | 150(18.8) | - |
| Blood transfusion | 2(40) | 78(9.8) | 0.000 |
| Hemodialysis | 1(20) | 2(0.02) | - |
| Surgery | 4(80) | 495(62.2) | **0.001** |
| Transplant | 0 | 3(0.03) | - |

Legend: *Fisher's exact test.

## DISCUSSION

This was the first study to assess the occurrence of anti-HCV antibody in individuals in Arcoverde, a municipality in the Brazilian semi-arid region in the state of Pernambuco, revealing a prevalence of 0.62% (95%CI 0.2 – 1.4%). These results align with the latest estimates by the Brazilian Ministry of Health of around 0.53%, corresponding to about 1,091,000 individuals with positive anti-HCV in Brazil in 2016.[4] These figures correspond to about half of the estimates for the 1990s and 2000s.[10,11] Greater control in blood banks, the use of disposable syringes and needles, as well as the use of antivirals were certainly responsible for the reduced occurrence of this infection in the last 30 years.[1] Furthermore, these initial studies, although population-based with household data collection, were conducted in the most populous capitals of the country and did not

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involve cities with lower population density, as in the present study. Our study was carried out with sample data from outpatients selected in waiting rooms for medical appointments of the basic health service in a municipality with less than 80,000 inhabitants in the semi-arid region of the state of Pernambuco.

Additionally, another population-based study carried out in Cavunge, a small town in the semi-arid region of the state of Bahia, involving approximately 75% of the population of the municipality of 2,000 inhabitants, found positivity for anti-HCV antibody in six out of 1,536 individuals (0.4%) tested.[16] Interestingly, this study from Bahia found only one of the six patients with viremia, but there were no reports of previous treatments against HCV. It is plausible to assume that the five patients with negative HCV-RNA achieved spontaneous cure or may have showed false-positive results for anti-HCV antibody. The mean age of individuals from the Bahia study was low, which may have favored the spontaneous cure of HCV infection in the younger ones.

A study with a very similar design to ours was developed at the University Hospital in São Paulo [UNIFESP] with 606 adult patients over 45 years old, half of whom came from the outpatient clinics and half from the Emergency service. Four anti-HCV positive cases were detected (0.66%), and all had viremia and reported risky behavior. Note that this study involved older patients and no differences between gender were observed.[17] This prevalence was very similar to that observed in the Arcoverde city, and greater attention should be paid to the detection of anti-HCV in older adults.

In another study carried out at a Basic Health Unit in São José dos Pinhais, state of Paraná, 13 positive cases for the rapid test for anti-HCV were found in a sample of 5,017 individuals, i.e., a prevalence of 0.30% (95%CI: 0.12% – 0.40%).[12] As in our sample, most individuals selected in the waiting rooms of the Basic Health Units in Paraná were female. The predominance of females in outpatient clinics has been described by other authors.[17] One of the explanations for the divergence between the male and female sex may be women's greater concern about their health and their more frequent search for medical care.

Unlike our study, where four out the five anti-HCV positive cases were among females (80%), in the study in São José dos Pinhais, most positive cases were among males (0.57%).[18] This gender discrepancy between the positive cases of the two studies may be explained by the smaller size of our sample, since estimated assessment by the Brazilian Ministry of Health describe a predominance of anti-HCV positive test in males.[4] In addition, it is already known that the predominance of females observed in the sample is explained by the higher demand of females in basic health units.

Regarding age distribution, in the Paraná survey, no differences were observed between mean ages of positive and negative cases. However, in our study, positive cases had a higher mean age (69.4 years) than negative (46.81 years). Time series studies show that individuals born in the three decades after World War II, between 1945 and 1975, called baby boomers, have a higher prevalence of HCV infection.[19] These individuals are presently over 50 years old and report a history of blood transfusion and use of non-disposable syringes or needles before the availability of anti-HCV tests.[19]

In our study, all cases with positive tests were over 60 years old and reported using non-disposable syringes, and having transfusions and surgeries in the past, possibly before the 1990s. However, none of the five anti-HCV positive cases reported other risk behaviors, such as illicit drugs, tattoos, or piercings, which reinforces the hypothesis of contamination through parenteral exposure in the past.

In addition, a few years ago, 97 former soccer players from the 1960s and 1970s were screened in the state of Pernambuco. Seven individuals (7.2%) were positive for anti-HCV, and the univariate analysis associated the infection with a history of transfusions, surgeries and use of vitamin complexes with non-disposable syringes. However, in the multivariate analysis to neutralize potential confounders, only the use of glass syringes remained an independent predictor for anti-HCV positivity (p = 0.001).[20]

A more recent study carried out in Minas Gerais, Southeast Brazil, involving 24,085 individuals, found 184 (0.76%) positive cases for anti-HCV, approximately 80.0% of those infected were born between the 1950s and 1980s and reported sharing needles or having tattoos and piercings.[21] Recent North American data suggest a bimodal incidence in age distribution of HCV infection, with peaks below 40 years attributed to the use of illicit injectable drugs, tattoos or piercings, and above 50 years (baby boomers) to blood transfusions and non-disposable syringe sharing.[1]

The main limitation of our study may have been the place where participants were recruited, i. e., the waiting rooms of Basic Health Units. Many of these individuals could attend these health units to control chronic diseases, such as arterial hypertension, diabetes mellitus or dyslipidemia, which eventually may have overestimated the prevalence of anti-HCV in this sample. Hence, patients with these diseases attend health services and undergo medical examinations, providing a greater risk of contamination. On the other hand, the lower representation of males in the sample may have led to a lower prevalence of positive anti-HCV antibody, since studies generally associate a higher risk of HCV contamination to males.[4] Moreover,

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the inclusion criterion of 18 years old or over may have underestimated the prevalence of positive results for anti-HCV antibody in this screening. If the age limit for inclusion in the study protocol had been above 50 years, probably the antibody positivity might have been higher. However, the objective of the study was to enroll the entire adult population of the municipality in a small town in the Brazilian semi-arid region to evaluate the sharing of syringes and needles, and having tattoos and piercings in younger people as well.

In conclusion, a low prevalence of HVC exposure was observed in this study, although close to that which has been estimated in recent studies in Brazil, with antibody positivity more frequent in older people and who reported past risky behaviors.[16,17,21] Data may contribute to the development of policies for tracking and diagnosing HCV infection, as well as increasing access to treatment, with a view to eliminating this viral agent, including small municipalities in remote regions of Brazil by 2030. Therefore, in smaller municipalities, greater attention should be given to older adults (baby boomers) since the use of illicit drugs, tattoos, and piercings is rarely reported in these locations.

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## AUTHORS' CONTRIBUTIONS

**Maria Tereza Estevam Vaz** contributed to the bibliographic research, execution of the research with the performance of the tests, writing of the abstract, introduction, methodology, discussion, interpretation and description of the results, preparation of tables, conclusions, review and statistics. **Lílian Rose Maia Gomes de Araújo** contributed to the bibliographic research, writing of the abstract, introduction, methodology, discussion, interpretation and description of the results, preparation of tables, conclusions, review and statistics. **Andrea Batista Dória** contributed to the project administration, bibliographic research, writing of the abstract, introduction, methodology, discussion, interpretation and description of the results, conclusions, review and statistics. Relevant critical review of the intellectual content. **Norma Arteiro Filgueira** contributed to the writing of the abstract, methodology, interpretation of the results, conclusions, review and statistics. Relevant critical review of the intellectual content. **Paula Carolina Valença Silva** contributed to the writing of the abstract, review and statistics. Relevant critical review of the intellectual content. **Alcides da Silva Diniz** contributed to the writing of the abstract, review and statistics. Relevant critical review of the intellectual content. **Ana Lúcia Coutinho Domingues contributed** to the writing of the abstract, review and statistics. Critical review of the relevant intellectual content. Final approval of the version to be published. **Edmundo Pessoa Lopes** contributed to the project administration, bibliographic research, writing of the abstract, introduction, methodology, discussion, interpretation and description of results, conclusions, review and statistics. Critical review of the relevant intellectual content. Final approval of the version to be published.

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