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Factors Associated with Blood Transfusion among Adult Patients at Murtala Muhammad Specialist Hospital, Kano State

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Abstract

Hemorrhage among adult patients is a common but preventable cause of adult mortality in sub-Saharan Africa. Safe blood transfusion is a highly effective method for saving the lives of adults in these circumstances. The study aims to determine the factors associated with blood transfusion and its prevalence among adult patients at MMSH, Kano. A retrospective cohort design over a period of one year from 1st January to 31st December 2024 was employed for the study. A standardized instrument based on CDC criteria was adapted, and the sample size was three hundred and eighty-nine (389). The obtained data were analyzed using SPSS version 22 and presented in frequency distribution tables, percentages, and charts. The results showed a prevalence rate of 39.01%, and patients within the age range of 18-25 have an increased risk of blood transfusion by 3-fold odds ratio (OR: 3), and anemia ($P < 0.005$) was the leading factor (predictor) associated with blood transfusion among the studied group. It is concluded that there is a high prevalence rate of blood transfusions, with anemia being the leading cause of blood transfusions among the studied group. It is therefore recommended that clinical guidelines for the appropriate use of different blood products should be developed and meticulously administered.

Keywords: Adult patients, blood transfusion, factors, prevalence.

INTRODUCTION

Global indices by the World Health Organization (2023) showed that blood collection rates vary dramatically worldwide, with 117 million units of blood collected annually from high-income settings. These indicators implied that low- and middle-income countries (LMICs) are underserved. Adewoyin and Oyewale (2015) reported that access to a safe and adequate blood supply remains a public health challenge in many countries, particularly in low-resource settings (characterized by poor economic conditions). In high-income countries, the average donation rate is 32.1/1000 population, compared to 4.6/1000 population in low-income countries, where about 80% of the world's population lives and has access to only 20% of the world's safe blood supply.

Cross et al. (2021) and Jolu and Suddock (2021) highlighted that blood is a vital human tissue and a precious health resource, required to be adequately available, safe, correctly and rationally used, and timely administered. Brain et al. (2019) asserted that blood and transfusion safety were of concern across all regions. Moreover, National reports to the World Health

Organization (WHO) Global Database for Blood Safety (GDBS), as well as other published data, suggest that poor quality or lack of blood donation screening could be the most significant gap in blood safety internationally (Chevalier et al., 2016). In an ongoing debate, it has been stressed that most LMIC blood supplies rely on both volunteer and family/replacement donors in ratios ranging from 0% to 100% (Tagny et al., 2013; Ifland, 2014). Blood products are one of the most precious lifesaving drugs in terms of potential benefit to recipients (Sharma et al., 2023). The need for an "adequate supply of safe blood" emerged as the major overriding discussion in low-income settings. Evidence suggests that currently, about 80% of the world's population has access to only 20% of the world's blood supply (Prentice, 2012; Brain et al., 2019). In similar reports, it has been shown that low- and middle-income countries (LMICs) often face challenges in meeting their transfusion needs. The approaches to securing a safe and adequate blood supply in high-income countries (HIC) are not appropriate, practical, or validated for the broad range of LMIC settings Brain et al., 2019.

Previous studies have documented that inadequate or inconsistent supplies and acute shortages of blood for transfusion in low-resource settings, often coupled with questionable quality, pose real risks to the health of patients who need transfusion (Brain et al., 2019). These reports align with the goals of the National Institutes of Health (NIH) and the National Heart, Lung, and Blood Institute (NHLBI). It was further argued that to achieve optimal use of blood, transfusion must be appropriate and judicious, consuming minimal resources and manpower (Kumari, 2017; Melku et al., 2018). The indications for blood transfusion, its prevalence, and cardinal factors associated with blood transfusion may be linked to proper availability, safety, appropriate use, and timely administration of blood products (Sharma et al., 2023; Krishnamurthy et al., 2020).

Despite its importance, blood transfusion can be fraught with risks if not properly managed. It was, however, observed that adverse events, such as transfusion reactions and the transmission of infectious diseases, continue to pose challenges even in high-income countries where safety standards are rigorous (Brain et al., 2019). Ensuring blood safety involves a combination of effective screening, proper blood storage, and meticulous transfusion practices (Kumari, 2017). Growing evidence on the factors associated with blood transfusion and its prevalence suggests a significant disparity exists between low-income and high-income countries regarding blood transfusion practices (Yawn, 2024). It was further highlighted that high-income countries generally have robust systems for blood collection, processing, and distribution, with sufficient supplies to meet demand, often relying on voluntary blood donation (Brain et al., 2019). In contrast, low-income countries frequently face chronic blood shortages, limited infrastructure for blood processing and storage, and a higher reliance on replacement or paid donors, leading to potential safety concerns (Brain et al., 2019). Reports on the factors associated with blood transfusion showed that low-income countries, up to 65% of blood transfusions are given to children under 5 years of age, whereas in high-income countries, approximately 76% of the blood supply is received by patient groups over 65, and this trends have equally been observed at the present study settings which informed the need for this study. The major methodological and clinical gap in blood transfusion is the variation in leading predictors for blood transfusion across settings in Nigeria, which served as the main focus of this study. Similarly, significant gaps remain in the safe availability of

blood, especially in low-resource settings, and in the implementation of appropriate clinical transfusion guidelines. Another empirical gap that informed the need for this study is that different regions have different levels, with significant interregional variability in the factors associated with blood transfusion and its prevalence rate.

MATERIALS AND METHODS

Research Design. A retrospective design was employed for the study. The design provided a structured approach of utilizing existing data to delve into the intricacies of factors influencing blood transfusion incidents.

Study Setting

The study was conducted at Murtala Muhammad Specialist Hospital, Kano, located on Kofar Mata Road, Kano Municipal Local Government, Kano State. It is located between the longitude of 1175E, 11.98E, and the latitude of 886N. The hospital was established in 1922 by the native authority. It was commissioned in 1926 in a densely populated area of Kano State, and it was the first hospital established by the British colonial government with the aim of treating both the colonial masters and African workers who worked with the colonial government and the native authority. The hospital is bordered by Madobi and Tofa Local Government Areas (LGAs) to the South West, Gezawa LGA to the East, Dawakin Kudu LGA to the South East, and Minjibir LGA on the North. It is one of the oldest hospitals in Nigeria, which was named after the former head of State-General Murtala Muhammad, who was assassinated in 1976. The hospital became a specialist hospital in the year 1997.

Target Population. The target population for this retrospective analysis encompasses adult patients who have undergone blood transfusions at Murtala Muhammad Specialist Hospital in Kano. These included individuals within a specified time frame (from January 2024 to December 2024), ensuring relevance to associated factors, prevalence, and clinical outcomes associated with blood transfusion practices among adult patients in labour and the emergency ward. During the study, there were 36,285 admissions, out of which 12410 were blood transfusions in the labour ward, while 1747 were blood transfusions in accident and emergency.

Inclusion Criteria

Adult patients within the age range of 18-60 years of age, who have received blood transfusions in accordance with established maternity and emergency care guidelines and protocols implemented at the hospital.

Adult patients for whom there exists comprehensive and pertinent documentation of the blood transfusion procedures in their medical records within the specified timeframe in the labour and emergency ward.

Exclusion Criteria

Non-adult patients within the age limit, patients with missing or insufficient medical records, hindering a thorough examination of blood transfusion practices in the labour ward and emergency ward, and cases where blood transfusions deviate significantly from established transfusion guidelines and protocols in the labour ward and emergency.

Sample Size

The sample size for this study was determined based on considerations of achieving sufficient statistical power and precision in estimating the prevalence and factors associated with blood transfusion. A confidence level of 95% and a margin of error of 5% were employed in the sample size calculation using standard sample size formula (Taro Yamane's formula) $n = N / (1 + N(e)^2)$ n =sample size N =population size (14157) e =acceptable sampling error (0.05) therefore; $n = 14157 / 1 + 14157(0.05)^2$ $n = 14157 / 1 + 14157(0.0025)$ $n = 14157 / 1 + 35.3925$ $n = 14157 / 36.3925$ $n = 389$. The calculated sample was selected from the target population of 36,285 patients admitted to the hospital during the study period. A cluster sampling technique was employed, using the hospital number to select patients' files or folders, until the desired sample size was attained.

Instrument for Data Collection

The data collection instrument was adapted from the Centre for Disease Control and Prevention (CDC, 2024) on the strategy for a retrospective study on factors associated with

blood transfusion. Involves a multi-faceted approach where the number of all patients who had blood transfusions from January 1st to December 31st, 2024, was collected from various units (A&E, labor ward), ensuring a systematic retrieval of key variables such as patient demographics, medical history, and records of blood transfusions. Facilitating the systematic collection of data related to clinical outcomes, reasons for transfusion, and prevalence.

Method of Data Collection

Data were collected retrospectively from the hospitals for the 12-month period from January 1st to December 31st, 2024, and a cluster sampling technique was employed, covering all blood transfusions recorded in the files and blood bank registers during this period for adult patients. Using the recipient's (patients') demographic information, the discharge summaries were extracted from the patient folders. The variables included in the final dataset were characteristics of the patient (age and gender), reasons for blood transfusion, clinical outcomes following transfusion (discharge status and length of hospital stay), the prevalence of blood transfusion, and the prevalence of blood transfusion reactions.

Method of Data Analysis

The data were collected, entered, and analyzed using the Statistical Package for the Social Sciences (SPSS) version 22. Microsoft Word was used for creating tables and charts.

Ethical Consideration

An introductory letter was obtained from the Department of Nursing Science, BUK, which was submitted to the State Ministry of Health Research Ethics Committee, Kano State, where ethical approval was granted with reference NHREC/17/03/2018.

RESULTS

Table 1: Bio-demographic characteristics of the respondents

Variables n=389	Frequency	Percentage
AGE		
18-25	103	26.47
26-35	181	46.52
36-45	87	22.36
46-50	11	2.82
51-60	7	1.79
GENDER		
MALE	24	6.16
FEMALE	365	93.83
RELIGION		
ISLAM	328	84.31
CHRISTIAN	61	15.68

The above table revealed that the majority (46.52%) of the subjects were between the age of 26-35 years, and most of the patients who had blood transfusions were females (93.83%)

TABLE 2: Factors Associated With Blood Transfusion

VARIABLES	FREQUENCY	PERCENTAGE
• Reasons/ or indication for blood transfusion		
Anemia	90	23.13
Surgery	45	11.56
Hemorrhage	80	20.56
Systemic Infection	26	6.68
Previous Transfusion	29	7.45
Delivery	50	12.85
Cancer	20	5.14
Sickle Cell Disease	49	12.59

It is clear from the table above that the most common indications for blood transfusion were anemia (23.13%) and hemorrhage (20.56%), with others reflected in the table.

Table 3: Correlation between patients' demographic and predictors for blood transfusion

Variables	n	%	OR	P-Value	CI
Age (yrs)					
□ 18-25	103	26.47	3.042	0.0112	
□ 26 -35	181	46.52	1.023	0.062	
Gender					
□ Male	24	6.16	2.010	0.0212	
□ Female	365	93.83	2.022	0.0321	
Indication for transfusion					
□ Anaemia	90	23.13	2.011	0.001	
2. Haemorrhage	80	20..56	1.201	0.0510	

Keys: n - number, % - percentage, OR - odds ratio, P<0.005, CI-Confidence Interval 95%

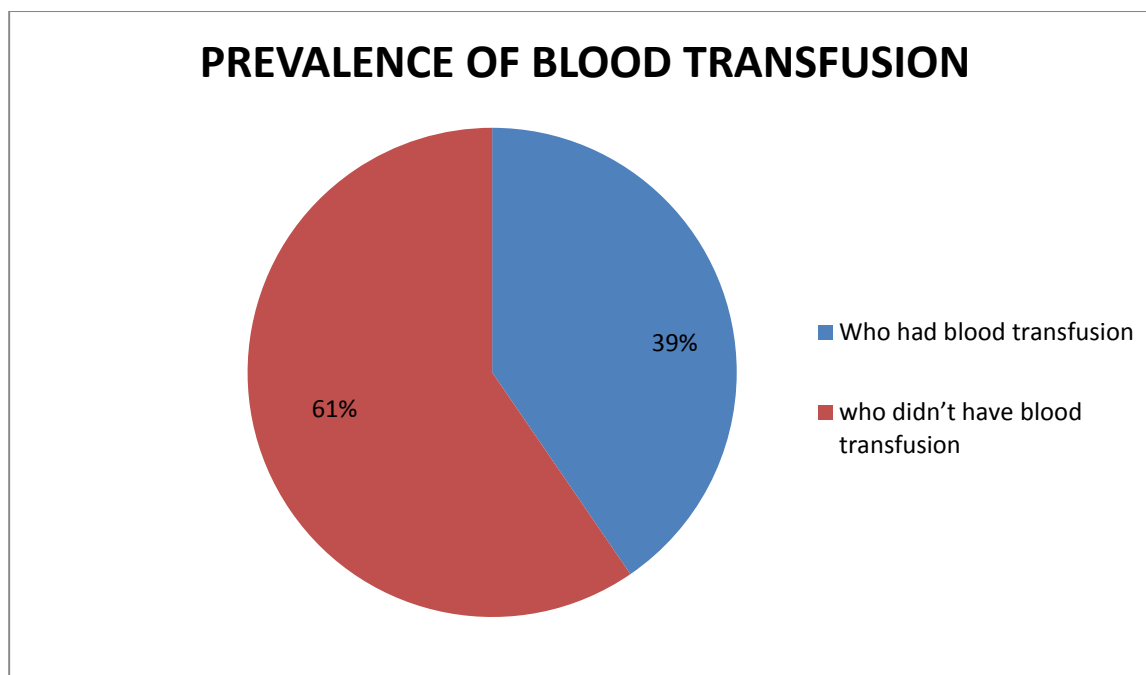


Figure 1. Prevalence of blood transfusion

Prevalence of blood transfusion = total no patients admitted / total no that had blood transfusion * 100%. Prevalence = $14157 / 36285 * 100 = 0.3901 * 100 = 39.01\%$

DISCUSSION

The demographic dynamics in this study showed that the most common age for transfusion is between 26 and 35 years (46.52%), and have also reflected a female preponderance. These findings are not counterintuitive, given the geographical dynamics of the study settings, which had heightened female dominance. This could be linked to an increased in surgical interventions among female patients, which necessitate blood transfusion. In addition, these groups of patients were within their reproductive age, which informed the need to maintain their hemodynamic level with minimal physiologic compromise.

This study finding is also in congruent with another study conducted by Chowdhary et al. (2016), where majority of transfusions were done for females patients than males patients (93.83%), this is equally similar to a study conducted by Idris et al. (2023) that found majority of the patients who received transfusion lives in urban area and were majorly within reproductive age that reflected female preponderance. In another report by Achia et al. (2023) and Eli et al. (2022), a study was conducted to determine post-operative anemia and the prevalence of blood transfusion in surgical patients at the Rivers State University Teaching Hospital. Similar demographic dynamics were documented.

The present study further revealed that anemia (23.13%) was the leading cause of blood transfusion, followed by hemorrhage (20.56%) and delivery (12.85%), among other common indications or factors for blood transfusion. Less common factors were previous transfusion, systemic infection, and cancer among adult patients. These findings are not surprising, considering the state and social dynamics of the patients receiving care at the hospital. The hospital provides medical services primarily to patients from low socio-economic backgrounds and rural areas, where awareness and the ability to consume a balanced diet to meet bodily physiological needs are often limited. Moreover, most patients come to the hospital as referral cases, in which the disease condition would have

been at a terminal stage, which could physiologically affect the hemodynamic level, leading to the need for transfusion. These findings are relatively comparable to another study conducted by Eli et al. (2022) and Mahfouz et al. (2021), where post-operative anemia was reported as the leading cause of blood transfusion.

The present study also reported a high prevalence rate of blood transfusion of 39.01%. The high prevalence reported in this study is relatively higher compared to studies conducted by Gwarzo et al. (2024), Baiq et al. (2013), and Yakubu et al. (2023). This study found that the majority of the patient population received blood transfusions during their hospital stay. Notably, over half of these patients received a single-unit transfusion. The study highlighted that an estimated blood loss exceeding 500 mL was a likely trigger for blood transfusion. Therefore, this study's findings revealed the implementation science that calls for the late stages of the translational research spectrum and studies optimal and sustainable strategies to deliver proven-effective interventions for blood transfusion.

CONCLUSION

The study concluded that there is a high prevalence rate of blood transfusion and anemia, which remained the leading cause of transfusion among the studied group. It was further established that individuals within the age range of 18-25 have a 3-fold increase in blood transfusion and a 2-fold increase in anemia (OR: 3.2, 95% CI) compared to their counterparts.

Limitation

The study is limited to adult patients and was conducted retrospectively over a 1-year period.

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Conflict of Interest

The study declares no conflict of interest in any form.

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