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## Blood Transfusion Burden of General Surgical Diseases at The Rivers State University Teaching Hospital, Port Harcourt, Nigeria

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## Abstract

**Background:** Blood transfusion plays a significant role in surgical practice, despite its sourcing and usage problems. The present study aimed to evaluate the intraoperative use of blood and blood products among General Surgery patients who underwent elective and emergency procedures at the Rivers State University Teaching Hospital from January 2022 to December 2023.

**Materials and methods:** This retrospective analytical observational study was conducted in Port Harcourt, Nigeria, among the total population of General Surgery patients who underwent elective and emergency procedures, using operating theatre registers.

**Results:** Out of the 78 General Surgery patients who received intraoperative blood transfusions, 28 were male and 50 were female. Patients in the age group of 41-50 years received 24 blood transfusions, followed by 31-40 years (23 transfusions), and 51-60 years (11 transfusions). The number of blood transfusions carried out increased by 51.6% from 2022 (n=31) to 2023 (n=47). The Transfusion Index (TI) was 1.13 for 2022 and 1.66 for 2023. Intestinal obstruction had the highest number of intraoperative blood transfusions - 32 (8 in 2022; 24 in 2023). Exploratory laparotomies performed for non-trauma cases had the highest number of blood transfusions (n=66: 23 in 2022; 43 in 2023), followed by mastectomies (n=24: 4 in 2022; 20 in 2023), and emergency exploratory laparotomies done for trauma (n=12: 6 in 2022; 6 in 2023).

**Conclusion:** The study reveals significant intraoperative blood transfusion practices, with exploratory laparotomies, mastectomies, and thyroidectomies requiring the most intraoperative blood transfusion.

## Keywords

Blood Transfusion; General Surgery; RSUTH; Port Harcourt; Nigeria.

## Introduction

The administration of blood in surgical practice is pivotal, influencing the patients' outcome despite the problems associated with its sourcing and usage. This has largely contributed to its continued usage from the inception of this practice in ancient Greek and Egyptian civilization to the discovery of blood circulation in 1616 by William Harvey [1]. Latter names in blood transfusion history were the Royal Society, James Blundell of London (1818), Carl Landsteiner (1900), however, the works of nineteenth century James Blundell made it possible for blood to be used as a replacement. Therapeutic use of blood became possible following discovery of anticoagulants and ABO blood groups in the 20th century [2]. Blood transfusion usage in Africa dates back the 1920s and grew after the second world war following establishment of organized health institutions [3]. The clinical use of blood is therefore a global concern to the World Health Organization and the nations of the world. Modern surgery from the 1960s has witnessed advocacy for bloodless surgery, especially with the declined of blood transfusion for religious reasons [4,5].

Among the many health policies in Nigeria - national health policy, national health promotion policy, national malaria control policy, etc., - is the national blood transfusion policy revised in 2005 comprising zonal centers in six geopolitical zones, States and Local Government Service Centers, Armed Forces Blood Centers, and Blood Bank centers in private and non-governmental establishments [6,7]. However, against the declaration and recommendations of the World health Assembly for nations to adopt the use of voluntary non-remunerated blood donors (VNRD), hospital-based blood transfusion services where family and paid donors are recruited are more prevalent in practice [8]. Use of life-saving blood is not without issues in our practice. When decisions of life and death had to be taken on minors in a highly religious country like ours, some challenges have been encountered between the State and the parent / guardian, regarding who should have the overriding obligation [9].

The challenges associated with blood transfusion safety and services in Nigeria are myriad: including shortage of blood, infrastructural deficits, poor implementation of blood transfusion guidelines, to high prevalence of transfusion-transmissible infections [10,11]. More worrisome is the delay that absence of blood has caused to commencement of surgery following inability of the patient and / or relatives to provide needed blood for surgery [12]. This is because the two main ways to obtain donor blood are still through paid donors and family replacements [13,14]. Blood components are not commonly available, and where available whole blood is more often requested as reported in a study in studies from other parts of Nigeria [15-17]. Autologous blood transfusion is an option in certain clinical situations, but the frequency of its use in our area of practice is uncertain. The use of erythropoietin, a stimulant of erythropoiesis, is effective but will take some time to achieve the desired goal [18]. Our study focuses on the blood transfusion burden for General Surgery, and evaluated intraoperative use of blood among patients operated by General Surgery teams at the Rivers State University Teaching Hospital from January 2022 to December 2023.

## Materials and Methods

**Research Design:** A retrospective analytical observational study.

**Study area:** The study was conducted at the General Surgery theatre of the Rivers State University Teaching Hospital, in Port Harcourt, the capital city of Rivers State, Nigeria.

**Study population:** All patients who underwent elective and emergency General Surgical procedures at the operating theatre of the Rivers State University Teaching Hospital formed the study population.

**Sample size determination:** Total population of patients was used for the study.

**Study instrument:** A proforma was developed for this study to capture data from the operating theatre register on blood transfusion for emergency and elective General Surgery cases done.

**Study variables:** Number of General Surgery cases done, type of surgery done, number of units of blood used intraoperatively.

**Blood transfusion indices:** Cross-match to transfusion ratio (C: T ratio) refers to the number of units cross-matched divided by the number of units transfused. A value of < 2.5 is considered efficient blood use. Transfusion Index (TI) refers to the number of units transfused divided by the number of patients cross-matched. TI value of >0.5 is indicative of significant blood utilization. Transfusion Probability (TP %) is the number of patients transfused divided by the number of patients cross-matched, and the value multiplied by 100. When the value is  $\geq 30\%$  it is considered as significant blood usage.

**Data analysis:** Collected data was entered in an Excel spread sheet and exported to SPSS version 23.0 for analysis.

**Validity/Reliability of instrument:** The study instrument was scrutinized by all authors before use.

## Results

(Table 1) shows the sex distribution of patients for data collected for 2022 and 2023. A total of 78 General Surgery patients were transfused (28 males and 50 females). The intraoperative blood transfusion rate was 10% ( $78/780 \times 100$ ).

Sex Distribution (for all patients who had intra-operated blood transfusion)	2022		2023		Total	
	Male	Female	Male	Female	Male	Female
	12	19	16	31	28	50
Total	31		47		78	
Total Number of Operated Patients in General Surgery	411		369		780	
Total						

**Table 1:** Sex distribution of patients (n =; N =)

The age distribution of operated General surgery patients who had blood transfusion is shown in Table 2. There were 24 patients aged 41-50 years who had blood transfusion, being the age grouping with the highest frequency (2022 = 9; 2023 = 15). This was closely followed by age group 31-40years (2022 = 8; 2023 = 15), and 51-60 years (2022 = 4; 2023 = 7).

S/N	Age Range (Years)	Frequency		
		2022	2023	Total
1	11 - 20	-	1	1
2	21 - 30	4	4	8
3	31 - 40	8	15	23
4	41 - 50	9	15	24
5	51 - 60	4	7	11
6	61 - 70	5	4	9

7	71 - 80	-	1	1
8	81 - 90	1	-	1
9	> 90	-	-	-
Mean Age (...Years)		31	47	78

**Table 2:** Age distribution of operated patients who had blood transfusion.

S/N	Surgical Conditions	2022		2023		Total	
		Number of Patients Transfused	Number of Pints transfused	Number of Patients Transfused	Number of Pints Transfused	Number of Patients Transfused	Number of Pints transfused
Trauma							
1	Gunshot Injuries	3	4	2	4	5	8
2	Road Traffic Accidents	2	2	1	1	2	2
3	Other Injuries	2	2	1	1	2	2
Infective							
4	Ruptured Appendicitis	1	1	1	2	2	3
5	Acute Pancreatitis	-	-	1	1	1	1
6	Miscellaneous (Abdominal Abscess)	-	-	2	3	2	3
Metabolic							
7	Perforations of Peptic Ulcer Disease	1	1	4	5	5	6
8	Goitre	-	-	3	3	3	3
Intestinal Obstruction							
9	Intestinal Obstructions other than Tumours	8	8	12	24	20	32
Neoplastic							
10	Breast Cancer	4	4	14	20	18	24
11	Pancreatic Tumour – Obstructive Jaundice	2	3	-	-	2	3
12	Pancreatic Pseudocyst	1	1	1	1	2	2
13	Colorectal Tumour	-	-	2	3	2	3
14	Pelvic Tumour	-	-	1	2	1	2
15	Other Intra-abdominal Tumour	2	3	-	-	2	3
Others							

16	Entero-cutaneous Fistula	4	5	1	1	5	6
17	Massive Splenomegaly	-	-	1	2	1	2
	Un-named	1	1	-	-	1	1
Total		31	35	47	73	78	108

**Table 3:** Surgical Conditions and Number of Pints of Blood Transfusions Per Case.

Table 3 presents the number of blood transfusions carried out for General Surgery Cases in the years 2022 and 2023. In 2022, 35 units of blood were transfused to 31 patients, resulting in a Transfusion Index (TI) of 1.13. Additionally, in 2023, a total of 78 pints of blood were administered to 47 patients, giving a Transfusion Index of 1.66. Intestinal Obstruction had the highest number of intraoperative blood transfusions, with 32 cases (8 in 2022 and 24 in 2023). The next two most frequent conditions were breast cancer (n=24, with 8 cases in 2022 and 24 cases in 2023), and Gunshot injuries (n=8, with 4 cases in both 2022 and 2023). The Transfusion Indices for the most common disease conditions were calculated as follows: intestinal obstruction = 1.6, breast cancer = 1.33, and gunshot injuries = 1.6.

S/N 1	Surgery	Number of Surgery		Number of number of pints of blood transfused		Total Number of number of pints
		2022	2023	2022	2023	Both Years
2	Thyroidectomies / Neck Dissections	-	3	-	4	4
3	Mastectomies	4	15	4	20	24
4	Emergency Exploratory Laparotomies for with Bowel Resections for Trauma (Gunshot Injuries and Others)	5	4	6	6	12
5	Exploratory Laparotomy for with resections for Non-Trauma Cases	20	26	23	43	66
6	Wound Debridement	1	-	1	-	1
7	Groin Vascular Surgery	1	-	1	-	1
Total		31	48	35	73	108

**Table 4:** Type of Surgery and Intra-Operatively Blood Transfusions Given.

(Table 4) shows the type of surgery and the number of intra-operatively blood transfusions given. Exploratory laparotomies done for non-trauma cases had the highest number of blood transfusions (n = 66: 2022 = 23; 2023 = 43), followed by mastectomies (n = 24: 2022 = 4; 2023 = 20), and emergency exploratory laparotomies done for trauma (n = 12: 2022 = 6; 2023 = 6). Surgery specific transfusion index

(TI): exploratory laparotomies for non-trauma cases 1.43, emergency exploratory laparotomies for trauma = 1.33, thyroidectomies / neck dissections = 1.33, and mastectomies = 1.26.

## Discussion

Blood transfusion practice has generated concern globally, [19-21] and especially so in Nigeria when it has to do with children who have to get the consent of their parents or guardians, who may belong to faith based organizations that refuse blood transfusion [22-24]. In contrast, our patients in this study were adults who gave consent before they had blood transfusions. The highest frequency of intraoperative blood transfusion was found among patients who were 41-50years of age followed by 31-40 years and 51-60 years. The explanation for this finding could be the availability of pediatric surgeons in our center and the sister institutions who take care of the health of children, leaving General Surgeons to focus on adult surgical practice. Additionally, our center is located in the Southern part of Nigeria, and patients within this age bracket are more likely to be outgoing to care for their families and hence may have increased risk for trauma and surgery. The age groups 40years and above also more likely to have age-related illnesses and co-morbidities.

The study found that females received intraoperative blood transfusions almost twice as often as males. The difference may be due to changing demographics in general surgery presentations, as reported even outside of our region [25]. It is possible that the observed increase in female admissions in General Surgery can be attributed to incisional hernias and intestinal obstructions resulting from previous obstetric and gynecologic abdominal surgeries. Another possible explanation could be that the baseline hemoglobin level for men is higher than that of women, [26,27] hence the tendency for higher chance of blood transfusion observed among females in this study.

In the year 2023 about twice intraoperative transfusion need was recorded over the previous year 2022. This finding could have resulted from an increase in the patronage of the hospital and hence increase in the total number of surgical patients in the year 2023 following improvement in ambience and services of the hospital compared to the previous year. Similar factors could account for the rise in the general Transfusion index from 1.13 to 1.66 within the two-year study period implying significant usage of blood, with intestinal obstructions, breast cancers, and gunshot injuries being the major indications for intraoperative blood demand. Disease specific transfusion index for the most frequent disease conditions of 1.6 for intestinal obstruction, 1.6 for gunshot injuries, and 1.33 for breast cancer all shows high blood usage.

Our experience in General Surgery practice shows that exploratory laparotomies (both emergencies and electives) are more prone to require intraoperative blood transfusions, followed by the mastectomies. Our findings share similarity with a study in Mumbai-India where the procedures that required significant blood utilization were reported to be Puestow's / Partington's surgery, biliary-enteric bypass, prostatectomy, pyelolithotomy – which were laparotomies, and modified radical mastectomy [28]. Similar findings were reported in Ilorin Nigeria, [29] and other regions of the world.[30] It is important to observe here that a study published in 1983 had criticized or emphasized the issue of unnecessary cross-match of blood for cholecystectomy, thyroidectomy, mastectomy, and vagotomy [31]. However, surgery specific

transfusion index (TI) in our study which is 1.43 for exploratory laparotomies for non-trauma cases, 1.33 for emergency exploratory laparotomies for trauma, 1.33 for thyroidectomies / neck dissections, and 1.26 for mastectomies, are higher than that reported in a South-West Nigerian study (laparotomy 0.31, mastectomy 0.09, thyroidectomy 0.07) [32]. The figures in our study are for both elective and emergency surgeries, whereas that for the South-West Nigerian study is solely for elective general surgery cases.

**Study Limitations:** This is a retrospective study carried out with already collected data. As it is the case with such studies in this category, incompleteness of data was a challenge. We were unable to obtain data specific for General Surgery needed information for calculation of Transfusion Index (TI) and Transfusion Probability (TP %).

## Conclusion

The intraoperative blood transfusion rate was 10% and females dominated. Patients within 31 and 60 years of age were prevalent and 41-50 years were greater in number. General Surgery Transfusion Index was 1.13 for 2022 and 1.66 for 2023 implying significant blood usage. Intestinal Obstruction was the surgical condition requiring the highest number of intraoperative blood transfusion, followed by breast cancer and gunshot injuries. Exploratory laparotomies, mastectomies, and thyroidectomies had the highest intraoperative blood requirement.

## Recommendations

There is need for improvement in compartmentalizing blood transfusion requests made and disbursements in the hospital for future studies. Efforts should be made to reduce the relatively high blood transfusion index recorded in this study, including exploring and expanding the option of minimally invasive procedures for selected cases in our General Surgery practice. This has the potential of minimizing the tendency for intraoperative blood loss experienced in some of the cases.

## Other Information

**Ethical considerations:** The approval of the Research Ethics Committee of the Rivers State University Teaching Hospital was obtained before commencement of study, and all the data collected for this study will be kept confidential.

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**Conflict of interest:** None declared.

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