Syphilis Reactivity in Blood Donors: Analysis in Blood Banks from Two Cities in the Colombian Caribbean

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Abstract

Introduction: Syphilis, caused by *Treponema pallidum*, is a sexually transmitted infection considered a global public health problem due to its silent course and potential severe complications if not treated promptly.

Objective: To describe serological reactivity to syphilis among blood donors from two cities in the Colombian Caribbean between 2021 and 2023.

Materials and Methods: A descriptive, cross-sectional, and retrospective study was conducted using secondary data from participating blood banks. Donors with reactive syphilis tests were included, and sociodemographic variables as well as coinfections with other infectious markers were analyzed. Descriptive and comparative statistical analyses were performed using GraphPad Prism 8.

Results: A total of 904 donors with reactive syphilis tests were identified: 42% in Cartagena and 58% in Sincelejo. Of these, 77.6% were male, a statistically significant difference ($p = 0.008$). The median age was 38 years, with the 29–39 age group being the most prevalent. Annual positivity rates exceeded the national average throughout the study period. Coinfection with other markers was found in 9.6% of cases, with hepatitis B virus being the most frequent.

Conclusion: Syphilis reactivity among blood donors in the Colombian Caribbean was higher in men and consistently above the national average. Although it was not possible to differentiate between active and past infection, the findings help identify key populations and guide prevention strategies for syphilis and other sexually transmitted infections.
Keywords: Syphilis; Blood donors; **Treponema pallidum;** Sexually transmitted infections.

Introduction

Syphilis is a bacterial infection caused by *Treponema pallidum*, transmitted primarily through sexual contact and from mother to child during pregnancy. Transmission through transfusion of blood components (except plasma) from infected donors has also been documented. The spirochete can affect multiple organs and manifest in a wide spectrum, ranging from asymptomatic stages to chronic conditions across different clinical phases (1,2). Despite the availability of effective treatments, syphilis remains a global public health problem. In 2022, the World Health Organization (WHO) estimated approximately eight million cases among adults aged 15 to 49 years (3).

In Colombia, for 2021, the projected prevalence of syphilis was approximately 280,654 cases per 100,000 inhabitants, although no official reports exist for the general population, as epidemiological surveillance is focused on gestational and congenital syphilis. These indicators have exceeded national targets in the past five years (4–6).

Blood donation represents a potential route of transmission for infections, including syphilis; therefore, surveillance in blood banks is essential to estimate the prevalence of infectious markers and guide preventive strategies. Previous studies in Colombia have reported syphilis prevalence in blood donors ranging between 0.93% and 1.68% (6–9). However, in cities such as Cartagena and Sincelejo, no recent studies have been conducted in the general population, making blood bank records the most reliable source to describe the behavior of this infection and to provide evidence for the design of public policies and prevention programs.

In this context, the present study describes serological reactivity to syphilis among blood donors from two cities in the Colombian Caribbean during 2021–2023, with the aim of providing useful epidemiological data to identify risk groups and guide health promotion and sexually transmitted infection (STI) prevention strategies.

Materials and Methods

A descriptive, cross-sectional, and retrospective study with a quantitative approach was conducted, using databases from the participating blood banks and annual reports from the National Blood Bank Network of Colombia issued by the National Institute of Health.

Study population

All blood donors with reactive results for syphilis on two treponemal tests using the ELISA technique, registered in the participating blood banks between 2021 and 2023, were included.

Participating institutions

- **Institution 1:** Category A blood bank, humanitarian in nature, with high donor recruitment capacity, located in Cartagena (Bolívar).
- **Institution 2:** Private, independent blood bank with no direct affiliation to public or governmental entities, located in Sincelejo (Sucre).

Variables

The following variables were analyzed: sociodemographic data (age and gender) and results of tests for other infectious markers, including human immunodeficiency virus (HIV), human T-lymphotropic virus (HTLV), hepatitis C virus (HCV), hepatitis B virus (HBV), and *Trypanosoma cruzi*.

Statistical Analysis

Data were organized in Microsoft Excel 365 and subsequently processed using GraphPad Prism 8. Data normality was assessed. Univariate and bivariate analyses were performed. Qualitative variables were expressed as absolute frequencies and percentages. Associations were evaluated using contingency tables and the Chi-square test, considering a p-value <0.05 as statistically significant. To compare age distribution between groups, the Mann–Whitney test was applied, with $p < 0.05$ considered statistically significant.

Ethical Considerations

According to Resolution 008430 of 1993 issued by the Colombian Ministry of Health, this study was classified as "risk-free." Authorization was obtained from the participating institutions for the use of the information.

Results

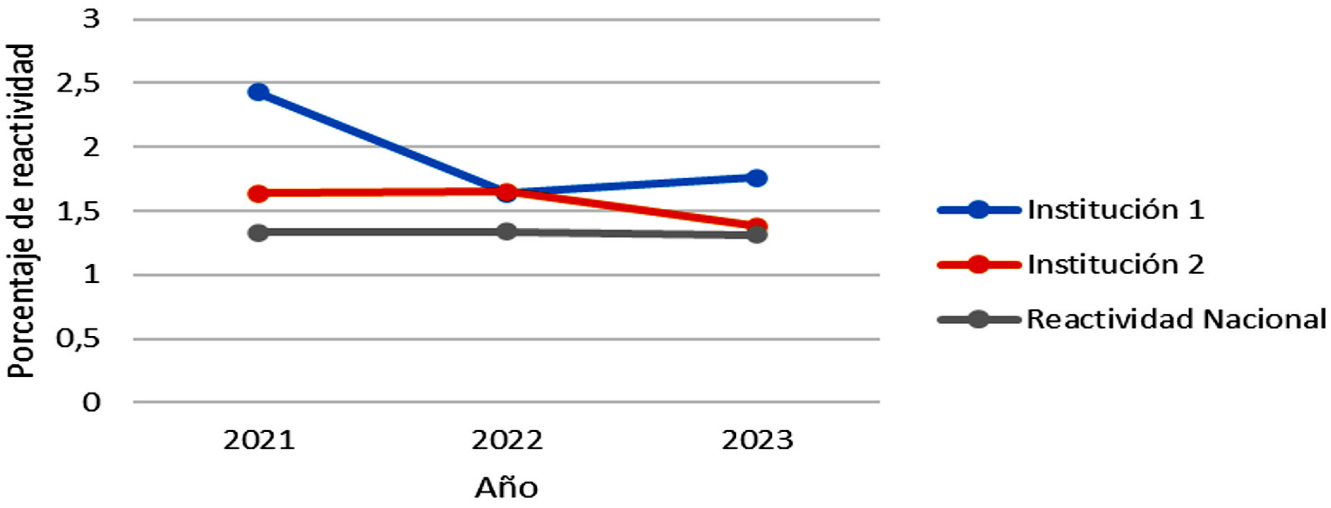
The study population consisted of 904 blood donors with reactive syphilis tests during the 2021–2023 period, of which 42% corresponded to Institution 1 and 58% to the blood bank in Sincelejo.

When analyzing the distribution of cases across the study period, Insti-

tution 1 showed the highest frequency of reactivity in 2021, accounting for 45% of the cases during the period, with a positivity rate of 2.43%, followed by a decreasing trend. In contrast, Institution 2 reported the highest frequency in 2022, with a positivity rate of 1.65%, although the absolute number of cases remained similar across the three years.

It is noteworthy that in both institutions, positivity rates were consistently higher than the national average throughout the study period (Figure 1).

Figure 1. Percentage of reactivity for syphilis during the period 2021-2023



Of the participants, 77.6% were men. Institutional analysis showed that syphilis reactivity was 2.7 times higher in men than in women at Institution 1 and 4.2 times higher at Institution 2. The association between male sex and syphilis reactivity was statistically significant (p = 0.008). The median age of reactive donors was 38 years. The highest frequency of cases was observed in young adults (29–39 years), with a progressive decline as age increased. No significant differences were found in age distribution between the institutions (p = 0.098). Regarding coinfection with other infectious markers, 9.6% of syphilis-reactive donors tested positive for more than one agent. This frequency was 10.2% in Institution 1 and 9.2% in Institution 2, with no statistically significant differences (p = 0.625). The most frequent marker was hepatitis B virus (4.2%), followed by hepatitis C virus (0.6%) (Table 1).

Table 1. Comparison of variables in syphilis-reactive blood donors from two institutions in the Colombian Caribbean.

		Institución 1 N=383 (%)		Institución 2 N=521 (%)		p-valu e	Total, general N=904 (%)	
Año	2021	175	45,7%	168	32,2%		37,9%	343
	2022	99	25,8%	191	36,7%		32,1%	290
	2023	109	28,5%	162	31,1%		30,0%	271
Sexo	Hombre	281	73,4%	421	80,8%	0,008	77,7%	702
	Mujer	102	26,6%	100	19,2%		22,3%	202
Edad	Mediana	38		38		0,098	38	
	18-28	109	28,5%	93	17,9%		22,3%	202
	29-39	97	25,3%	182	34,9%		30,9%	279
	40-50	97	25,3%	130	25,0%		25,1%	227
	51-61	75	19,6%	95	18,2%		18,8%	170
	Más de 62	5	1,3%	21	4,0%		2,9%	26
Reactividad simultánea con otro marcador infeccioso	Sí	39	10,20%	48	9,2%	0,625	87	9,6%
Reactividad a otros marcadores infecciosos	VHB	33	8,6%	5	1,0%		4,2%	38
	HCV	4	1,0%	1	0,2%		0,6%	5
	HIV	3	0,8%				0,3%	3
	HTLV	1	0,3%				0,1%	1
	VHB, HTLV	1	0,3%				0,1%	1

Fuente: Construcción propia a partir de datos recolectados.

Taken together, the findings reveal relevant differences in the sociodemographic and clinical characteristics of syphilis-reactive donors between the two institutions in the Colombian Caribbean. These results provide key insights into the associated factors and are discussed below.

Discussion

The results of this study show that syphilis reactivity among blood donors in Cartagena (1.9%) and Sincelejo (1.5%) exceeded the national average reported during the same period by the National Blood Bank Network (data not cited). These findings, however, were lower than those reported among donors in Barranquilla in 2015–2016 (1.86%) and in India between 2021 and 2022 (7,10). Regional variations may be explained by geographic and sociodemographic factors, as well as differences in the diagnostic methods employed.

The higher reactivity observed in Cartagena is consistent with indicators of gestational syphilis, which showed a rising incidence (always above the national average) between 2021 and 2023 (4). In contrast, lower and declining rates were reported in Sincelejo and the department of Sucre (4).

Regarding donor characteristics, the predominance of reactivity among men is consistent with most national and international reports (2,7,11–13). Several studies have noted that men, particularly men who have sex with men, present higher infection rates, a finding related to riskier sexual practices and reduced access to timely diagnosis and treatment (11).

In terms of age, the highest frequency of reactivity was observed among individuals aged 29–39 years, consistent with findings from studies in Colombia, Iraq, and other regional settings (7,12,15). This age group includes a significant proportion of blood donors, but may also be exposed to risk behaviors such as a higher number of sexual partners and unprotected practices (11).

Coinfection with other infectious agents was observed in 9.6% of donors, with hepatitis B virus (HBV) being the most frequent. Previous studies in Bogotá reported HBV coinfection in up to 67.7% of cases (14), underscoring the need to strengthen transfusion safety measures, since not all coinfected individuals belong to groups traditionally considered high risk.

A limitation of this study was the inability to differentiate between recent and past infections, given that blood banks rely exclusively on treponemal tests. Nevertheless, these findings provide a valuable baseline for the Caribbean region and may guide future population-based studies, as well as the strengthening of strategies for the prevention and control of syphilis and other sexually transmitted infections (1–3).

Conclusion

Syphilis reactivity among blood donors in Cartagena and Sincelejo was higher than the national average. A significant association with male sex and a higher frequency among young adults were identified, in line with previous reports (2,7,11–13). While sexual transmission remains the primary route of infection, transmission through blood transfusion continues to represent a risk that should not be underestimated (2).

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Conflicts of Interest None declared.

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