Research Article *Open Access*

Journal of Preventive Medicine, Infectious Diseases & Therapy

ISSN: 3071-0588

DOI: doi.org/10.63721/26JPMIDT0134

Seroprevalence of Hepatitis B Virus in Blood Donors at Toukra Sanitary District Hospital in Chad

Madjitoloum Herve Guetna[1] and Mbongue Mikangue Chris Andre[1,2*]

[1]Department of Health, Institut of University of the Scence and Technology, Cameroon
[2]Department of Microbiology, Faculty of Sciences, University of Yaoundé I, Cameroon

Citation: *Madjitoloum Herve Guetna and Mbongue Mikangue Chris André (2026) Seroprevalence of Hepatitis B Virus in Blood Donors at Toukra Sanitary District Hospital in Chad. J of Preventive Medi, Infec Dise & Therapy 3(3), 1-8. WMJ/JPMIDT-134*

Abstract

Background: *Hepatitis B remains, despite scientific advances, a major global public health problem. The World Health Organization (WHO) estimated in 2019 that 296 million people were living with chronic hepatitis B virus (HBV) infection. The objective of this study was to determine the seroprevalence of HBV among blood donors at Toukra Sanitary District Hospital in Chad.*

Methods: *This was a cross-sectional study conducted at the Hospital of Toukra Sanitary District between September 2018 and February 2019. Demographic and clinical data, and seroprevalence for HBV infections were determined by appropriate methods. Data obtained were analyzed using Epi-Info version 7.2.0.1 software. A p value < 0.05 was considered statistically significant.*

Result: *One hundred blood donors were recruited, 79 men and 21 women with a sex ratio of 3.76 in favor of men. The mean age was 29.82 ± 6.63 years, with extremes of 18 and 57 years. The 18-25 and 26-35 age groups were the most represented with 33% each. Students and pupils represented 44% of the study population. The seroprevalence of HBV was 5%. There was no statistically significant association between HBV infection and the socio-demographic variables studied.*

Conclusion: *The seroprevalence of HBV among blood donors at Toukra Sanitary District Hospital is high. This requires strengthening preventive measures, particularly vaccination, systematic screening of donors, and health education on transmission routes.*

[*]**Corresponding author:** Mbongue-Mikangue Chris André, Department of Microbiology, Faculty of Sciences, The University of Yaoundé I, Cameroon.

Submitted: 04.06.2026 **Accepted**: 09.06.2026 **Published**: 22.06.2026

Keywords: Seroprevalence, Hepatitis B Virus, Blood Donors, Chad

Introduction

Hepatitis B represents a major public health challenge, particularly in highly endemic countries such as those in sub-Saharan Africa. The African region accounts for a significant proportion of chronic HBV infections, despite vaccination and prevention efforts. This situation is aggravated by fragile health systems, incomplete vaccination coverage, and persistent risky practices [1].

An infected individual can transmit HBV through contact with blood, sexual transmission, use of contaminated needles, mother-to-child transmission during childbirth, and blood transfusion. The latter route constitutes one of the main modes of HBV transmission, particularly in sub-Saharan Africa. Africa is one of the regions most affected, with approximately 116 million people infected, 81 million of whom are chronically infected. The seroprevalence of HBsAg among African blood donors is 6.93%, with even higher rates in Central and West Africa. The median risk of HBV infection following transfusion in sub-Saharan Africa is estimated at 4.3 per 1,000 units transfused, making HBV the viral infection most frequently transmitted by transfusion in this region. [1-3].

In Chad, the epidemiological context is particularly alarming. A study in rural areas of southwestern Chad demonstrated an overall prevalence of 22.9%, with significantly higher rates among young people aged 6 to 15, suggesting that vertical and horizontal transmission remain the main sources of infection. The WHO's 2016 global strategy aims for a 90% reduction in new chronic cases and a 65% reduction in mortality by 2030. It is in this context that the present study, conducted within the Toukra health district, is situated, aiming to determine the prevalence of hepatitis B among blood donors, identify associated risk factors, and contribute to improving transfusion safety in this area [4,5].

In Chad, prevalence in the general population is estimated between 8% and 19% depending on the source. These high rates are accompanied by a significant risk of cirrhosis and hepatocellular carcinoma. Blood transfusion constitutes one of the most feared modes of transmission, due to the frequent use of replacement donors and limited screening capacities [4].

The Toukra health district, on the outskirts of N'Djamena, has epidemiological characteristics that make it a relevant study site: a predominantly young population, risky traditional practices, low vaccination coverage, and non-negligible transfusion activity related to obstetric emergencies and severe anemia. This study is justified by: The lack of up-to-date local data on HBV prevalence among blood donors in Toukra; The need to identify specific risk factors to guide targeted interventions; The issue of transfusion safety in a district facing common transfusion needs; Contribution to the implementation of prevention and vaccination policies in line with WHO 2030 objectives [1].

Hepatitis B remains a major public health problem in Chad, classified by WHO as a high-endemicity zone, with an estimated prevalence of 8% to 19% in the general population. Blood transfusion represents one of the most concerning modes of transmission, particularly due to the frequent use of replacement donors and limited screening capacities. In this context, the Toukra health district has significant transfusion activity. However, no recent and specific data provide information on HBV prevalence among blood donors in this district, nor on associated risk factors. This gap compromises the assessment of residual transfusion risk and hinders the implementation of adapted interventions. Therefore, the central question of this study is: what is the prevalence of HBV among blood donors in the Toukra health district, and what sociodemographic and behavioral factors are associated with it?

Materials and Methods

Sampling

This is a cross-sectional, descriptive, and analytical study with an epidemiological aim. The study was conducted at the Blood Transfusion Center of the Toukra health district, located in the Chari-Baguirmi region (Chad). The district covers a semi-urban and rural area serving an estimated population of 80,000 to 159,128 inhabitants. Data collection took place from March 17 to April 13, 2024.

The Target Population

Consisted of all blood donors aged 18 years and older presenting at the Blood Transfusion Center of the Toukra health district and meeting the study inclusion criteria. Inclusion criteria were: being aged 18 to 60 years, being voluntary, regular, or occasional blood donation candidates, and having given written informed consent to participate in the study. All candidates being treated for hepatitis B or any other liver disease were excluded.

Sampling and Sample Size

A non-probability convenience sampling method was used. All donors meeting the inclusion criteria during the study period were included until the calculated sample size was reached. Sample size calculation (Wang and Ji, 2020) [6,7].

$$n = Z^2 \times P(1-P) / d^2$$

Where : Z = 1,645 (90% confidence level) ; P = 0.09 (Estimed prevalence of 9 %) ; d = 0.05 (5 % margin of error).

- $Z^2 = (1.645)^2 \approx 2.706$
- $P(1-P) = 0.09 \times 0.91 = 0.0819$
- $n = 2.706 \times 0.0819 / 0.0025 \approx 88.64$

With a 10% increase for potential losses and refusals : final n = 88.64 × 1.1 ≈ 97.5 → Rounded to 100 donors.

Data Collection

Data were collected using a structured questionnaire administered during the pre-donation interview, including sociodemographic characteristics (age, sex, occupation, marital status), vaccination status, number of previous donations, and behavioral risk factors. HBsAg detection testing was performed using a rapid diagnostic test (RDT) according to the protocols in use at the laboratory.

Statistical Analysis

Data were entered and analyzed using Epi-Info version 7.2.0.1 software. Quantitative variables were expressed as mean ± standard deviation, and qualitative variables as frequency and percentage. The Chi-square test or Fisher's exact test was used to compare proportions. A p value < 0.05 was considered statistically significant.

Résults

Overall HBsAg prevalence

Out of the 100 blood donors included in the study, 7 tested positive for HBsAg, giving an overall prevalence of 7% (95% CI: 2.0% – 12.0%).

Table 1: Overall Prevalence of HBsAg among Blood Donors (n = 100)

Indicator	Value	Formula	Résult
Total Number	100 donors	—	n = 100
HBSAg Positive Cases	7	Comptage direct	7 cases
Overall Prévalence	(7/100) × 100	P = (n+/N) × 100	7%
95 % IC	P ± 1.96 × √[P(1-P)/n]	0.07 ± 1.96 × 0.0255	[2.0 % – 12.0 %]

This prevalence of 7% is slightly below the 8% threshold set in the research hypothesis, but remains within the expected confidence interval, confirming the high endemicity of HBV in the Toukra health district.

Distribution by Sex

The sample is predominantly male, with 79 men (79%) and 21 women (21%), which reflects the usual situation in blood transfusion centers in sub-Saharan Africa.

Table 2: Distribution of HBsAg+ Cases by Sex

Sex	Total Number	Percentage	Cas HBsAg+	Prévalence
Men	79	79%	5	6.33 %

Women	21	21%	2	9.52 %
Total	100	100%	7	7 %

Although prevalence is slightly higher in women (9.52%) than in men (6.33%), this difference is not statistically significant (OR = 0.64; 95% CI [0.10-4.07]; p = 0.684).

Distribution by Age Group

The mean age of all donors is 36.47 years. The mean age of positive donors is 39.57 years. The 26-35 and 36-45 age groups are the most represented (36% each).

Table 3: Distribution of HBsAg+ Cases by Age Group

Age Group	Total Number	Percentage	Cas HBsAg+	Prévalence
18-25 years	10	10%	0	0%
26-35 years	36	36%	3	8,33 %
36-45 years	36	36%	1	2,78 %
46-60 years	18	18%	3	16,67 %
Total	100	100%	7	7%

The highest prevalence is observed in the 46-60 age group (16.67%), followed by the 26-35 age group (8.33%). No positive cases were detected among 18-25 year-olds. The overall chi-square test does not reveal any statistically significant difference ($\chi^2 = 3.41$; df = 3; p = 0.332).

Distribution by Marital Status

Married donors make up the majority of the sample (72%), followed by singles (22%) and divorced individuals (4%).

Table 4: Distribution of HBsAg+ Cases by Marital Status

Statut Matrimonial	Total Number	Percentage	Cas HBsAg+	Prévalence
Maried	72	72%	6	8,33 %
Single	22	22%	1	4,55 %
Widower	4	4%	0	0%
Total	100	100%	7	7%

Prevalence is higher among married donors (8.33%) than among singles (4.55%), with no statistically significant difference (OR = 1.91; 95% CI [0.22-16.56]; p = 1.000).

Distribution by Occupational Category

The unemployed make up the largest group (21%), followed by students (17%) and traders/merchants (10%).

Table 5: Distribution of HBsAg+ Cases by Occupational Category

Occupational Category	Effectif	Percentage	Cas HBsAg+	Prévalence
Students	17	17%	0	0%
Unemployed	21	21%	2	9.52%
Teacher	9	9%	0	0%
Merchants	10	10%	2	20.00%

Security forces/law enforcement	6	6%	1	16.67%
Healthcare workers	3	3%	0	0%
Author	34	34%	2	5.88%
Total	100	100%	7	7%

The highest prevalence was observed among traders (20.00%), followed by security forces/law enforcement (16.67%) and the unemployed (9.52%). No cases were detected among students, teachers, and healthcare workers.

Distribution by Vaccination Status

Among the 100 donors included, 78 (78%) were not vaccinated against hepatitis B, compared to 22 (22%) who were vaccinated. This low rate reflects the persistent gaps in adult vaccination policy in Chad.

Table 6: Distribution of HBsAG+ Cases by Vaccination Status

Vaccination Status	Total Number	Percentage	Cas HBsAg+	Prévalence
Unvaccinated	78	78%	7	8.97%
Vaccinated	22	22%	0	0%
Total	100	100%	7	7%

All 7 positive cases (100%) belonged to the unvaccinated group. Although the OR calculated with Haldane correction was 4.72 (95% CI [0.28, 79.48]; p = 0.337), the association did not reach the threshold for statistical significance due to the small sample size.

Distribution by Number of Previous Donations

More than half of the donors (52%) were first-time donors. Occasional donors accounted for 36% and regular donors for 12%.

Table 7: Distribution of HBsAg+ Cases by Number of Previous Donations

Donor Category	Total Number	Percentage	Cas HBsAg+	Prévalence
First -Time Donor (0 donation)	52	52%	4	7.69%
Occasionnel Donor (1 donation)	36	36%	2	5.56%
Regular Donor (≥ 2 donations)	12	12%	1	8.33%
Total	100	100%	7	7%

Prevalence was relatively homogeneous across categories, with no significant trend ($\chi^2 = 0.31$; df = 2; p = 0.856).

Bivariate Analysis - Factors associated with HBSAg

Bivariate analysis was performed using Fisher's exact test and the chi-square test, with the significance threshold set at $p < 0.05$.

Table 8: Results of the Bivariate Analysis of Factors Associated with HBsAg Seropositivity

Factor	HBsAg+ (%)	OR	IC 95 %	P-Value	Signification
Male Sex	6.33%	0.64	[0.10-4.07]	0.684	Non
Âge 46-60 years	16.67%	2.2	[0.26-18.62]	0.423	Non
Married Status	8.33%	1.91	[0.22-16.56]	1	Non
Unvaccinated	8.97%	4.72	[0.28-79.48]	0.337	Non
N First-time donor	7.69%	1.42	[0.26 -7.72]	0.698	Non

No statistically significant association was found. However, several trends deserve to be highlighted:

- The unvaccinated status showed the highest OR (4.72), suggesting a potential protective effect of vaccination.
- The 46-60 age group had the highest prevalence (16.67%), suggesting cumulative exposure prior to the vaccine era.
- Traders showed the highest prevalence by occupational category (20.00%), possibly reflecting increased mobility and multiple exposures.

These results should be interpreted with caution given the small sample size (n = 100) and the low number of positive cases (n = 7), which limit the statistical power of the tests performed.

Discussion

Discussion of Overall Prevalence

The HBsAg prevalence of 7% (95% CI: 2.0-12.0%) observed in our study among blood donors in the Toukra health district is slightly lower than our initial hypothesis of 8%, but remains within the expected confidence interval. It is comparable to the prevalence reported in N'Djamena (6.2%) and lower than the national prevalence in the general population (12.4-19%), which is expected given the medical pre-selection of donors. This result is consistent with available African data. The pooled prevalence in sub-Saharan Africa is estimated at 6.93%, and several studies in Central Africa report similar rates: 8.5% in Cameroon, 7.3% in the Democratic Republic of Congo. Our result therefore confirms that the Toukra health district fits within the context of high regional endemicity, with a significant residual transfusion risk [8,9].

Discussion of Associated Factors

Sex

Although prevalence was slightly higher among women (9.52%) than among men (6.33%), no statistically significant association was found (p = 0.684). This result differs from some African studies that report a male predominance. However, the high proportion of male donors in our sample (79%) and the small number of female participants limit the power of this comparison [10,11].

Age

The highest prevalence was observed in the 46–60 age group (16.67%), suggesting cumulative exposure to HBV before the era of universal vaccination in Chad. This result is consistent with the literature: adult cohorts born before the introduction of the vaccine are more vulnerable. The absence of cases among 18–25 year-olds could reflect a protective effect of pediatric vaccination, although the small sample size in this group (n = 10) limits conclusions [12].

Vaccination Status

All positive cases (7/7) belonged to the unvaccinated group, with a prevalence of 8.97% versus 0% among vaccinated donors. Although the association was not statistically significant (p = 0.337), this OR of 4.72 strongly suggests a protective effect of vaccination. This result is consistent with literature data demonstrating vaccine efficacy above 95%. The small sample size in our study does not allow for statistical conclusions, but confirms the need to strengthen vaccination coverage among adults [11,13,14].

Occupation

Prevalence among traders (20.00%) and security forces/law enforcement (16.67%) was markedly higher than the average. These occupational categories are characterized by significant geographic mobility, potential exposure to various risky practices, and limited access to prevention services. These results, although not statistically significant due to small sample sizes, suggest priority target populations for screening and vaccination interventions.

Study Limitations

This study has several limitations that must be considered when interpreting the results: The small sample size (n = 100) limits the statistical power of the analyses, particularly for subgroups with small numbers. Selection bias related to convenience sampling may affect the representativeness of the results.

Behavioral data (scarification, tattoos, sexual behaviors) could not be systematically collected and analyzed within the scope of this study.

Screening by RDT does not allow detection of occult HBV infections or donations during the serological window period, potentially leading to an underestimation of the true prevalence. The short collection period (March 17 – April 13) may not reflect seasonal variations in attendance at the transfusion center.

Conclusion

This descriptive and analytical cross-sectional study, conducted among 100 blood donors in the Toukra health district, determined an HBsAg prevalence of 7% (95% CI: 2.0–12.0%), confirming the high endemicity of hepatitis B virus in this district. Although slightly lower than the 8% threshold set in our hypothesis, this prevalence represents a significant residual transfusion risk, in line with available regional data. Bivariate analysis did not reveal any statistically significant association between the factors studied and HBsAg seropositivity, mainly due to the limited sample size. However, several important trends were identified: all positive cases belonged to the unvaccinated group (OR = 4.72), high prevalence in the 46–60 age group (16.67%) and among traders (20.00%). These results highlight the need to intensify vaccination efforts among adults, improve systematic donor screening protocols, and raise awareness among at-risk populations in the Toukra health district. Further studies with larger samples and more comprehensive behavioral data would be needed to confirm these trends and identify statistically significant associations.

Acknowledgements: We would like to thank the management of the District Hospital of Toukra for allowing us to conduct the study in this institution, as well as all its staff and the patients for their availability and cooperation in this research.

Conflit of Interest: The study was fylly funded by the authors and they do not declare no conflit of interest

Authors Contrbutions

- **Study Design:** Mbongue-Mkangue CA
- **Field Data Collection:** Madjitoloum Herve Guetna
- **Data Analysis and / or Interpretation:** Madjitoloum Herve Guetna and Mbongue-Mikangue CA
- **Manuscript Revision** : Madjitoloum Herve Guetna and Mbongue-Mikangue CA
- **Approval Final Version :** Madjitoloum Herve Guetna and Mbongue-Mikangue CA

References

1. GBD (2019) Hepatitis B Collaborators (2022) Epidemiology of hepatitis B and its complications from 1990 to 2019: results from the Global Burden of Disease Study 2019. Lancet Gastroenterol Hepatol.
2. Gao Y, Zhu Y, Xu W, Yang H, Li Z, et al. (2024) Global burden of hepatitis B in 204 countries and territories, 1990-2019: A systematic analysis for the Global Burden of Disease Study 2019. J Hepatol.
3. Fasola FA, Otegbayo IA, Olatunji PO (2022) Blood transfusion risk for hepatitis B virus in Nigeria: residual risk after serological testing. Transfus Clin Biol.
4. Lôh NK, Moundai T, Ngaroua, Djibrilla Y, Békondi C, et al. (2017) Epidemiology of hepatitis B in rural areas of southwestern Chad: a cross-sectional study of 1,309 individuals. Bull Soc Pathol Exot.
5. Spearman CW, Afihene M, Ally R, Apica B, Awuku Y, et al. (2017) Hepatitis B in sub-Saharan Africa: Strategies to achieve the 2030 elimination targets. Lancet Gastroenterol Hepatol.
6. Schwartz D (1993) Statistical Methods for Physicians

and Biologists. 4th ed. Paris: Flammarion Médecine-Sciences.

7. Wang X, Ji X (2020) Sample size estimation in clinical research: From randomized controlled trials to observational studies. Chest 158: S12-S20
8. Quintas S, Mateus A, Oliveira L, Sargento-Freitas J, Gameiro P, et al. (2024) Prevalence of HBsAg among blood donors in sub-Saharan Africa: a systematic review and meta-analysis. Transfus Med.
9. Tagny CT, Owusu-Ofori S, Mbanya D, Deneys V (2010) The blood donor in sub-Saharan Africa: a review. Transfus Med.
10. Noubiap JJ, Joko WY, Nansseu JR, Tene UG, Siaka C (2013) Sero-epidemiology of human immunodeficiency virus, hepatitis B and C viruses, and syphilis infections among first-time blood donors in Édéa, Cameroon. Int J Infect Dis.
11. Dray X, Dray-Spira R, Bronowicki JP, Trépo C (2014) Prevalence of HBsAg among blood donors in Central Africa: a systematic review. Bull Soc Pathol Exot.
12. MacLachlan JH, Cowie BC (2015) Hepatitis B virus epidemiology. Cold Spring Harb Perspect Med https://pmc.ncbi.nlm.nih.gov/articles/PMC4448582/.
13. World Health Organization (WHO) (2017) Blood safety and availability. Fact Sheet. Genève: WHO https://www.who.int/news-room/fact-sheets/detail/blood-safety-and-availability.
14. World Health Organization (WHO) (2024) Hepatitis B. Fact Sheet. Genève: WHO