Original Article

Know Better, Do Better: A Study of Blood Transfusion Adverse Events Reporting in Rivers State, Nigeria

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Abstract

Background: Blood transfusion is a critical life-saving intervention, particularly in resource-limited settings. However, it is not risk-free. Inadequate haemovigilance systems and inconsistent reporting practices obscure the true burden of transfusion-related adverse events. This study aimed to assess the incidence, types and characteristics of adverse transfusion reactions in healthcare facilities across Rivers State, Nigeria. **Materials and Methods**: A prospective observational study was conducted across 30 healthcare facilities from September 2024 to January 2025. Data collection utilised a standardised reporting tool adapted from international haemovigilance guidelines. A total of 359 transfusion recipients were monitored for adverse events, and descriptive statistics were applied to analyse incidence patterns by demographic, clinical and facility characteristics. **Results**: Twenty-four adverse transfusion events were reported out of 397 blood units transfused, yielding a 6.0% incidence rate. The majority were reported in tertiary urban facilities, with packed cells and whole blood emerging as the most frequently implicated components. Cough (2.2%), headaches (1.4%) and dyspnoea (0.8%) were the most reported symptoms. However, likely due to limitations in recognition and documentation, 95.8% of reactions were labelled 'unclassified (UNC)'. **Conclusion**: This study highlights significant gaps in transfusion safety monitoring and reporting in Rivers State. The high rate of 'UNC' events reflects deficiencies in training, diagnostic capacity and report standardisation. Strengthening haemovigilance infrastructure, promoting staff education and establishing hospital transfusion committees are urgent steps needed to enhance transfusion safety and reduce adverse outcomes in this setting.

Keywords: Adverse blood transfusion events, haemovigilance, reporting, transfusion reactions

Introduction

Worldwide, blood transfusion is a therapeutic, life-saving intervention. However, risks are implicit, ranging from mild allergic reactions to potentially fatal complications.[1] These are magnified in resource-limited settings due to infrastructural deficiencies, inadequate quality control and poor surveillance.[2]

The Nigerian healthcare system faces numerous challenges in ensuring blood transfusion safety,[3] with uncoordinated, fragmented services across states.[3] These create discrepancies in blood screening, storage and maintenance, thus impeding the quality of blood products and increasing risks of adverse transfusion-related

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events.[3-5] Haemovigilance systems are transfusion safety surveillance measures overseeing the entire transfusion process, from donor selection to post-transfusion monitoring.[6] For effectiveness, standardised reporting tools, well-defined case criteria, laboratory support and structured data analysis are required. Sub-Saharan Africa's (SSA's) fledgling haemovigilance systems with variable implementation result in under-reporting and inadequate characterisation of transfusion risks.[7]

Nigerian studies report transfusion reaction incidence rates between 2.5% and 9.3%.[8] These demonstrate probable inconsistencies in recognition and reporting rather than actual variations in reaction occurrence.[9] Predominantly, research on transfusion adverse events concentrates on tertiary care hospitals, offering only a partial view of transfusion practices and related complications across the entire healthcare ecosystem.[7,10] Patient demographics, blood components and adverse reactions have not been well explored, precluding evidence-based strategies for improved holistic transfusion safety.

Our study aimed to examine adverse transfusion events reporting across healthcare facilities in Rivers State, seeking to identify baseline information on incidence, types and clinical presentations of transfusion reactions. Furthermore, we endeavoured to identify associations between patient characteristics, transfusion practices and adverse outcomes that could inform targeted safety interventions. We seek to contribute to institutionalising routine reporting and transfusion safety protocols for improved haemovigilance systems in Rivers State and perhaps similar resource-constrained settings.

Materials and Methods

Study population, design and data collection

This prospective observational study was conducted to determine the incidence of adverse transfusion events across healthcare facilities in Rivers State, Nigeria, and identify the current pattern of blood transfusion adverse events in the state. Rivers State, located in Nigeria's Niger-Delta, has a population exceeding 9.9 million and substantial urban–rural disparities in healthcare access, resources, manpower and transfusion practices.[10,11] A standardised reporting tool [Appendix 1] was developed according to global haemovigilance guidelines[12,13] and pre-tested among 10 blood transfusion professionals in Rivers State participating in a three-day residential workshop in Port Harcourt for all registered and licensed secondary/tertiary-level hospitals with bedspaces exceeding 60 beds (n = 98), between February 12, 2024, and February 14, 2024. After a one-week training for data collection uniformity, the tool was distributed by purposive sampling to all 30 consenting healthcare facilities present at the workshop, drawn from all 23 local government areas (LGAs), with a combined bedspace capacity of 4450 beds [Appendix 2]. Data on blood transfusions and related adverse events were collected prospectively from hospital records dated September 1, 2024, to January 31, 2025.

For eligibility, patient symptoms must have been observed and documented by a clinician during or after transfusion, and the transfused blood component(s) must have been clearly identified by name or barcode. Adverse transfusion events were recorded prospectively using digital reports submitted throughout the study period. Confirmation was achieved through a manual search of transfusion events recorded in patient records. Ethical approval was obtained from Rivers State Health Research Ethics Committee (RSHMB/RSHREC/202/013), and all data were fully anonymised to ensure data privacy and confidentiality.

Data analysis

Descriptive statistical methods examined the incidence and distribution of reported transfusion-related adverse events. Data analysis and visualisation using RStudio 2024.12.0+467 generated frequency distributions and summarised key findings.

Results

Out of 30 healthcare facilities, 16 facilities (12 LGAs) responded by the end of the study period (53% response rate). Six non-responding hospitals were rural, six were urban and two were semi-urban. A total of 359 patients were transfused with 397 blood components. Two facilities recorded no transfusions in the study period. Demographic analysis revealed a female predominance (64.1%, n = 230; Table 1).

The patient population showed a mean age of 37 years (range: 1–99 years), with most patients aged between 23 and 47 years.

Healthcare facility characteristics

The majority of patients (71.6%, n = 257) were transfused in tertiary, predominantly urban (91.4%, n = 363) healthcare facilities [Table 2].

Table 1: Distribution of study participants in Rivers State by age and gender

Gender	0–17	18–29	30–39	40–49	50–59	60–69	70–79	80+	Total
Female	26 (44.1%)	48 (68.6%)	64 (77.1%)	44 (74.6%)	16 (51.6%)	20 (58.8%)	8 (53.3%)	4 (50.0%)	230 (64.1%)
Male	33 (55.9%)	22 (31.4%)	19 (22.9%)	15 (25.4%)	15 (48.4%)	14 (41.2%)	7 (46.7%)	4 (50.0%)	129 (35.9%)
Total	59 (100.0%)	70 (100.0%)	83 (100.0%)	59 (100.0%)	31 (100.0%)	34 (100.0%)	15 (100.0%)	8 (100.0%)	359 (100.0%)

Table 2: Distribution of transfusions by healthcare facility characteristics in Rivers State

Facility characteristics	Number of patients transfused (n = 359)_	Percentage (%)	Number of units transfused (n = 397)	Percentage (%)
Facility level				
Primary	16	4.4	20	5.0
Secondary	86	24.0	96	24.2
Tertiary	257	71.6	281	70.8
Total	359	100.0	397	100.0
Facility location				
Urban	329	91.7	363	91.4
Rural	18	5.0	21	5.3
Semi-urban	12	3.3	13	3.3
Total	359	100.0	397	100.0
Bed capacity				
Less than 25 beds	18	5.0	21	5.3
25–50 beds	82	22.8	90	22.7
50–100 beds	18	5.0	22	5.5
100–250 beds	11	3.1	15	3.8
250–500 beds	224	62.4	243	61.2
More than 500 beds	6	1.7	6	1.5
Total	359	100.0	397	100.0

Table 3: Primary diagnoses reported in patients receiving blood transfusions in Rivers State

Diagnosis	Frequency	Percentage (%)
Anaemia	285	79.4
Caesarean section	11	3.0
Uterine fibroids	10	2.8
Renal vascular disease	9	2.5
Bleeding disorders	8	2.2
Leukaemia	6	1.7
Sickle cell disease	6	1.7
Other diagnoses	24	6.7
Total	359	100.0

Table 4: Summary of adverse events reported by blood product type in Rivers State

Blood product	Symptom	Frequency	Percentage (%)
Packed cells (n = 12)	Headache	5	41.71
	Cough	4	33.30
	Abdominal pain/cramps	1	8.33
	Back pain	1	8.33
	Chest tightness	1	8.33
	Total	12	100.00
Whole blood (n = 11)	Cough	4	36.30
	Dyspnoea	3	27.30
	Abdominal pain/cramps	1	9.10
	Anxiety	1	9.10
	Fever	1	9.10
	Nausea/ vomiting	1	9.10
	Total	11	100.00
Sedimented cells (n = 1)	Fever	1	100.00
	Total	1	100.00

Clinical characteristics

Anaemia was the predominant diagnosis requiring transfusion (n = 285). Others (n = 24) included fractures (n = 4), peptic ulcer disease (n = 3), ectopic pregnancy (n = 2) and infectious conditions such as sepsis (n = 3) and pneumonia (n = 2; see Table 3).

Transfusion adverse events reported

A total of 24 adverse events were reported during the study period (incidence rate of 6.0%). The most reported symptoms were cough (n = 8, 2.23% incidence) and headache (n = 5, 1.39% incidence). Different blood products were reportedly associated with varying profiles of adverse events [Table 4].

Classification of adverse events reported

Most reported adverse events (23/24, 95.8%) were classified as 'unclassified (UNC)' in the reporting system, with only one case classified as 'minor allergic' (anxiety). The severity of adverse events was predominantly reported as 'non-severe' across all cases.

Discussion

Seeking to determine the patterns, incidence, types and clinical presentations of adverse transfusion events in Rivers State, and identifying likely associations between patient characteristics, transfusion practices and adverse outcomes, we found that of the 397 blood transfusions

documented in 359 patients, 24 adverse events reportedly occurred, representing an incidence rate of 6.0%. This exceeds previous reports from Zimbabwe (0.046%) and South Africa (estimated 0.024%)[14,15] and may be due to our smaller sample size. Nevertheless, it is considerably below the 8.7% rate documented at a tertiary care hospital in Ile-Ife, South West Nigeria.[7] Variations in study methodology, surveillance approaches, personnel training and reporting structures may account for reporting differences. In Zimbabwe, passive surveillance was used, retrospectively collating data, with 20% participation compared to active surveillance in South Africa.[14,15]

Transfused patients had a mean age of 37 years (SD = 20.1), with women comprising 64% of recipients. This sex disparity could be attributed to obstetric/gynecological-related transfusions, including caesarean sections (11 cases) and uterine fibroid-related haemorrhages (10 cases). Similar distributions appear in transfusion studies throughout SSA, highlighting the additional transfusion burden associated with reproductive health complications.[10,16] In Zimbabwe, women also made up 64% of reported recipients, and the median age reported was 36 years.[14] South Africa, however, did not disaggregate recipient data by age or sex.[15] Nonetheless, the fact that transfusions in paediatrics, sickle cell disease and malaria were not as frequently reported aligns with a previous multi-facility study in Nigeria on blood utilisation by specialty.[17]

The majority of reported transfusions (91.7%) were urban, reflecting population distribution and healthcare resource inequities rather than true differences in transfusion needs. This urban–rural disproportion raises concerns about blood safety in rural settings, where both blood supply and adverse event surveillance may be suboptimal.[18]

Cough was the most common symptom (eight cases, 2.23% incidence), unlike in developed countries where fever predominates.[19] Fever, commonly associated with febrile non-haemolytic transfusion reactions (FNHTR),[20] was reported in only two cases (0.557% incidence). This may highlight differences in symptom recognition and reporting, underlying patient factors or differences in blood component preparation and storage practices.[4] Misclassification of FNHTRs or failure to report mild febrile responses may have resulted in a low incidence of reported fever.[20]

Unsurprisingly, packed red blood cells and whole blood transfusions were most frequently implicated.[21] Possibly, non-use of capital-intensive leucoreduction in low- and middle-income countries may contribute to the observed reaction patterns, particularly for symptoms associated with cytokine release or white cell antibodies.[21,22] Whilst fever was not frequently reported in our study, other features, such as headaches and difficulty breathing, were reported.

The categorisation of 23 of the 24 adverse reactions as UNC was disappointing. This highlights fundamental weaknesses in Rivers State. Identification, categorisation and diagnostic capabilities of professionals may be insufficient, and documentation practices may be inadequate. This corroborates researchers' citing of inadequate awareness and feedback systems as reasons for under-reporting adverse events.[23] Hospital blood transfusion committees, standardised reporting protocols, enhanced personnel training with supportive supervision and appropriate use of blood components are therefore vital.[23] The near-total categorisation of adverse events as UNC made it virtually impossible to determine associations between patient characteristics, transfusion practices and adverse events. As haemovigilance reporting is not currently legally mandated in Nigeria, transfusing establishments are not obligated to deploy scarce resources towards haemovigilance training and systems strengthening. Legislation such as the mandatory haemovigilance officer legislation in the European Union is therefore necessary to mandate organised surveillance for traceability, reporting serious adverse events and blood safety in donors and recipients.[24]

Strengths of this study include its prospective design and insights into transfusion practices and adverse events reporting in Rivers State. However, state-specificity, under-reporting, inconsistent documentation, infrequent investigations and laboratory confirmation of suspected reactions are important limitations hindering generalisability.

Nevertheless, we establish important baseline data for transfusion safety in Rivers State and highlight the need for enhanced surveillance, standardised reporting and improved training for recognising and managing transfusion reactions. Future research in other states, assessing causality of adverse transfusion events, component preparation, storage and patient risk factors, could offer valuable insights for targeted interventions to minimise adverse events.

In conclusion, the 6.0% incidence of reported transfusion reactions in our study reflects previously reported regional ranges. Nevertheless, the predominant categorisation of adverse events as 'UNC' clearly demonstrates a substantial need for personnel enhancement in recognising, investigating and reporting transfusion-related adverse events. To boost transfusion safety in resource-limited settings, improved haemovigilance systems are essential for accurate risk assessment and use of appropriate preventive measures. Therefore, propelling effective haemovigilance systems will depend on the extent of intentional investment in legislation, systems and personnel to drive them.

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Author contributions

AO and MVH conceived and designed the study. AO, JDW, IM, HI, FB, OA, CTA and HUO acquired the data. AO, IM and MVH analysed the data, which were then interpreted by AO, MVH, KBG, SOO, TN and MP. AO and IM drafted the initial manuscript, and all authors contributed to re-drafting and critical revision of the manuscript for intellectual content. All authors provided final approval of the version to be published.

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Conflicts of interest

There are no conflicts of interest.

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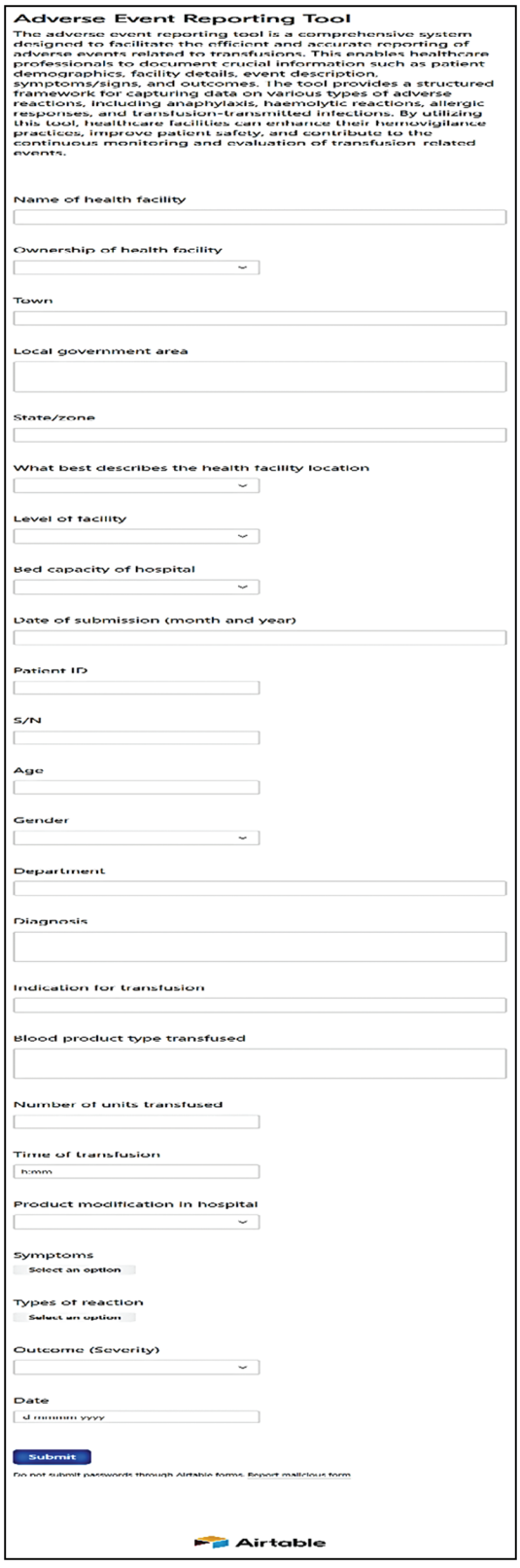
Appendix

Appendix 1: Adverse events reporting form



Adverse Event Reporting Tool

The adverse event reporting tool is a comprehensive system designed to facilitate the efficient and accurate reporting of adverse events related to transfusions. This enables healthcare professionals to document crucial information such as patient demographics, facility details, event description, symptoms/signs, and outcomes. The tool provides a structured framework for capturing data on various types of adverse reactions, including anaphylaxis, haemolytic reactions, allergic responses, and transfusion-transmitted infections. By utilizing this tool, healthcare facilities can enhance their hemovigilance practices, improve patient safety, and contribute to the continuous monitoring and evaluation of transfusion related events.

Name of health facility

Ownership of health facility

Town

Local government area

State/zone

What best describes the health facility location

Level of facility

Bed capacity of hospital

Date of submission (month and year)

Patient ID

S/N

Age

Gender

Department

Diagnosis

Indication for transfusion

Blood product type transfused

Number of units transfused

Time of transfusion

Product modification in hospital

Symptoms

Select an option

Types of reaction

Select an option

Outcome (Severity)

Date

Submit

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Appendix 2: Total numbers of patients and blood units transfused by hospital in Rivers State

S/n	Name of health facility	Health facility location	Total number of transfused patients	Total number of blood units transfused
1	Rivers State University Teaching Hospital, Port Harcourt	Urban	229	249
2	Nigerian Air Force Reference Hospital, Port Harcourt	Urban	45	49
3	Health of the Sick Hospital, Port Harcourt	Urban	23	25
4	Model Primary Healthcare Centre Rumuokwurusi, Obio Akpor	Urban	16	20
5	Professor Kelsey Harrison Hospital, Port Harcourt	Urban	14	18
6	General Hospital Okrika	Rural	9	10
7	General Hospital Terabor, Gokana	Rural	6	8
8	General Hospital Nchia Eleme	Semi-urban	6	7
9	General Hospital Opobo	Rural	0	0
10	Zonal Hospital Bori	Semi-urban	5	5
11	Zonal Hospital Degema	Rural	0	0
12	Cottage Hospital Umuebulu, Etche	Rural	2	2
13	Abua General Hospital	Rural	1	1
14	General Hospital Ogu	Rural	1	1
15	Neuropsychiatric Hospital Rumuigbo, Obio Akpor	Urban	1	1
16	General Hospital Ngo, Andoni	Rural	1	1
			359	397