

# Blood Transfusion Practices in Maxillofacial Surgery in a Nigeria Tertiary Hospital

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## ABSTRACT

**Background:** Blood transfusion could be a life-saving procedure. It is often used to treat hemorrhage, correct anaemia, and to improve oxygen delivery to tissues. There have been a lot of debates on the appropriate use of blood and blood products in surgery, this had necessitated this study. **Aim:** To assess the pattern of blood ordering and transfusion practices in elective maxillofacial surgery in a tertiary hospital in Nigeria. **Methodology:** We evaluated pattern of blood ordering and transfusion practices in 100 maxillofacial surgical patients from January, 2005 to April, 2006. With the help of different indices such as crossmatch transfusion ratio (C/T), transfusion probability (%T), patient transfusion ratio (P/T) and transfusion index (TI). Blood ordering pattern for various maxillofacial surgical procedures were studied. **Results:** Out of 208 units of blood crossmatched for 100 patients, 185 units were transfused to 85 patients. 11.1% of the crossmatched blood was not utilized. The outcome of this study showed crossmatch transfusion ration of 1.10, a transfusion probability of 85%, transfusion index to be 0.62 and patient transfusion ratio is 0.54. **Conclusion:** This study showed over-usage of blood; therefore, it is imperative to improve clinical transfusion practices through alternative to allogeneic blood transfusion such as autologous transfusion, and raising of the hemoglobin level with iron supplements for elective maxillofacial surgical procedures.

**Keywords:** Blood, transfusion, maxillofacial, surgery, allogeneic, autologous, patients.

## INTRODUCTION

Maxillofacial surgery is widely practiced globally, and it is well established because of its capacity to correct many dentofacial deformities, treatment of jaw tumours and fractures of facial bones.<sup>[1]</sup> While, surgical precision is

important, clinicians should pay attention to other parameters such as the patients' haemoglobin level, intra-operative blood loss and operation time.<sup>[2]</sup> All parties involved in the surgery such as the maxillofacial surgeons, anaesthesiologists, and



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even the patients should be interested in the patient's blood level, expected blood loss, and anticipated need for blood transfusion.<sup>[3]</sup>

Only a few of the oral and maxillofacial procedures generate very little blood loss. Procedures such as orthognathic surgery, maxillofacial reconstruction surgery, tumour ablative surgery and those related to craniofacial trauma and head and neck cancer, are associated with greater loss of blood.<sup>[3]</sup>

Achieving satisfactory haemostasis during maxillofacial surgery is difficult because of the vascularity of the region.<sup>[4]</sup> The increasing demand for blood and its products together with the rising costs and transfusion associated morbidity led to a number of studies in the late 1970's reviewing blood ordering and transfusion practices.<sup>[5]</sup>

Efficient transfusion practice provides blood products which are therapeutically active and potent, as well as being safe and available in abundance.<sup>[6]</sup> The safety of blood is continually threatened from unknown infectious agents.<sup>[7,8]</sup> At present transfusion is substantially safe. Nevertheless, allogeneic blood transfusions are still associated with various hazards ranging from clerical errors to infections and immunologic complications.

Guidelines should be drawn up for the crossmatching of blood unit to prepare for elective maxillofacial procedures. Patients would then be better informed about the likelihood of a transfusion occurring before they undergo the surgery. Many units of blood routinely ordered by surgeons are not utilized but are held in reserve and thus are unavailable for other patients.<sup>[9]</sup> This can impose inventory problems for blood bank, loss of shelf life and wastage of blood. Blood for transfusion is not readily available in Nigeria due to limited resources in the processing of safe blood.<sup>[10]</sup>

The wastage implicit in the inability to separate available blood into various useful components, further compounds the scarcity.<sup>[10]</sup>

Hence, the aims of this study were to analyze various indications for the use of blood and blood products in maxillofacial surgery, to determine the quantity of blood and its product being used in

maxillofacial surgery. This study is essential in our teaching hospital to improve the efficacy of blood ordering system for maximum blood utilization and devise practical guidelines for blood unit preparation for various maxillofacial surgical procedures.

## METHODOLOGY

### Study design

One hundred patients were included in this study over a period of sixteen months from January, 2005 to April, 2006. Patients that decline blood transfusion were excluded from the study. All these patients were planned for elective maxillofacial surgical procedures for which blood transfusion was anticipated. Preoperative blood grouping and cross matching were done.

The sample size was calculated using Taro Yamane (1967) formula.  $n =$

Hence, sample size (n) = 100 patients was determined.

The following information was obtained from the patients using a questionnaire- age, sex and presenting complaints. The diagnosis, units of blood crossmatched, unit transfused, reasons for transfusion were provided by the clinician.

These 100 patients were grouped under 9 separate procedures. Under each procedure the number of patients, units of blood crossmatched and number of units transfused were recorded and the following indices were calculated for each procedure:

Crossmatch transfusion ration (C/T ratio) =

Number of units' cross-matched.

Number of units' transfused.

Transfusion probability (%T) =

$\frac{\text{Number of patients transfused}}{\text{Number of patients crossmatch}}$

Transfusion index (TI) =

$\frac{\text{Number of units transfused.}}{\text{Number of units crossmatched.}}$

Patient transfusion ratio =  

$$\frac{\text{Number of patients for which blood was crossmatched.}}{\text{Number of patients transfused.}}$$

### Maximum Surgical Blood Ordering Schedule (MSBOS):

This was calculated using Mead's criterion (Mead et al., 1980).

$$\text{MSBOS} = 1.5 \times \text{TI}$$

Where TI= Transfusion Index

### Data Analysis

Data was stored and analyzed using IBM SPSS statistics for windows version 20 and results were presented as simple frequencies, percentages and descriptive statistics.

### Ethical Approval

This was obtained from the ethical and scientific committee of Ahmadu Bello University Teaching Hospital, Zaria, Nigeria. The project number is ESC/2005/00228.

## RESULTS

The investigation was carried out with one hundred patients, 63 males and 37 females a male to female ratio of 1.7:1. A total of 185 units of crossmatched blood were transfused to eighty-five patients giving an average of 2.2 per patient. Surgery was the commonest reason for transfusion with 170 units (91.9%) of blood being transfused intraoperatively (Figure 1).

Anaemia in malignancies occurred in five patients who were transfused with 12 units (6.5%) of packed red cells. Acute blood loss secondary to trauma in two patients necessitated the transfusion of 3 units (1.6%) of blood. Majority, 134 units (78.8%) of the transfusion were done intraoperative, 24 units (14.1) preoperatively, and 12 units (7.1%) were transfused postoperatively (Figure 2)

Table 1 shows the distribution according to histological/clinical diagnosis of patients seen. There were 93 surgical procedures with majority

carried out on the mandible 48 (51.6%), followed by the maxillae 24 (25.8%) while other surgeries accounted for 21 (22.5%) of the procedures.

Comparison between units of blood crossmatched and units transfused showed that 208 units of blood were crossmatched for 100 patients but 185 units were transfused to eighty-five patients (Table 2). Majority, 173 units (94.1%) of the blood transfused were whole blood while 12 units (5.9%) were packed red blood cells (Table 3). Fifteen patients for whom 23 units of blood were crossmatched were not transfused because their condition did not warrant blood transfusion (Table 2).

### Determination of transfusion indices

Crossmatch transfusion ration (C/T ratio) =  

$$\frac{\text{Number of units' cross-matched.}}{\text{Number of units' transfused.}}$$

Number of units' transfused.

$$\text{C/T Ratio} = 208 \div 185 = 1.1: 1.0$$

Transfusion probability (%T) =

$$\frac{\text{Number of patients transfused}}{\text{Number of patients crossmatch}}$$

$$\begin{aligned} \text{T\%} &= 85 \div 100 \\ &= 0.85 \times 100 \\ &= 85\% \end{aligned}$$

Transfusion index (TI) =

$$\frac{\text{Number of units transfused.}}{\text{Number of units crossmatched.}}$$

$$\begin{aligned} \text{TI} &= 185 \div 208 \\ &= 0.9 \end{aligned}$$

Patient transfusion ratio =

$$\frac{\text{Number of patients for which Blood was crossmatched.}}{\text{Number of patients transfused.}}$$

$$\begin{aligned} \text{P : T} &= 100 : 85 \\ &= 1.2 : 1.0 \end{aligned}$$

### Maximum Surgical Blood Ordering Schedule (MSBOS):

This was calculated using Mead's criterion (Mead et al., 1980).

$$\text{MSBOS} = 1.5 \times \text{TI}$$

Where TI= Transfusion Index

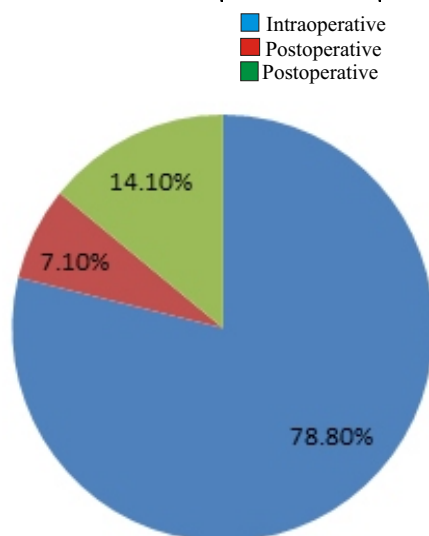
$$\text{TI} = 0.9$$

$$\begin{aligned} \text{MSBOS} &= 1.5 \times 0.9 \\ &= 1.35 \end{aligned}$$

Sample size was 100

**Table 1. Distribution according to histological/clinic diagnosis of patients**

Diagnosis	Number of patients	Percentage
Infective lesion		
Chronic osteomyelitis of mandible	2	2.0
Developmental lesion		
Tongue lymphangioma	2	2.0
Traumatic lesion		
Avulsive of injury	2	2.0
Neoplasms		
Benign odontogenic tumors		
Ameloblastoma of mandible	24	24.0
Ameloblastoma of maxillae	5	5.0
Benign salivary gland tumors	1	1.0
Odontogenic fibromyxoma	5	5.0
Pleomorphic adenoma of parotid gland	2	2.0
Other benign lesions		
Plexiform neurofibroma	4	4.0
Frontocele	3	3.0
Giant cell granuloma	5	5.0
Malignant epithelial lesions		
Squamous cell carcinoma	5	5.0
Mucus gland carcinoma	1	1.0
Mucoepidermoid carcinoma	3	3.0
Acinic cell carcinoma	1	1.0
Adenoid cystic carcinoma	2	2.0
Mesenchymal malignant neoplasm		
Osteogenic sarcoma	2	2.0
Chondrosarcoma	1	1.0
Malignant fibrous histiocytoma	1	1.0
Embryonal rhabdomyosarcoma	6	6.0
Alveolar rhabdomyosarcoma	6	6.0
Plasmacytoma of mandible	1	1.0
Fibrosarcoma	3	3.0
Angiosarcoma of the jaws	3	3.0
Fibro -osseous lesion		
Ossifying fibroma	4	4.0
Fibrous dysplasia	6	6.0
Total	100	100.0



**Figure 1: Distribution According to the period/time of transfusion**

**Table 2. Surgical Procedures and Units of Blood transfused**

Surgical Procedures	Number of Patients	Units of Blood Crossmatched	Units of Blood Transfused	Units of Blood Not Used
Mandibulectomy	47	98	88	10
Maxillectomy	17	34	31	03
Parotidectomy	7	10	7	03
Excision of giant neurofibroma	4	14	14	-
Excision of giant cell granuloma	5	8	6	02
Excision of fibro -osseous lesion	10	20	18	02
Excision of tongue lymphangioma	2	3	2	01
Excision of malignant tumours	6	19	19	-
Sequestrectomy of chronic osteomyelitis	2	2	-	2
Total	100	208	185	23

**Table 3. Types of blood and blood product used.**

Blood/Product	Male		Female		Total		
	Units transfused	Patients transfused	Units transfused	Patients transfused	Units transfused	Patients transfused	Median
Whole blood	102	53	71	27	173	80	2.2
Packed red cell	8	3	4	2	12	5	2.4
Total	110	56	75	29	185	85	

## DISCUSSION

Blood transfusion plays a major role in the management of maxillofacial patients. This study showed that more males were treated than females during the period. This study also has shown that the indications for transfusion can be classified under three broad categories which are: surgery, correction of anaemia in malignancies, and restoration of blood volume in acute blood loss following road traffic accident and gunshot. This is consistent with previous studies done in general surgery<sup>4,7</sup>. Ezenwosu *et al.*<sup>12</sup> in their study of indications for transfusion among children in three secondary health facilities in South-East Nigeria, reported severe malaria, sepsis and bronchopneumonia as common indications for transfusion. This is in contrast to this study which was done in surgical specialty.

Friedman *et al.*<sup>[11]</sup> in their analysis of blood transfusion for surgical patients categorized transfusion into three; preoperative, intraoperative and postoperative. Clinical events and laboratory data of patient vary according to the specific period of hospitalization. In this study, transfusion need was based on preoperative, intraoperative, and postoperative conditions of the patients. The mandible and the maxillae were the common sites of surgeries in this study and had the highest transfusion demands. Also, excision of giant neurofibroma and malignant tumour ablative surgeries required more blood transfusion. The outcome of this study showed that not all surgeries required blood transfusion as many units of blood crossmatched were not transfused and many patients for which blood were crossmatched did not need the blood. Any surgical procedure resulting in patients losing about 20% or more of their blood usually entails providing a transfusion to make sure patients stay healthy and stable during surgery and recovery.<sup>[11]</sup> Avoiding blood loss and using blood products judiciously enhances surgical outcome and better patient care.<sup>[12]</sup>

Surgical blood transfusion serves to provide additional oxygen delivery needed to correct or

protect against the development of tissue hypoxia.<sup>[12-14]</sup> When considering adequacy of oxygen delivery to the tissues three factors need to be taken into consideration. These are: haemoglobin concentration, cardiac output and tissue oxygenation. When haemoglobin falls below 7g/dl, the cardiac output can no longer compensate for the anaemia and blood transfusion is usually necessary.<sup>[13]</sup>

According to Friedman *et al.*<sup>[11]</sup> factors which precipitated blood transfusion during the preoperative period included a low or falling haematocrit (or haemoglobin concentration), as well as the clinical signs and symptoms of anaemia. However, preoperative blood transfusion of a symptom free patient can also be initiated to satisfy the hospital policy that haemoglobin concentration should exceed a given level prior to the induction of general anaesthesia.<sup>[11]</sup> The policy at our study centre stipulates a minimum of 10g/dl haemoglobin concentration for patient undergoing elective surgery under general anaesthesia. The current trend in surgery is 8-10g/dl of haemoglobin depending on the procedure and expected blood loss.<sup>[16]</sup>

Intraoperative blood transfusion is usually in response to intraoperative blood loss, evidenced by the changes in the patient's vital signs.<sup>[17]</sup> However, this study showed that for similar surgical procedures, the intraoperative blood loss of males and females were approximately equal and were treated in the same manner. Transfusion was begun after tumour ablation and when haemostasis had been achieved. Bone surgeries were documented to have more blood loss; hence more transfusion needs.<sup>[18]</sup>

Anaemia in oral malignancies may be due to blood loss following erosion of blood vessels supplying the tumour, the suppression of erythropoiesis in the bone marrow as well as nutritional deficiency.<sup>[19]</sup> In this study chronic anaemia was seen in patients with oral squamous cell carcinomas and sarcomas.



Anaemia in these patients was due to inadequate nutrition caused by the large tumour size, which made feeding through the oral route difficult. Three of the patients bled profusely before surgery from the tumour site due to erosion of the blood vessels by the tumour. These patients were transfused with packed cells to increase the oxygen-carrying capacity of the blood. Blood loss secondarily to trauma occurred in two patients whose haemoglobin level showed less than 7g/dl. They had transfusion with 3 units of whole blood.

Vibhute *et al.*<sup>[20]</sup> reported a crossmatch to transfusion ratio of 4.30 concluding that a value of 2.50 is considered an indicator of significant blood usage. The outcome of this study showed crossmatch to transfusion ratio of 1.10; a value of 0.25 is considered indicative of significant blood usage. A transfusion probability (T%) of 53% was documented in general surgery by Vibhute *et al.*,<sup>[20]</sup> compared to the outcome of this study with transfusion probability of 85%. This study showed over usage of blood, this may be due to rich vascularization of the maxillofacial region, which gave rise to excessive bleeding intraoperative. They reported transfusion index of 1.5 and concluded that a value of 0.50 is indicative of significant blood utilization. The outcome of this study showed transfusion index to be 0.90, 0.50 is also considered indicative of significant blood usage. Patient to transfusion ratio in this study was 1.2 and value of 0.50 was considered indicative of significant blood usage.

However, this study had exposed the need for adequate patient preoperative preparations, careful planning of surgical incisions to reduce bleeding and availability of effective haemostatic methods to reduce blood loss and reduce need for transfusion. Moreover, blood transfusion is a life-saving procedure therefore; every effort must be made to make it readily available in abundance for use when needed and significantly safe.

## CONCLUSION

This study showed over-usage of blood; therefore,

it is imperative to improve clinical transfusion practices through alternative to allogeneic blood transfusion such as autologous transfusion, and raising of the hemoglobin level with iron supplements for elective maxillofacial surgical procedures.

**Conflict of Interest:** None.

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