

Prevalence and Trends of Transfusion-Transmitted Infections Among Screened Samples During 2024-2025 at El-Obeid Central Blood Bank, North Kordofan, Sudan.

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ABSTRACT

Background: Transfusion-transmitted infections (TTIs) remain a major public health challenge in low-resource settings, including Sudan, and ensuring blood safety is difficult when screening and surveillance systems are limited. **Objectives:** To estimate the prevalence and monthly trends of HBV, HCV, HIV, and syphilis among blood donors in El-Obeid, Sudan (2024-2025), and to compare the performance of rapid tests with ELISA in the detection of these infections. **Methods:** A retrospective analysis was performed using donor screening records from January 2024 to December 2025. Screening for HBV, HCV, HIV, and syphilis was performed using rapid tests and ELISA. Data were analysed in SPSS; chi-square tests were used for comparisons, and $p < 0.05$ was considered statistically significant. **Results:** A total of 211,773 screening results were reviewed. The overall prevalence of HBV, HCV, HIV, and syphilis using ELISA was 2.6%, 0.6%, 0.4%, and 4.6%, respectively. In 2025, ELISA detected significantly more positive cases than rapid tests, particularly for HBV and syphilis ($p < 0.05$). Monthly trend analysis showed noticeable fluctuations with mid-year peaks.

Conclusion: HBV and syphilis remained the predominant TTIs among screened donors. The higher detection rate by ELISA supports its wider use for blood screening to enhance transfusion safety.

Keywords: Transfusion-transmitted infections; prevalence; ELISA; rapid tests; trends; El-Obeid, North Kordofan, Sudan.

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INTRODUCTION

Transfusion-transmitted infections (TTIs) are major public health concerns worldwide, particularly in resource-limited developing countries. They threaten blood safety and can lead to severe morbidity and mortality in recipients [1].

Hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and syphilis are among

the key TTIs routinely screened for in blood banks. These infections impose a substantial burden on healthcare systems in resource-limited settings [2]. Globally, millions of people are infected with HIV, HBV, and HCV, and co-infections frequently occur because of shared transmission routes [3]. Syphilis is caused by *Treponema pallidum* and can be transmitted through sexual contact via mucous membranes or microabrasions;

it has re-emerged in many settings and is a concern in donor screening [4].

Laboratory screening is essential to prevent transmission of TTIs. Rapid diagnostic tests are widely used because they are simple and inexpensive; however, enzyme-linked immunosorbent assay (ELISA) typically provides higher sensitivity, including during early seroconversion [5,6]. The World Health Organization (WHO) recommends nucleic acid amplification testing (NAAT), where feasible, to reduce residual risk during the window period; however, high costs and infrastructure requirements limit its implementation in many low-resource settings [7,8].

In Sudan, data on the prevalence and temporal trends of TTIs are limited, particularly regarding comparisons between screening methods. Therefore, this study aimed to assess the prevalence and monthly trends of HBV, HCV, HIV, and syphilis during 2024-2025 at El-Obeid Central Blood Bank and to compare the performance of rapid tests and ELISA in detecting positive cases.

MATERIAL AND METHODS

This descriptive retrospective study used blood donor screening records from the Central Blood Bank in El-Obeid, Sudan, covering the period from January 2024 to December 2025. Screening results for HBV, HCV, HIV,

and syphilis were extracted from routine registers. The screening assays included Immunochromatographic assay and ELISA, as implemented by the blood bank during the study period.

Statistical analysis

Data were entered and analysed using SPSS version 24 (IBM Corp., Armonk, NY, USA). Frequencies and percentages were calculated. Comparisons between years (2024 vs 2025) and between screening methods (rapid tests vs ELISA) were assessed using chi-square tests. A p-value of < 0.05 was considered statistically significant.

Ethical considerations

Ethical approval was obtained from the Ministry of Health Ethical Committee, North Kordofan State, El-Obeid, Sudan. The study used routinely collected laboratory records; no personal identifiers were included in the analysis.

RESULTS

A total of 211,773 screening results for HBV, HCV, HIV, and syphilis were reviewed for 2024-2025. The numbers of positive results were 1,370 for HBV, 338 for HCV, 218 for HIV, and 2,439 for syphilis. The corresponding overall prevalence was 2.6%, 0.6%, 0.4%, and 4.6%, respectively. (Table 1)

Table 1 Distribution of screened samples and positive cases for transfusion-transmitted infections (2024-2025) by rapid test and ELISA.

Infection	Total screened	Positive cases	Prevalence (%)
HBV	52888	1370	2.6%
HCV	52822	338	0.6%
HIV	52716	218	0.4%
Syphilis	53347	2439	4.6%
Total	211773	4365	2.1%

Comparison between the two study years showed statistically significant differences in the prevalence of HBV and syphilis between 2024 and 2025 ($p < 0.05$). No

statistically significant differences were observed for HCV or HIV ($p > 0.05$). (Table 2)

Table 2 Comparison of infection prevalence between 2024 and 2025 by rapid tests and ELISA.

Infection	2025, n (%)	2024, n (%)	P-value
HBV	863 (2.8%)	507 (2.3%)	0.002
HCV	192 (0.6%)	146 (0.7%)	0.458

HIV	117 (0.4%)	101 (0.4%)	0.131
Syphilis	1567 (4.7%)	872 (4.3%)	0.019

In 2025, ELISA detected a higher number of positive cases for HBV and syphilis compared with rapid tests, and the differences were statistically significant ($p < 0.05$). (Table 3)

Table 3 Comparison of positivity between rapid tests and ELISA in 2025.

Infection	Rapid test, n (%)	ELISA, n (%)	P-value
HBV	410 (1.9%)	453 (4.5%)	<0.001
HCV	152 (0.7%)	40 (0.4%)	0.001
HIV	48 (0.2%)	69 (0.7%)	<0.001
Syphilis	653 (2.8%)	914 (9.1%)	<0.001

Monthly counts of positive cases fluctuated across the study period. HBV showed higher counts in most months with a notable mid-year peak. Syphilis varied moderately

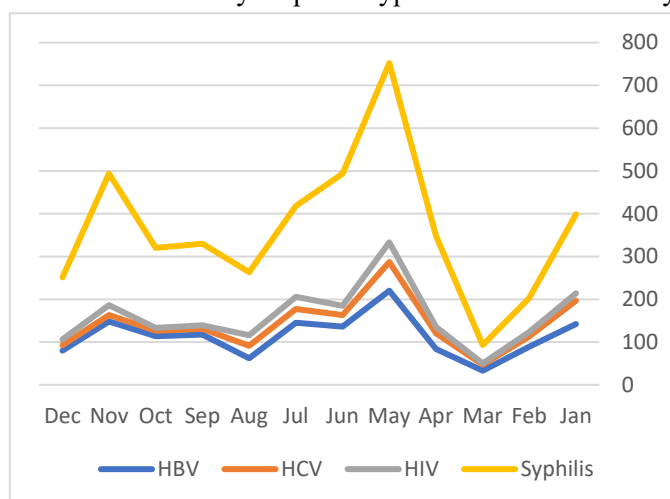


Figure 1 Monthly distribution of positive cases by infection (2024-2025) by rapid test and ELISA. with increases in some months, while HCV and HIV remained relatively lower and more stable across months. (Figure 1)

Syphilis showed the highest prevalence in both years, followed by HBV. A slight increase in HBV and syphilis prevalence was observed in 2025 compared with 2024, whereas HCV and HIV remained relatively stable and low. (Figure 2)

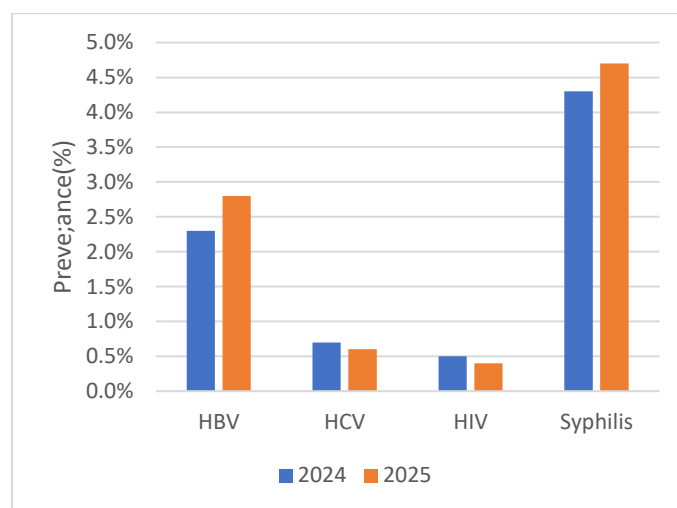


Figure 2 Prevalence of TTIs by year (2024 vs 2025).

DISCUSSION

This study assessed the prevalence and monthly trends of transfusion-transmitted infections during 2024-2025 at the El-Obeid Central Blood Bank. Overall, HBV and syphilis showed higher prevalence than HCV and HIV, and ELISA detected more positive cases than rapid tests.

The findings are consistent with a previous study conducted in El-Obeid, which also reported HBV and syphilis as the most prevalent TTIs among screened donors [9]. This suggests that these infections remain persistent challenges for blood safety in this setting. Similar results were also observed in blood donors in other parts of Sudan (e.g. Wite Nile state, River Nile, state, Northern state, red sea state) where all of these of

infections were detected, albeit the numbers varied from one state to another [10,11,12,13,14,15].

Also, Similar prevalence patterns have been reported in other low-resource settings [17]. Differences in seroprevalence between studies may reflect variation in study populations, risk behaviours, access to prevention services, and laboratory methods. [18] Continuous donor education, strict donor selection, and high-quality screening remain important to reduce the burden of TTIs.

Monthly trends showed clear fluctuations, with HBV remaining consistently higher across most months. Such variations may reflect seasonal patterns in blood donation and transfusion-transmitted infections, as well as operational and population-related factors including changes in donor attendance, service disruptions, and population movement; however, these factors were not specifically assessed in the present study [19,20,21].

The present findings clearly underscore the importance of continuous monitoring of TTIs and the use of sensitive screening methods to enhance transfusion safety.

CONCLUSION

Transfusion-transmitted infections remain a public health concern in this setting, with syphilis and HBV showing the highest prevalence among screened donors. ELISA demonstrated higher detection compared with rapid tests, supporting its wider implementation in blood screening programs to improve diagnosis and transfusion safety.

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Author contributions

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Ekhlash Alrasheid Abuelfadol: study conception and design; data collection; data analysis; drafting and critical revision of the manuscript; approval of the final version.

Reham Abdelhady Ali Awad Elkareem: study conception and design; data collection; critical revision of the manuscript; approval of the final version.

Khalid A Enan: critical revision of the manuscript; approval of the final version.

Conflict of interest

The authors declare no conflicts of interest.

Data availability

The data are available from the corresponding author upon reasonable request.

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