

## HEPATITIS B AND C AND SYPHILIS: PREVALENCE AND CHARACTERISTICS ASSOCIATED TO COINFECTION AMONG SEROPOSITIVE INDIVIDUALS

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**ABSTRACT:** This study aimed to determine the prevalence, epidemiology and characteristics associated with coinfection with hepatitis B virus, hepatitis C virus and syphilis among individuals infected by the human immunodeficiency virus. Quantitative study that used documentary analysis of notes included in the medical records by the multidisciplinary staff from 323 patients' records from 10 cities in the state of Goiás. Data was collected from June to November 2016 at a Specialized Care Service (SAE) for people living with HIV/AIDS and viral hepatitis. The serological tests conducted showed a prevalence of coinfection of 54 (19%) for hepatitis B, seven (2,3%) for hepatitis C, and 51 (16,2%) for syphilis. The coinfections were related to age, marital status, multiplicity of sexual partners and low adherence to condom use during sexual intercourse. The results of this study may contribute to the planning and implementation of health activities, providing guidance on preventive measures targeted to groups vulnerable to coinfection.

**DESCRIPTORS:** Sexually transmissible diseases; Health profile; Serological Tests; Epidemiology.

### HEPATITES B, C E SÍFILIS: PREVALÊNCIA E CARACTERÍSTICAS ASSOCIADAS À COINFEÇÃO ENTRE SOROPOSITIVOS

**RESUMO:** Objetivou-se determinar a prevalência, perfil epidemiológico e as características associadas à infecção pelo vírus da hepatite B, C e sífilis entre indivíduos infectados pelo vírus da imunodeficiência humana. Estudo quantitativo, por meio de análise documental das anotações de consultas feitas e documentadas em prontuário pela equipe multiprofissional de 323 prontuários cadastrados e/ou em acompanhamento, provenientes de dez municípios do Estado de Goiás, com coleta de dados entre os meses de junho e novembro de 2016 no Serviço de Assistência Especializada. Do total de sorologias analisadas, observou-se prevalência de infecção de 54 (19%) para hepatite B, sete (2,3%) hepatite C e 51 (16,2%) sífilis. As infecções estiveram relacionadas à idade, estado civil, multiplicidade de parceiros sexuais e baixa adesão ao uso do preservativo durante o intercurso sexual. Os resultados desta investigação poderão contribuir no planejamento e implementação de ações de saúde, orientando medidas preventivas para grupos vulneráveis à infecção.

**DESCRIPTORES:** Doenças sexualmente transmissíveis; Perfil de saúde; Testes sorológicos; Epidemiologia.

### HEPATITIS B, C Y SÍFILIS: PREVALENCIA Y CARACTERÍSTICAS ASOCIADAS A LA COINFECCIÓN ENTRE SOROPOSITIVOS

**RESUMEN:** Fue objetivo del estudio establecer la prevalencia, el perfil epidemiológico y las características asociadas a la co-infección por el virus de la hepatitis B, C y sífilis entre individuos infectados por el virus de la inmunodeficiencia humana. Estudio cuantitativo, realizado por medio del análisis documental de los apuntes de consultas y documentados en prontuario por el equipo multiprofesional de 323 prontuarios registrados y/o en acompañamiento, provenientes de diez municipios del Estado de Goiás. Los datos fueron obtenidos entre los meses de junio y noviembre de 2016 en el Servicio de Asistencia Especializada. Del total de sorologías analizadas, se observó prevalencia de co-infección de 54 (19%) para hepatitis B, siete (2,3%) hepatitis C y 51 (16,2%) sífilis. Las co-infecciones se relacionaban a la edad, al estado civil, multiplicidad de parejas sexuales y baja adhesión al uso del preservativo durante la relación sexual. Los resultados de la investigación podrán contribuir para el planeamiento e implementación de acciones de salud, orientando medidas preventivas para grupos vulnerables a la co-infección.

**DESCRIPTORES:** Enfermedades sexualmente trasmisibles; Perfil de salud; Pruebas sorológicas; Epidemiología.

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## ● INTRODUCTION

Sexually transmitted diseases (STDs) are a major public health problem worldwide, which has a significant socioeconomic impact, especially in developing countries<sup>(1)</sup>. With the availability for free of the antiretroviral therapy (HAART) for the treatment of HIV-infected individuals in 1996 there has been a decrease by 49% in the mortality rates by Acquired Immunodeficiency Syndrome (AIDS) and decrease by 7.5 in hospital admissions, corroborating the effectiveness of the referred treatment<sup>(2-3)</sup>. As a result of the increased life expectancy and improved quality of life provided by the HAART, HIV/Hepatitis B virus (HBV); HIV/Hepatitis C virus (HCV) and HIV/ *Treponema pallidum* (Syphilis) coinfections have become major causes of morbidity and mortality among seropositive individuals<sup>(4)</sup>.

As these infections share similar transmission routes and risk factors, the prevalence rate of coinfections HIV/Hepatitis B and C and HIV/syphilis is highly variable, being influenced by demographic aspects, life style, sexual behavior and access to health services<sup>(5-6)</sup>. It is estimated that approximately 35 million people are HIV-positive, 350 and 180 million people are chronically infected with HBV and HCV, respectively, and 12 million new cases of syphilis occur each year among HIV- positive individuals in the world<sup>(7-9)</sup>.

Previous studies<sup>(4,10)</sup> revealed that about 20 to 30% of HCV patients and 4 to 10% of individuals chronically infected with HBV are HIV positive. HIV/ Syphilis coinfection occurs in approximately 0.6% of the HIV- positive population, although the prevalence is higher among men who have sex with men, sex workers, prison population and injecting drug users, with rates ranging from 2.7% to 24.4%<sup>(3,11)</sup>.

Investigating the presence of coinfection with HBV, HCV and syphilis in HIV-positive individuals is a very important to public health, since it provides information to support decision making and the allocation of public resources to prevention and treatment. The findings of this study may contribute to the assessment of the rates of viral hepatitis and syphilis of people living with HIV/AIDS and provide guidance on preventive measures for groups that are more vulnerable to coinfection.

Therefore, the present study aimed to assess the prevalence, the epidemiological profile and the risk factors associated with coinfection with HBV, HCV, and *T. pallidum* among HIV- infected individuals from 10 cities in the Southwest of the state of Goiás.

## ● METHOD

Quantitative and descriptive study that assessed sociodemographic, behavioral and serological data concerning current or previous infection with HBV, HCV, and *T. pallidum*, the bacterium that causes syphilis, among HIV-infected individuals.

The study used secondary data records with analysis of records of HIV-positive individuals aged 18 or over from 10 cities in the Southwest of Goiás: Aporé, Caiapônia, Chapadão do Céu, Doverlândia, Jataí, Mineiros, Perolândia, Portelândia, Serranópolis, Santa Rita do Araguaia, registered at the SAE of the city of Jataí-GO from 2008 to November 2016.

The inclusion criteria of the study were: individual who tested positive for HIV, with patients' records registered at SAE of Jataí from January 2008 to November 2016, aged 18 years or older. All the patients' records containing insufficient information related to serology, demographic data and risk factors or were unavailable at the time of data collection or whose information was unavailable during data collection were excluded.

The sample of the study consisted of 323 patients' records registered at SAE/Jataí. Data was collected from June to November 2016. The information was obtained from document analysis of records of consultations made by the multidisciplinary staff of the service, and the data was compiled for an instrument developed by the authors.

The instrument was divided into three parts: 1) Sociodemographic variables: age, skin color, gender, marital status, education; 2) Risk factors for coinfection: condom use, type of sex, number of sexual partners, alcohol and illicit drug use; 3) History of serological tests performed: VDRL, HBsAg, Anti-HBc

Total, Anti-HCV<sup>(12)</sup>.

Three age groups were established according to the criteria of the authors of the study: 18-34 years; 35-54 years and  $\geq 55$  years.

The data was submitted to descriptive analysis with the use of the Statistical Package for Social Sciences (SPSS) software, version 22.0, and the results were expressed as absolute and relative frequencies.

Sociodemographic and behavioral variables were considered independent and were included in a multivariate Poisson regression model with robust variance. Prevalence ratio (PR) with a confidence interval of 95% (CI 95%) was used to estimate possible associations between the variables. The level of significance was  $p \leq 0.05$ .

The presents study was approved by the Research Ethics Committee for studies with humans of Universidade Federal de Goiás under no 1578125, according to the recommendations of Resolution 466/2012<sup>(13)</sup>.

## ● RESULTS

The study comprised 323 patients' records registered at the SAE, and sociodemographic data of the patients is shown in Table 1.

Table 1 - Sociodemographic characteristics of HIV-positive individuals assisted at the Specialized Care Service. SAE. Jataí, GO, Brazil, 2016

| Characteristic              | n   | (%)  |
|-----------------------------|-----|------|
| Gender                      |     |      |
| Male                        | 175 | 54.2 |
| Female                      | 148 | 45.8 |
| Age                         |     |      |
| 18-34                       | 94  | 29.1 |
| 35-54                       | 191 | 59.1 |
| $\geq 55$                   | 38  | 11.8 |
| Marital Status              |     |      |
| Married/Stable relationship | 23  | 7.1  |
| Widowed/Separated/Divorced  | 110 | 34.1 |
| Single                      | 185 | 57.3 |
| Skin color                  |     |      |
| White                       | 83  | 25.7 |
| Black†                      | 49  | 15.2 |
| Brown†                      | 190 | 58.8 |
| Yellow†                     | 1   | 0.3  |
| Education                   |     |      |
| Early Childhood Education   | 27  | 8.4  |
| Elementary Education        | 71  | 22   |
| Secondary Education         | 27  | 8.4  |
| Higher Education            | 18  | 5.6  |

†Not White

Source: Specialized Care Service (SAE) Jataí, GO, Brazil

The prevalence of coinfections is shown in Table 2. The presence of at least one HBV marker (HBsAg and/or anti-HBc (total)) was detected in 54 (19%) serological tests analyzed. There were positive results of hepatitis C in seven (2.3%) serological tests, and HIV/syphilis was detected in 51 (16.2%) of the VDRL tests, with coinfection prevalent in male individuals.

Table 2 - Prevalence of distribution of coinfection with HIV and of Anti-HCV, HBsAg, anti-HBc-total and VDRL markers in 323 patients' records available and analyzed at the SAE. Jataí, GO, Brazil, 2016

| Marker           | Man |      | Woman |      | Total:<br>Serological tests (+) |      | Available<br>Serological<br>tests<br>n |
|------------------|-----|------|-------|------|---------------------------------|------|--|
|                  | n   | %    | n     | %    | n                               | %    |  |
| Anti-HCV         | 5   | 1.6  | 2     | 0.7  | 7                               | 2.3  | 306                                    |
| HBsAg            | 2   | 0.6  | 1     | 0.3  | 3                               | 0.9  | 288                                    |
| Anti-HBc (Total) | 28  | 10   | 23    | 8.2  | 51                              | 18.1 | 281                                    |
| VDRL             | 30  | 9.5  | 21    | 6.7  | 51                              | 16.2 | 315                                    |
| Total            | 65  | 21.7 | 47    | 15.9 | 112                             | 37.6 | 1190                                   |

Source: SAE. Jataí, GO, Brazil.

Tables 3 and 4 show the results of multivariate analysis for factors potentially associated with HIV coinfection and exposure to HBV (HBsAg and/or anti-HBc (total)), HCV and syphilis. As it can be seen, marital status appeared to affect serological detection of all the analyzed infectious agents.

Table 3 – Association and prevalence ratio between the outcomes and sociodemographic variables. SAE. Jataí, GO, Brazil, 2016

| Risk factors                   | VDRL +         |                  | HCV +          |                  | HBC +          |                  | HBsAg +        |                  |
|--------------------------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|
|                                | %              | PR (CI 95%)      |
| Marital status                 | <b>p=0.046</b> |                  | <b>p=0.026</b> |                  | p=0.525        |                  | <b>p=0.022</b> |                  |
| Married/Stable relationship    | 11             | 1                | 2.3            | 1                | 21.1           | 1                | 6.1            | 1                |
| Widowed/Separated/<br>Divorced | 9.1            | 0.99 (0.93–1.06) | 0              | 0.99 (0.97–1.01) | 23.8           | 1.01 (0.92–1.11) | 0              | 0.97 (0.95–0.99) |
| Single                         | 20.7           | 1.04 (1.01–1.09) | 2.3            | 1.00 (0.98–1.01) | 16.3           | 0.98 (0.93–1.02) | 0.6            | 0.97 (0.95–0.99) |
| Sex                            | p=0.506        |                  | p=0.332        |                  | p=0.853        |                  | p=0.328        |                  |
| Male                           | 17.4           | 1                | 3              | 1                | 18.5           | 1                | 3.2            | 1                |
| Female                         | 14.4           | 0.99 (0.95–1.03) | 1.4            | 0.99 (0.98–1.01) | 17.7           | 0.99 (0.96–1.04) | 1.5            | 0.99 (0.97–1.01) |
| Age                            | p=0.555        |                  | <b>p=0.025</b> |                  | <b>p=0.001</b> |                  | p=0.631        |                  |
| 18 to 34                       | 16.7           | 1                | 0              | 1                | 6.3            | 1                | 1.2            | 1                |
| 35 to 54                       | 17             | 1.01 (0.96–1.46) | 3.3            | 1.02 (1.01–1.03) | 22.5           | 1.08 (1.04–1.21) | 2.8            | 1.01 (0.99–1.02) |
| ≥55                            | 10.8           | 0.97 (0.92–1.03) | 2.9            | 1.01 (0.99–1.04) | 24.2           | 1.09 (1.01–1.16) | 2.9            | 1.01 (0.99–1.02) |
| Education                      | p=0.080        |                  | p=0.312        |                  | p=0.690        |                  | p=0.131        |                  |
| Early Childhood Education      | 24             | 1                | 0              | 1                | 13             | 1                | 8.7            | 1                |
| Elementary Education           | 8.5            | 0.93 (0.86–1.01) | 1.5            | 1.08 (0.99–1.02) | 20.3           | 1.03 (0.96–1.12) | 0              | 0.96 (0.91–1.01) |
| Secondary Education            | 21.7           | 0.99 (0.89–1.10) | 0              | 1 (1–1)          | 12             | 0.99 (0.91–1.09) | 0              | 0.96 (0.91–1.01) |
| Higher Education               | 27.8           | 1.02 (0.90–1.14) | 0              | 1 (1–1)          | 12.5           | 0.98 (0.90–1.10) | 0              | 0.96 (0.91–1.01) |

PR, prevalence ratio; CI 95%, confidence interval of 95%.

Source: SAE, Jataí, GO, Brazil.

Table 4 – Association and prevalence ratio between the outcomes and behavioral variables. SAE. Jataí, GO, Brazil, 2016

| Risk factors       | VDRL + |                  | HCV + |                  | HBC + |                  | HBsAg + |                  |
|--------------------|--------|------------------|-------|------------------|-------|------------------|---------|------------------|
|                    | %      | PR (CI 95%)      | %     | PR (CI 95%)      | %     | PR (CI 95%)      | %       | PR (CI 95%)      |
| Sex without condom |        | p=0.612          |       | p=0.149          |       | <b>p=0.001</b>   |         | p=0.149          |
| No                 | 33.3   | 1                | 0     | 1                | 0     | 1                | 0       | 1                |
| Yes                | 19.8   | 0.94 (0.75–1.19) | 2.5   | 1.01 (0.99–1.03) | 20.3  | 1.10 (1.06–1.15) | 2.6     | 1.01 (0.99–1.03) |
| Type of sex        |        | p=0.152          |       | p=0.692          |       | p=0.276          |         | <b>p=0.012</b>   |
| Heterosexual       | 15.5   | 1                | 1.8   | 1                | 19    | 1                | 3.8     | 1                |
| Bisexual           | 28.6   | 1.06 (0.95–1.18) | 7.1   | 1.03 (0.96–1.10) | 7.7   | 0.95 (0.88–1.02) | 0       | 0.98 (0.97–0.99) |
| Homosexual         | 30     | 1.07 (0.99–1.15) | 3.2   | 1.01 (0.97–1.04) | 11.5  | 0.97 (0.91–1.03) | 0       | 0.98 (0.97–0.99) |
| Partner            |        | p=0.226          |       | p=0.793          |       | <b>p=0.007</b>   |         | p=0.935          |
| One                | 13.3   | 1                | 3.4   | 1                | 6.9   | 1                | 3.5     | 1                |
| Multiple           | 20.6   | 1.03 (0.98–1.09) | 4.2   | 1.01 (0.97–1.06) | 21.8  | 1.07(1.02–1.13)  | 3.3     | 0.99 (0.97–1.03) |
| Alcohol use        |        | p=0.362          |       | p=0.123          |       | p=0.418          |         | p=0.695          |
| No                 | 14.7   | 1                | 2     | 1                | 19.1  | 1                | 2.1     | 1                |
| Social drinker     | 18     | 1.01 (0.96–1.07) | 4     | 1.01 (0.98–1.04) | 14.6  | 0.98 (0.92–1.04) | 2.1     | 1 (0.98–1.03)    |
| Chronic drinker    | 25.6   | 1.05 (0.98–1.13) | 0     | 0.99 (0.98–1.01) | 26.5  | 1.03 (0.96–1.11) | 5.4     | 1.02 (0.98–1.06) |
| Drugs              |        | <b>p=0.040</b>   |       | p=0.469          |       | p=0.276          |         | <b>p=0.041</b>   |
| No                 | 13.4   | 1                | 2.9   | 1                | 17.6  | 1                | 3       | 1                |
| Yes                | 30.3   | 1.08 (1.01–1.16) | 6.1   | 1.01 (0.97–1.06) | 10.3  | 0.97 (0.91–1.07) | 0       | 0.98 (0.97–0.99) |

PR, prevalence ratio; CI 95%, confidence interval of 95%.

Source: SAE. Jataí, GO, Brazil.

Individuals older than 35 years were found to be more vulnerable to coinfection with HBV (HBC +:  $p = 0.001$ ; PR = 1:09 - 1:01- 1:16) and HCV ( $p = 0.025$ ; PR = 1:02 - 1:01-1:03). Unprotected sex, multiple partners and type of sex were main behavioral factors associated with coinfection with HIV/HBV. Use of drugs was crucial for infection with *T. pallidum* ( $p = 0.040$ ; OR = 1.0), and had a negative influence on coinfection with HBV.

## ● DISCUSSION

Seropositive individuals are more susceptible to coinfection with other STDs, and the frequency of this combination can be directly related to exposure to the prevalent risk factors of this population. Sexual risk associated with low adherence to condom use and multiplicity of sexual partners is highly prevalent factors among seropositive individuals with coinfection. The combination of risk factors, seropositivity and presence of serological markers for HBV, HCV, and *T. pallidum*, also present in this study, reveals statistically that married heterosexual individuals over 35 years old, exposed to alcohol and illicit drugs, are the most vulnerable individuals to some type of coinfection<sup>(5,14-15)</sup>.

HIV/HBV association was present in 19% of the serological tests analyzed, revealing a prevalence lower to the one found in studies in the Northern and Southern regions of the country where the HBV detection rates were greater than 23%<sup>(1-2)</sup>. A study conducted in Brazil's Center-Western region<sup>(5)</sup> showed that the prevalence of this coinfection in 2015 was 33.5%, about 1.8 times higher than in our study, confirming the variability of this coinfection according to the period, the geographic region and risk and transmission factors to which the study population is exposed.

The data obtained in this investigation showed that increase in detection rates of HBV was directly proportional to age, with significant risk in the age groups over 55 years. This relationship between increased detection rates and aging may be associated with behavioral aspects acquired throughout life, such as frequent unprotected sex and use of alcohol and drugs. A study found that individuals aged 40-49 and 50 or older are respectively 4.9 and 7.3 times more likely to become infected with HBV

compared to the younger age group<sup>(16)</sup>. This trend may be related to the introduction of drugs for the treatment of erectile dysfunction in the 1990s, in Brazil, which increased the frequency of this infection among the population groups infected in adulthood<sup>(17)</sup>.

Although there are different risk factors for coinfection with HIV/HBV and HIV/HCV<sup>(12)</sup>, marital status had a significant impact on coinfections in this study, particularly when the presence of HCV markers was detected, suggesting that the risk of sexual transmission was predominant in this investigation

Regarding sexual transmission of HCV, several authors found a 0% to 27% variation in the mode of transmission in the general population and among specific populations such as homosexuals, sex workers and injecting drug users. This mode of transmission has increased compared to that of the general population<sup>(18-19)</sup>.

The prevalence of HCV detection among seropositive individuals varies between 3.3% (20) to 54.7% (21), according to the region and study design adopted. In this study, we found that 2.3% of the anti-HCV positive tests analyzed had positive serological markers. Studies on the prevalence of HCV in Brazil are scarce and inaccurate, often conducted in specific geographical areas or with specific populations such as blood donors<sup>(15,22)</sup>.

Coinfection with HIV and Syphilis is common among patients assisted at public health services and could be reduced with condom use during sexual activity. After the introduction of the HAART there has been an increase in the rates of unprotected sex and an unreasonable lack of concern with the necessary precautions to avoid transmission or infection by STDs, and this fact has influenced the detection rates of these pathologies<sup>(23)</sup>. The prevalence of coinfection with HIV/syphilis in this study was 16.2%, higher than that observed in studies with seropositive population conducted in Rio de Janeiro (2.7%)<sup>(24)</sup> and Londrina (8.7%)<sup>(25)</sup> and lower than the prevalence rate found in Porto Alegre (20.5%)<sup>(7)</sup>.

Marital status and exposure to drugs were significantly associated with the diagnosis of syphilis, and the percentage (11%) of married individuals who were coinfecting may lead to the false idea that people bound by marriage are less likely to contract STD's. Use of alcohol and drugs are among the major factors that contribute to the transmission of infectious agents, being associated with risk behaviors, such as multiple sexual partners, sex work and no use of condom<sup>(26-27)</sup>.

One limitation of this study, which used secondary data records, is the lack of valuable information, either due to underreporting or to technical failure during patient follow-up. Since this is a retrospective study based on analysis of medical records, its main limitations concern the underreporting of information related to sexual orientation, drug use (licit and illicit) and the sexual behavior of the individuals registered at the SAE.

The findings of this study may contribute to the planning and implementation of health actions targeted to population groups more vulnerable to coinfections, as well as to the assessment of the impact of viral hepatitis and syphilis on people living with HIV/AIDS.

## ● CONCLUSION

In view of the aforementioned, the prevalence of coinfections was mostly related to age, marital status and use of drugs. The mechanisms of transmission were mostly sex, depending on the number and types of partners, as well as poor or non-adherence to the use of condoms during sexual intercourse. This study draws attention to the importance of ensuring all the relevant information is available and accessible when needed in patients' records and of investigating the causes of underreporting, since many health care services in Brazil lack information necessary to provide a more accurate picture of the health status of the population.

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