

Blood Transfusion Service Challenges and Patterns at Kampala International University Teaching Hospital, Ishaka-Bushenyi, Western Uganda: Insights from a Comprehensive Prospective Study

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ABSTRACT

Uganda, a developing East African nation with nearly 20% of its populace living below the poverty line, faces significant constraints in its national blood transfusion service. Despite serving over 3 million individuals in Regional Referral Hospitals, a chronic scarcity of blood persists, impacting critical healthcare provisions, notably at Mulago, Uganda's National Referral Hospital. This study conducted a meticulous assessment of the indications and influential factors shaping blood transfusion services at Kampala International University Teaching Hospital, Ishaka-Bushenyi, adopting a prospective descriptive cross-sectional design encompassing a 100% review of the target patient population receiving blood transfusions. Employing a pretested questionnaire as the data collection instrument, the gathered information underwent meticulous coding, sorting, entry, and analysis utilizing statistical software. Results were systematically presented through tables and charts. The findings revealed that a considerable proportion (42.3%) of transfused individuals fell within the age range of 20-39 years, with infants and young children (<5 years) comprising 22.4% of the recipients. Males accounted for 58.7% of the transfused population. Predominant indications for blood transfusions included anemia (30.4%), obstetric and gynecological conditions (23.4%), surgical operations (19.0%), infections (14.2%), and incidents involving road traffic accidents or assault (13.0%). The study identified the availability of a blood storage facility as a significant factor motivating the utilization of blood transfusion services, with an 87.4% availability rate reported. Notably, the demand for transfusions was notably high among females (56.1%) compared to males (43.9%), with anemia (53.3%) and blood group O (48.6%) constituting the majority of cases. Blood group distributions varied across different indications, with group O being predominant in most categories. Additionally, the Rh factor played a role, with Rh+ constituting 90.5% of cases and Rh- comprising 9.5%. Blood Group O had the highest occurrence of Rh+, while Blood Group A had the highest occurrence of Rh-. In summary, the study outlined several prominent factors influencing blood transfusion indications at KIUTH, notably anemia, obstetric and gynecological conditions such as postpartum hemorrhage and cesarean sections, surgical procedures (e.g., abdominal obstructions), infections (e.g., malaria), and incidents involving road traffic accidents or assault. These indicators are influenced by factors such as blood availability, age, gender, medical conditions, and blood type, with Blood Group O Rh+ being the most prevalent.

Keywords: Blood transfusion, Gynaecology, Anaemia, Blood Group O.

INTRODUCTION

Blood transfusion remains a mainstay in upholding a safe and ample blood supply and is crucial to ensuring positive results for patients in both emergent and non-

emergent situations [1, 2]. However, low- and middle-income countries, including Uganda, frequently report insufficient blood supplies to meet their demand [3,

4]. Blood transfusion has long not been recommended for volume expansion alone, except in cases of severe hemorrhage. Similarly, transfusion is required to increase viscosity only in cases of severe hemodilution. High viscosity in itself may impede circulation. Transfused blood also does not immediately increase oxygen delivery or utilization at the tissue level [5]. Therefore, clinical situations where blood transfusion is beneficial to the patient and improves outcomes are limited.

Globally, since 2006, only an approximation of about 41.5% of the demand for blood in the World Health Organization (WHO) African Region was met [6]. Additionally, approximately 112.5 million blood units are collected worldwide annually, with 50% collected in high-income countries, comprising only 19% of the world's population [7]. Thus, WHO recommends voluntary, non-remunerated blood donation and has set a standard of 10 blood donations per 1000 populations as a baseline value for all countries to meet [7].

Additionally, on average, 32.1 and only 4.6 donations per 1000 population donations are present in high and low-income countries (including Uganda) respectively[8]. Also, the WHO estimates that blood donation by only 1% of a country's population is needed to meet the basic demand for blood used in transfusion [7]; to achieve this, the WHO advises that all activities related to blood donation, including collecting, testing, processing, and storage, be centralized at the national level. While many countries strive to achieve this, it can be more difficult for especially developing countries in Asia and Africa with poor infrastructure and lower healthcare funding.

In Africa, various barriers commonly across these low-income developing countries, ranging from blood donation and processing of blood units, make it easier said than done to maintain an adequate blood supply for transfusion purposes [9]. Thus, according to a review of 35 studies by Asamoah et al[10]. on the motivations and deterrents to blood

donation and transfusion in 16 Sub-Saharan African countries, it concluded that fear is a major deterrent, including fear of needles, adverse effects, and discouraging spiritual, religious, and cultural perceptions of blood donation [10], thus low practice of, and low volumes of blood available for transfusion.

Given the various factors that may affect one's perception of blood transfusion, community-specific education is essential to recruiting a steady blood pool in pursuit of transfusion services. In patients with acute severe upper gastrointestinal hemorrhage, a restrictive transfusion strategy (trigger Hb < 7 g/dl, target Hb: 7-9 g/dl) resulted in lower 45 days all-cause mortality (5% vs. 9%, P = 0.02) than a liberal strategy (trigger Hb < 9 g/dl, target Hb: 9-11 g/dl). Also, the incidence of further bleeding and other serious adverse effects was reduced. However, the results of this single-center trial with strict protocol adherence may not be generalizable. A multicentric pragmatic cluster-randomized feasibility trial reflecting real-world settings in patients with upper gastrointestinal hemorrhage is currently underway in the UK (TRIGGER trial) [11].

In a multicentric RCT (Transfusion Requirements in Septic Shock (TRISS) trial) in 1000 patients with septic shock in 32 ICUs, there was no difference in the 90-day mortality (RR 0.94 [0.78-1.09]), the number of patients with ischemic events (0.90 [0.58-1.39]), or in the use of life support in patients receiving Leuk reduced RBCs at a transfusion trigger of 7 or 9 gm/dl [12].

Despite blood transfusion being the mainstay of treatment, upholding a safe and ample blood supply and crucial to ensuring positive results for patients in both emergent and non-emergent situations, there has been an increase in blood collection requirements by the Uganda Blood Transfusion Service (UBTS) from 187,000 units in 2010 to 266,800 units in 2016, which is still inadequate to serve its purpose [1]. Suggesting either inappropriate use or excessive transfusion indication coupled with fear as a major

deterrent, including fear of needles, adverse effects, and discouraging spiritual, religious, and cultural perceptions of blood donation and transfusion [10], thus low practice of, and low volumes of blood available for transfusion. Furthermore, various factors have been identified to cause hemorrhage, thus requiring transfusion of blood as treatment, including advanced age-related issues, road traffic accidents, anemia (including those due to infections as well as genetic anaemia-causing conditions), and the presence of a history of pregnancy-related issues or complications such as postpartum hemorrhage, operative vaginal deliveries, and emergency cesarean delivery, as well as

multiple pregnancies in women[13-17] Similarly, in case of any complications involving bleeding, emergency surgical intervention, application of medical treatments, and rapid supply and replacement of necessary blood and blood products remain very important steps in treatment [18]. However, there exists no comprehensive publication at KIU Teaching Hospital detailing blood transfusion practices at the facility. Therefore, this study intends to determine the common indications, factors affecting blood transfusion, and quantities used. This will aid in proper patient management, planning, and implementation at the facility level and provide feedback to UBTS.

METHODOLOGY

Study Design

A cross-sectional study was used to ascertain the indications, blood use, and factors influencing blood transfusion services at KIUTH. This study was quantitative, whereby objective measurements, statistical, mathematical, or numerical analysis of data collected through a questionnaire were done.

Area of Study

The study was carried out at Kampala International University Teaching Hospital of the Western Campus, a private international university located in Ishaka Town, Bushenyi district, Western Uganda, approximately 330 kilometres (210 miles) by road, southwest of Kampala, Uganda's capital, and approximately 62 kilometres (39 miles) by road, west of Mbarara, the largest city in the sub-region. The hospital has a capacity of 400 inpatient beds, offering a wide range of medical care in medical, surgical, pediatric, psychiatric, obstetrics and gynecology wards, accident and emergency department, operating theatres, special clinics, and outpatient departments. The pediatric department has a capacity of 50 beds with pediatric intensive care having 12 beds. The Accident and Emergency department has 13 beds.

Study Population

All cases of blood transfusion cases admitted and scheduled to be done at KIUTH within the period of the study.

Sample Size

The sample size was determined using the Kirsch Leslie, formula[19].The sample size was approximately 317 patients.

Sampling Techniques

Participants were enrolled consecutively based on the inclusion and exclusion criteria.

Inclusion Criteria

All cases requiring transfusion with blood at KIUTH during the period of study.

Exclusion Criteria

All transfusion cases before and after the period of research study as well as transfusion away from KIUTH.

Data Collection and Management

Data was collected using a checklist guide. Two assistants were trained and used to aid and ease the process of data collection.

Data Collection Instrument

A checklist was used for both quantitative and qualitative data collection. The checklists had both closed and open-ended questions.

Pre-test for the Data Collection Instrument

To ensure quality control, the researcher conducted a field test of the study instrument at Ishaka Adventists Hospital. Thirty checklists (approximately 10% of the study sample) were filled out within Ishaka Adventists Hospital, Bushenyi District, for a pre-test to verify the validity of the data in the checklist.

Data Analysis Plan

Both qualitative and quantitative data were collected and analyzed by the statistical package for social scientists (SPSS) version 20 to obtain frequencies and percentages. Regression analysis was conducted for the p-values and risk estimates of the significance and association of the determinant to the prevailing distribution of the common indications for blood transfusion at KIUTH. Typing was done using appropriate computer packages such as Microsoft Office Word for the results that enable formatting and drawing of charts and tables. The findings were presented as frequencies, percentages, and cross-tabulations on graphs and charts.

Data Presentation Methods

Data was presented in the form of tables and graphs. Descriptive statistics were used where percentages for each response were calculated to give the lesson learned and conclusion from the response.

Data Quality Control

The quality of data was enhanced by ensuring the completeness of the checklists based on results from a pilot study. The checklist was checked for completeness with every participant.

Ethical Consideration

A letter of approval was obtained from the KIUWC Research and Ethics Committee, as well as an introduction letter from the research unit, Faculty of Clinical Medicine and Dentistry, presented to the authorities of the study area; Hospital Executive Director's office of KIUTH.

RESULTS

Table 1: Socio-demographic Characteristics of the participants

Variables	Frequency(n=)	Percentage (%)
Age (years)		
<5	71	22.4
6-12	19	6.0
13-19	19	6.0
20-39	134	42.3
40-59	43	13.6
≥60	31	9.8
Gender		
Male	131	41.3
Female	186	58.7

The Common indications for blood transfusion at KIU-TH Ishaka Bushenyi. According to the study, the commonest indications for blood transfusion were anaemia (30.4%), obstetric and gynaecological interventions (23.4%)

including PPH, C/S among others, surgical operations (19.0%) such as abdominal obstruction and circumcision; then infection (14.2%) and lastly RTA/Assault (13.0%).

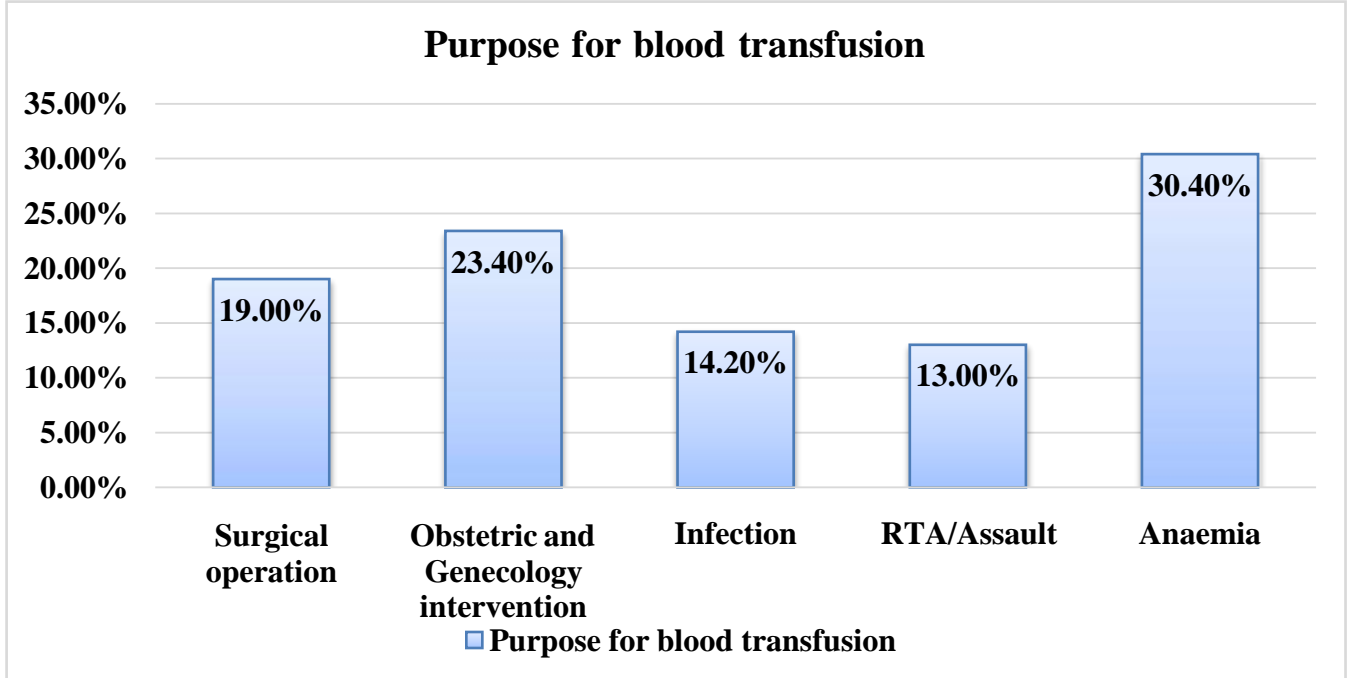


Figure 1: Common indications for blood transfusion at KIU-TH Ishaka Bushenyi. The factors affecting blood transfusion at KIU-TH Ishaka, Bushenyi.

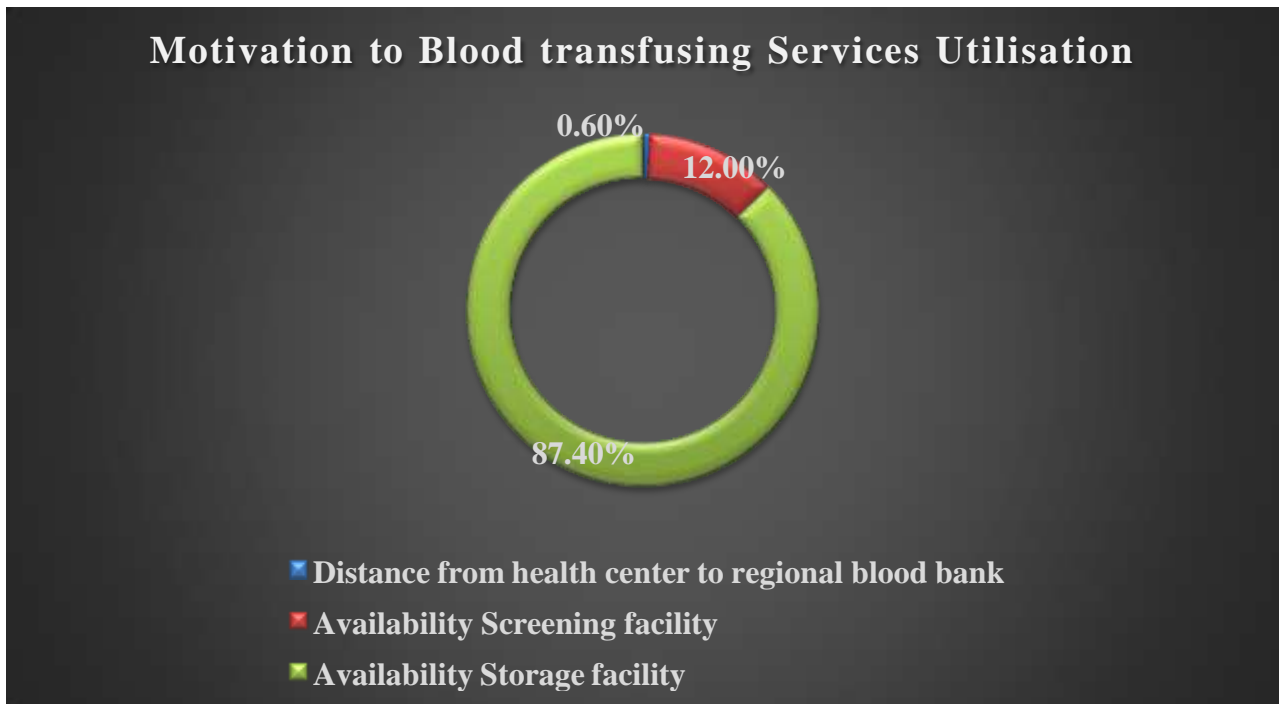


Figure 2: Factors affecting blood transfusion at KIU-TH Ishaka, Bushenyi.

Table 2: Socio-demographic factors affecting blood transfusion at KIU-TH Ishaka, Bushenyi.

Variable	Hemoglobin level	TOTAL N (%)		
		7 or less g/dl	7 or more g/dl	
Age (years)	<5	38(35.5%)	33(15.7%)	71(22.4%)
	6-12	9(8.4%)	10(4.8%)	19(6.0%)
	13-19	4(3.7%)	15(7.1%)	19(6.0%)
	20-39	38(35.5%)	96(45.7%)	134(42.3%)
	40-59	9(8.4%)	34(16.2%)	43(13.6%)
	≥60	9(8.4%)	22(10.5%)	31(9.8%)
Gender	Male	47(43.9%)	84(40.0%)	131(41.3%)
	Female	60(56.1%)	126(60.0%)	186(58.7%)
Purpose for blood transfusion	Surgical operation	10(9.3%)	50(23.9%)	60(19.0%)
	Obstetric and Genecology	9(8.4%)	65(31.1%)	74(23.4%)
	Infection	22(20.6%)	23(11.0%)	45(14.2%)
	RTA/Assault	9(8.4%)	32(15.3%)	41(13.0%)
	Anaemia	57(53.3%)	39(18.7%)	96(30.4%)
Bloodgroup	A	27(25.2%)	59(28.1%)	86(27.1%)
	B	21(19.6%)	62(29.5%)	83(26.2%)
	AB	7(6.5%)	18(8.6%)	25(7.9%)
	O	52(48.6%)	71(33.8%)	123(38.8%)

According to the study findings, the majority (87.4%) reported the availability of a blood storage facility as the main motivating factor for blood transfusion services utilization. Socio-demographically, based on haemoglobin level demands for transfusion; the majority 38(35.5%) of the transfusion requirement was among those aged <5 and 20-39 years of age, least need among

those 13-19 years and stably constant with the other age range at 9(8.4%). Gender-wise, women 60(56.1%) make the highest blood transfusion requirement compared to their male counterparts 47(43.9%). Similarly, anaemia, 57(53.3%) and blood group O, 52(48.6%) remain the highest motivation for blood transfusion services utilization. See Table 2.

The distribution of blood type transfused amongst patients with different health conditions at KIU-TH Ishaka Bushenyi.

Table 3: The distribution of blood type transfused amongst patients with different health conditions at KIU-TH Ishaka Bushenyi.

Variable	Blood group				Rh factor status	
	A	B	AB	O	Rh -	Rh +
Condition						
Surgical operation	15(17.6%)	18(21.7%)	6(24.0%)	21(17.1%)	2(6.7%)	58(20.3%)
Obstetric & Gynaecology	17(20.0%)	29(34.9%)	7(28.0%)	21(17.1%)	10(33.3%)	64(22.4%)
Infection	7(8.2%)	13(15.7%)	0(0.0%)	25(20.3%)	2(6.7%)	43(15.0%)
RTA/Assault	12(14.1%)	8(9.6%)	3(12.0%)	18(14.6%)	2(6.7%)	39(13.6%)
Anaemia	34(40.0%)	15(18.1%)	9(36.0%)	38(30.9%)	14(46.7%)	82(28.7%)
Rh factor status						
Rh -	14(46.7%)	10(33.3%)	2(6.7%)	(13.3%)	30(9.5%)	---
Rh +	72(25.1%)	73(25.4%)	23(8.0%)	119(41.5%)	---	287(90.5%)

According to the study findings, Blood groups A, B, AB and O are mostly transfused in 34(40.0%), 29(34.9%), 9(36.0%), 38(30.9%) and 38(30.9%) for anaemia, Obstetrics and Gynaecology conditions like PPH, C/S among others, anaemia, anaemia and anaemia

respectively. Altogether, majority 287(90.5%) were Rh + whereas only 30(9.5%) were Rh -. However, Rh+119(41.5%) was commonest among Blood Group O while Rh - 14(46.7%) was commonest among Blood Group A.

DISCUSSION

The Common Indications for Blood Transfusion at KIU-TH Ishaka, Bushenyi
According to the study, the commonest indications for blood transfusion were anemia, obstetric and gynecological interventions, including PPH, C/S, among others, surgical operations such as abdominal obstruction and circumcision; infection, and lastly, RTA/Assault. This complements a study conducted in Uganda, Jinja, and Lira regional referral hospitals, where it was concluded that 574/2275 (25.2%) of the children admitted in the two hospitals were assigned a diagnosis of severe anemia, resulting in 551 (95.9%) blood transfusions, accounting for the majority, 551/560 (98.4%), of the blood transfusions in the pediatric wards [20, 21]. Similarly, all patients who have PPH risk are normally followed up in our ICU for close observation and treatment with blood

transfusion. Apart from these approaches, several studies suggest massive bleeding protocols for patients with PPH[2, 22, 23]. These normally surround transfusion. Furthermore, in the case of trauma, in this case, those with RTA/Assault, patients with traumatic brain injury, the target Hb should be 7-9 g/dl; blood transfusion should be initiated. In those with additional evidence of cerebral ischemia, the target Hb should be >9 g/dl.[24].

The Factors Affecting Blood Transfusion at KIU-TH Ishaka, Bushenyi

According to the study findings, the majority reported the availability of a blood storage facility as the main motivating factor for blood transfusion services utilization. This agrees with a Cochrane meta-analysis published in 2012, which included 6264 patients in 19 such trials in the settings of surgery (including cardiac surgery), critical care,

trauma, and acute hemorrhage, found that the use of a restrictive transfusion strategy (Hb: 7-9 g/dl) led to 39% fewer patients receiving transfusion (risk ratio [RR]: 0.61) and a decrease in the total number of transfusions (mean decrease 1.19 [1.85-0.53]) compared to liberal strategy (Hb: 9-12 g/dl) [25, 26]. Moreover, based on hemoglobin level demands for transfusion, the majority of the transfusion requirement was among those aged <5 and 20-39 years of age, least need among those 13-19 years, and stably constant with the other age range. This complements Retter et al. [24] in which it was concluded that in patients with traumatic brain injury, the target Hb should be 7-9 g/dl; blood transfusion should be initiated, and in those with additional evidence of cerebral ischemia, the target Hb should be >9 g/dl. Gender-wise, women have the highest blood transfusion requirement compared to their male counterparts. This disagrees with a study by Aneke and Okocha [27], in which it was revealed that the greatest prevalence of blood transfusions was in the male population, and blood group B was the second prevalent blood group in this study. Also, anemia, and blood group O, remain the highest motivation for blood transfusion services utilization. This adds a study to the UBTS, in which it was stipulated that there exists an important task of meeting the increased demand for safe blood transfusion, especially at Health Centre IVs, which are located in rural areas where most of the population lives. Most of the blood is used for transfusion of children and mothers; 50% of all blood collected is for treating children with severe anemia, largely due to malaria, intestinal worm infestation, and malnutrition; a further 25% of the blood is required to treat pregnant women with anemia and complications of childbirth, and 25% to treat accident or surgical cases [28].

The Distribution of Blood Type Transfused Amongst Patients with Different Health Conditions at KIU-TH Ishaka, Bushenyi.

According to the study findings, Blood group O is the most transfused for the common indication, which was anemia, obstetrics and gynecology conditions like PPH, C/S, among others, anemia, anemia, and anemia, respectively. This agrees with a study by Frank et al., (2015), in which it was revealed that the majority (53.2%) of the population had blood group O, with the greatest prevalence being in the male population. Blood group B was also found to be highly prevalent (23.4%), and second to blood group O, in which the male population was also most prevalent (14.9%). Furthermore, the major internationally recognized blood group systems in operation are the ABO and Rhesus (Rhesus) systems [29-31]. Similarly, the study revealed that the majority had Rh+. This is comparable to a study by Hadjesfandiari et al. [32], which revealed that the major associated Rhesus factor was O+ (53.2%) and B+ (21.3%), showing a significant downward shift in the levels of the Rhesus antigen. Blood group O was the most prevalent, probably due to its evolutionary advantage in the region. The phenotypic expression needs to be investigated further for the development of a strong hematological team in various rural communities. The study further revealed that the positive Rhesus factor was shown to be the most prevalent (89.4%) antigen in the population and it was most prevalent in the male population (61.7%) and independent of sex [32]. However, Rh- was commonest among Blood Group O while Rh- was commonest among Blood Group A. In comparison to a study in which it was concluded that the Rhesus factor was prevalent (53.2%) in blood group O with the positive (O+) Rhesus factor being most prevalent (48.9%). No statistical significance ($p= 0.825$) was shown between the Rhesus factor and blood group in the population [32].

CONCLUSION

Blood transfusion indications at KIUTH are

anemia, obstetric and gynecological such

as PPH and C/S, surgical operations (Abdominal Obstructions), infection (Malaria), and RTA/Assault. It's affected by

blood availability, age, sex, and condition as well as blood type with the majority being Blood Group O Rh+.

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