



Original Article

Transfusion-Transmissible Infections Among Discarded Blood Units in A Tertiary Care Blood Centre in Central India

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ABSTRACT

Background: Transfusion-transmissible infections (TTIs) remain a critical threat to blood safety and are a major cause of discard of blood units and components. Profiling TTI markers among discarded units provides a practical indicator of infection burden in the donor pool and can inform targeted donor counselling and quality-improvement measures at blood centres.

Methods: We conducted a prospective observational study at the Department of Transfusion Medicine and Blood Centre, All India Institute of Medical Sciences (AIIMS), Raipur, India. All eligible discarded whole blood units and prepared components recorded between May 2024 and October 2025 were included using complete enumeration. The unit of analysis was a discarded unit/component (whole blood, packed red blood cells (PRBC), platelets, fresh frozen plasma (FFP), and cryoprecipitate). The primary outcome was the distribution of TTI reactivity among discarded units/components (HIV, hepatitis B surface antigen (HBsAg), hepatitis C virus (HCV), syphilis, and multiple reactivity), summarized as frequencies and percentages.

Results: During the study period, 5,226 units/components were discarded, of which 951 (18.21%) were TTI-reactive. Syphilis was the most frequent marker (360; 6.89% of all discarded units/components), followed by HBsAg (317; 6.07%), HIV (164; 3.14%), and HCV (95; 1.82%). Dual reactivity was uncommon (HIV+HBsAg: 12; 0.23% and HIV+syphilis: 3; 0.06%). Component-wise, TTI-reactive discards were predominantly PRBC (323), FFP (317), and platelet concentrates (310), with rare whole blood discards (1) and no cryoprecipitate discards (0) due to TTI reactivity.

Conclusions: Nearly one-fifth of discarded units/components in our centre were TTI-reactive, with a predominance of syphilis and HBV markers. Discard-based TTI profiling offers a feasible surveillance approach within routine blood-bank workflow and supports strengthening donor counselling, confidential self-deferral, retention of low-risk repeat voluntary donors, and systematic referral of reactive donors to reduce preventable collection and component loss while maintaining transfusion safety.

Keywords: transfusion-transmissible infections; discarded blood units; blood components; blood bank; syphilis; hepatitis B; HIV; central India.

INTRODUCTION

Blood transfusion remains indispensable in contemporary clinical care; however, it carries the risk of **transfusion-transmissible infections (TTIs)**. To protect recipients, all blood donations in India are mandatorily screened for major TTIs including **HIV-1/2**, **hepatitis B virus (HBV)**, **hepatitis C virus (HCV)**, and **syphilis** as per national standards and technical guidance issued through the Directorate General of Health Services (DGHS)/National Blood Transfusion Council (NBTC) [1,2]. Units/components found reactive are removed from the transfusion chain and discarded, which is necessary for safety but represents a measurable loss of a scarce resource.

Beyond ensuring recipient safety, the **profile of TTIs among discarded blood units/components** serves as an operational and epidemiological indicator for a blood centre. It reflects the underlying infection burden in the donor pool, the effectiveness of donor selection and counselling, and the sensitivity of the testing strategy. Monitoring the distribution of markers (HBV, HCV, HIV and syphilis) among discarded units can inform targeted donor education, deferral and referral practices, and local public-health priorities.

Indian studies consistently report that TTI reactivity is a major contributor to discards, though its magnitude varies widely by region and denominator used (whole blood collected versus components prepared) [3-6]. A recent systematic review and meta-analysis of Indian blood donors (2019–2024) estimated pooled seroprevalence of approximately **0.12%** for HIV, **0.91%** for HBV, **0.28%** for HCV, and **0.14%** for syphilis, with pronounced zonal variation (e.g., higher HBV in central India and higher HIV/HCV in the North-east) [7]. Such geographic heterogeneity makes it important to generate centre-level evidence, particularly from central India, to support locally appropriate donor counselling, deferral and linkage-to-care.

Although multiple audits from India describe overall discard rates and broad causes of wastage, fewer reports provide a focused description of **TTI marker distribution specifically among discarded units/components**, and comparison is further limited by inconsistent reporting frameworks. In this context, the present study aimed to describe the **profile of TTIs among discarded blood units and components** at a tertiary care blood centre in central India, including the relative contribution of individual TTI markers and the component-wise distribution of TTI-reactive discards.

MATERIALS AND METHODS

Study design, setting, and study period

We conducted a prospective observational study at the Department of Transfusion Medicine and Blood Centre, All India Institute of Medical Sciences (AIIMS), Raipur (a tertiary-care teaching hospital in central India). All eligible discarded whole blood units and blood components recorded between May 2024 and October 2025 (18 months) were included.

Eligibility criteria

The unit of analysis was a discarded whole blood unit or a prepared blood component. We included discarded whole blood units and discarded components (packed red blood cells [PRBC], platelets, fresh frozen plasma [FFP], and cryoprecipitate) that were prepared, tested, stored, and discarded at the Blood Centre during the study period.

- **Inclusion:** whole blood units collected through in-house donation and outdoor donation camps, and all corresponding components prepared and discarded during the study period.
- **Exclusion:** apheresis donations, autologous donations, and therapeutic phlebotomy units.

Sample size and sampling

We used complete enumeration (census sampling) of all eligible discarded units recorded during the study period; therefore, no a priori sample size calculation was performed.

Data collection and study variables

Routine donor screening, collection, component preparation, storage, and transfusion-transmissible infection (TTI) testing were performed according to applicable national guidance (DGHS/NBTC). Discarded units/components were identified from the discard register and verified against blood bank records. Data were recorded on a predesigned case record form and de-identified before analysis. Variables captured included donation type (in-house/outdoor), unit identification number, component type (whole blood, PRBC, platelets, FFP, cryoprecipitate), key dates (collection, expiry, discard), reason for discard, TTI testing status (reactive/non-reactive), and method of discard.

Definitions

Discard reasons were grouped by the stage at which the unit/component was lost. **Donation-related** causes included TTI reactivity (HIV, HBV, HCV, syphilis and multiple reactivity), quantity not sufficient, under-/over-collection, lipaemia, and antibody screening positivity. **Processing-related** causes included quality control failure (e.g., absent platelet swirling/low yield/failure to meet quality parameters), laboratory test failure during processing, bag leakage/damage during processing, and clerical/labeling errors. **Storage-related** causes included expiry, leakage during storage or thawing, plasma discoloration, and haemolysis detected during storage. **Post-issue** causes were units returned unused after issue.

Outcome measures

The primary outcome was the **distribution of TTIs among discarded units/components**, described as the number and proportion of discarded units/components reactive for HIV, HBV (HBsAg), HCV, syphilis, and multiple reactivity. Secondary outcomes included the component-wise distribution of TTI-reactive discards.

Data management

Data were entered into Microsoft Excel and cross-verified with discard registers and blood bank records. Analyses were performed on de-identified datasets.

Statistical analysis

Statistical analysis was performed using R (version 4.4.0) in RStudio. Categorical variables were summarized as frequencies and percentages. The TTI profile among discarded units/components was described overall and by marker (HIV, HBsAg, HCV, syphilis, and multiple reactivity), and component-wise counts of TTI-reactive discards were tabulated.

Ethical considerations

The study was initiated after approval from the Institutional Ethics Committee, AIIMS Raipur. Donor confidentiality was maintained throughout; no personal identifiers were used for analysis or reporting, and data were used solely for academic and research purposes.

RESULTS

Profile of transfusion-transmissible infections (TTIs) among discarded units

A total of **951** discarded units/components were **TTI-reactive** during the study period, accounting for **18.21%** of all discarded units/components (n=5,226). Among TTI-reactive discards, **syphilis reactivity** was the most frequent marker (**360**; 6.89% of all discarded units), followed by **HBsAg** (**317**; 6.07%), **HIV** (**164**; 3.14%) and **HCV** (**95**; 1.82%). Dual reactivity was uncommon (HIV+HBsAg: 12; 0.23% and HIV+syphilis: 3; 0.06%).

Component-wise, TTI-reactive discards were observed predominantly among **PRBC** (323), **FFP** (317) and **platelet concentrates** (310). TTI reactivity was rare among **whole blood** discards (1) and not observed for **cryoprecipitate** (0).

Table 1: Distribution of TTI-reactive discarded units/components in AIIMS Raipur between May 2024 and October 2025

TTI Reactive Reason	Number of Units	Percentage of Total Discarded Units (%)
Syphilis reactive	360	6.89%
HBsAg reactive	317	6.07%
HIV reactive	164	3.14%
HCV reactive	95	1.82%
HIV & HBsAg reactive	12	0.23%
HIV & Syphilis reactive	3	0.06%
Total TTI reactive discards	951	18.21%

DISCUSSION

This study describes the **profile of transfusion-transmissible infections (TTIs) among discarded blood units/components** at a tertiary care blood centre in central India. TTI-reactive discards constituted a substantial fraction of all discards (18.21%), underscoring that infection-related loss remains an important operational issue in addition to its primary implication for recipient safety.

In the present analysis, **syphilis reactivity** was the most frequent marker among TTI-reactive discards, followed by **HBsAg**, **HIV** and **HCV**, with very few dual-reactive units. Many Indian donor-based studies and pooled estimates commonly report HBV as the leading TTI, with lower HIV and syphilis prevalence overall [7,8]. A syphilis-predominant pattern among discards may reflect local epidemiology, donor mix (first-time and replacement donors typically show higher TTI burden than repeat voluntary donors), and differences in testing algorithms (e.g., treponemal versus non-treponemal screening and

the balance between biological false positivity and true infection) [2,9]. These findings highlight the need for robust donor education on sexually transmitted infections, confidential self-deferral, and systematic donor referral for confirmatory testing and linkage to care, as recommended in national donor-selection and referral guidance [2].

TTI-reactive discards were observed predominantly among **PRBC, FFP and platelet concentrates**, which is expected in settings where most whole blood donations are component-prepared. Operationally, each reactive donation can translate into multiple discarded components; therefore, TTI reactivity can amplify wastage at the component level. This reinforces the value of upstream risk reduction—retention of low-risk repeat donors, enhanced pre-donation counselling, and strict donor selection—to prevent collection of units that will ultimately be discarded after screening [1,2].

The observed TTI profile suggests several actionable measures: strengthening confidential donor-history assessment and counselling (including self-deferral), prioritising recruitment and retention of repeat voluntary donors, and ensuring systematic *recall and referral* pathways for reactive donors for confirmatory testing and treatment as per national guidance [2]. In addition, the contribution of HBV to discards supports continued emphasis on HBV prevention (including vaccination and awareness) in the catchment population [8].

This was a single-centre analysis and used *discarded units/components* as the unit of analysis; therefore, the findings represent the TTI profile among discards rather than donor seroprevalence. Donor-level determinants (e.g., first-time versus repeat donation, voluntary versus replacement, age/sex) and confirmatory test outcomes were not analysed, limiting causal inference. Nevertheless, discard-based TTI profiling remains useful for local quality improvement and surveillance within the blood-centre workflow.

CONCLUSIONS

The present study profiles transfusion-transmissible infections (TTIs) among discarded blood units/components at a tertiary care blood centre in central India. During the study period, **951** discarded units/components were **TTI-reactive**, constituting **18.21%** of all discards.

Among TTI-reactive discards, **syphilis** was the most frequent marker (360), followed by **HBsAg** (317), **HIV** (164) and **HCV** (95). Dual reactivity was uncommon (HIV+HBsAg: 12; HIV+syphilis: 3).

TTI-reactive discards were concentrated in routinely prepared components—**PRBC** (323), **FFP** (317) and **platelet concentrates** (310)—illustrating how a single reactive donation can translate into multiple discarded components. Overall, discard-based TTI profiling provides a practical surveillance signal within routine blood-centre workflow. Strengthening pre-donation counselling and confidential self-deferral, prioritising low-risk repeat voluntary donors, and ensuring recall and referral of reactive donors may reduce TTI-reactive collections and improve both blood safety and inventory efficiency.

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