

# RETROSPECTIVE COMPARISON STUDY OF CROSS MATCH TO TRANSFUSION RATIO IN VIEW TO IMPROVE UTILIZATION OF BLOOD COMPONENTS

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## **Abstract-**

**BACKGROUND:** Blood transfusion plays important role in management of patients. There is surpassing ordering of blood preoperatively for most of surgical procedures. The cross match to transfusion ratio should be evaluated as time and effort consumed in cross matching for each patient is substantial. This rate is best indicator of proper blood utilisation from blood center.

**AIM:** 1) To find cross match and transfusion ratio.

2) To compare cross match to transfusion ratio with utilisation of blood components.

**METHOD:** A retrospective study was done in a tertiary care hospital for a period of 6 months. Cross match to transfusion ratio was calculated using the formula  $C/T \text{ ratio} = \text{Number of units cross matched} / \text{number of units transfused}$ .

**RESULTS:** A total of 5120 units were cross-matched. The maximum cross match was made for packed red corpuscles followed by whole blood. Out of 5120 units cross-matched, only 3878 units were transfused. So, overall CT ratio was 1.32.

**CONCLUSION:** The ratio of cross matching to transfusion is 1.32 which is significant. It indicates significant usage of blood as it is less than 2.5. Also there is need to reduce the over-ordering of blood and unnecessary compatibility testing in surgical departments.

**Keywords:** Blood transfusion, Cross-matching to transfusion ratio, Blood center.

## **Introduction**

Provision of adequate and safe blood is most challenging in developing countries due to the scarcity of voluntary blood donors, poor facilities for storage and blood component preparation as well as inappropriate blood ordering and utilization<sup>(1)</sup>. This sparse and expensive blood should be used efficiently and wisely. Excessive ordering of blood can lead to an unintentional misuse of blood bank resources<sup>(1)</sup>. It appears that surgeons, physicians and obstetricians order request for cross-matching of blood as part of hospital routines and based on worst case assumptions. But it is likely that in most emergency medical and surgical departments, they order more units of blood than what are actually needed<sup>(1)</sup>. These unutilized but cross-matched units are held in reserve (usually for 72 h) and thus are unavailable for other needy patients which inflict inventory problems for blood bank, loss of shelf life and expiry of precious blood without being transfused<sup>(2)</sup>. The time and effort consumed in cross-matching for each patient undergoing a surgical procedure is substantial, most of which is not actually used for transfusion<sup>(3)</sup>. Therefore, our study was conducted to use the blood stocks more efficiently and reduction in the wastage due to expiry of blood components, to prevent injudicious pre-operative undesired cross-matching of blood by calculating cross-match to transfusion ratio<sup>(4)</sup>.

Cross-match to transfusion ratio (CT Ratio) is used as a measure of the efficiency of blood ordering practice. A CT ratio of  $>2.5$  means that less than 25% of cross matched units are transfused<sup>(5,6)</sup>. CT ratio closer to 1:1 depends on clinician's accurate predictability of needs of patient for blood. Thus, a low CT ratio signifies efficient hospital transfusion policy and practice.

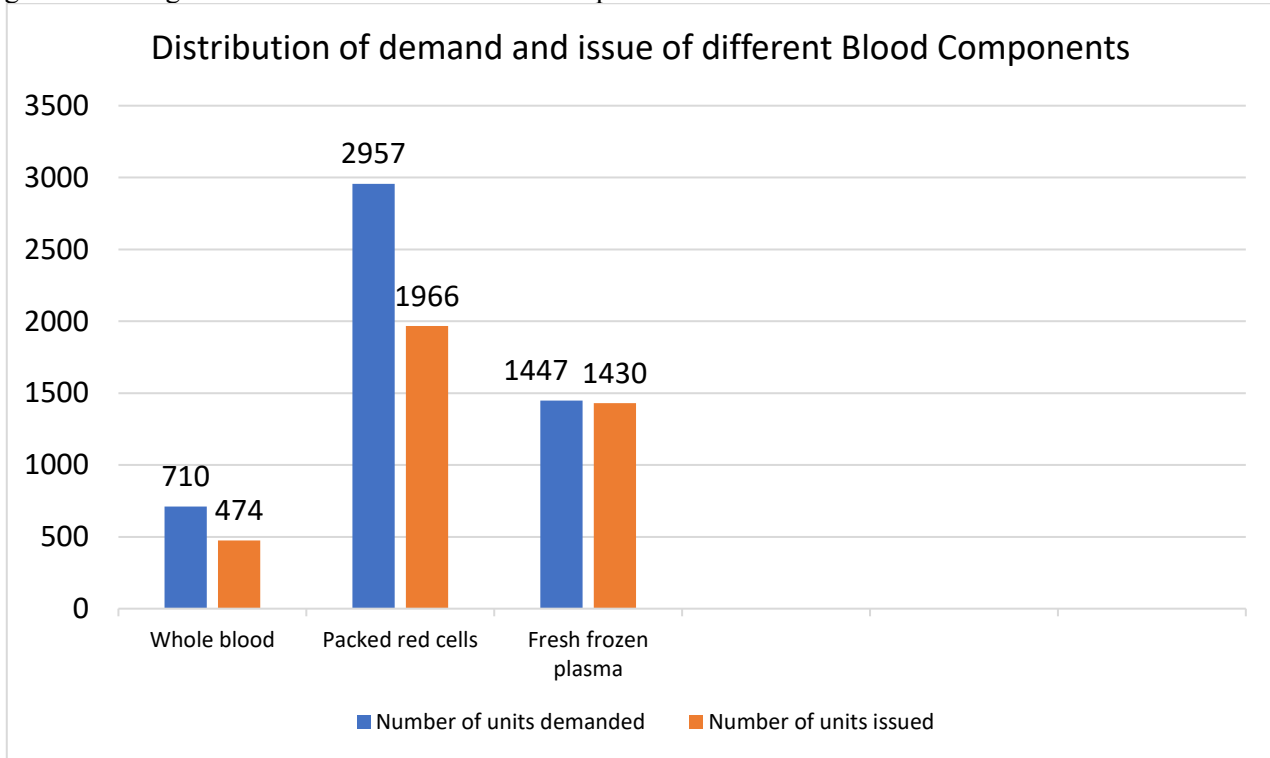
## **Materials and methods**

This study was carried out in a tertiary care hospital which has major clinical departments such as general surgery (subunits: General surgery, urology, and neurosurgery), medicine, pediatrics, gynecology and obstetrics, orthopedics, psychiatry as well as Intensive Care Unit (ICU), NICU. This was a retrospective study conducted in tertiary care hospital blood center from January 1, 2023 to June 31, 2023.

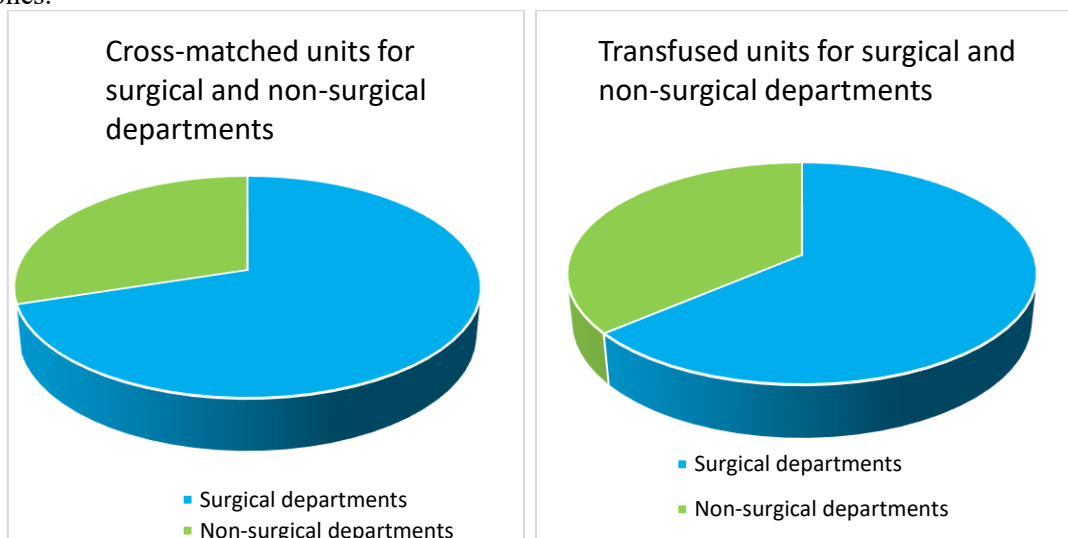
The blood issue registers and the cross-match worksheets of the blood bank were accessed and the required data from the clinical units (orthopedics, general surgery, obstetrics and gynecology, pediatrics, and medicine) were extracted. The number of patients for whom transfusion requests were made, units cross-matched, units issued were calculated.

**Observations and Results**

In present study of 6 months duration, total 5120 units were cross-matched out of which only 3878 units were transfused. This gave an average CT ratio of 1.32 for the entire hospital.



The Urosurgery department had the highest CT ratio of 4.4 followed by Neurosurgery which is 3.06. Pediatrics, Pediatric surgery, Medicine and Respiratory medicine have the lowest ratio. Overall, CT ratio is higher for the surgical (1.43) and quite lower for the medical (1.07) units indicating optimum usage of blood by medical departments when compared to the surgical ones.



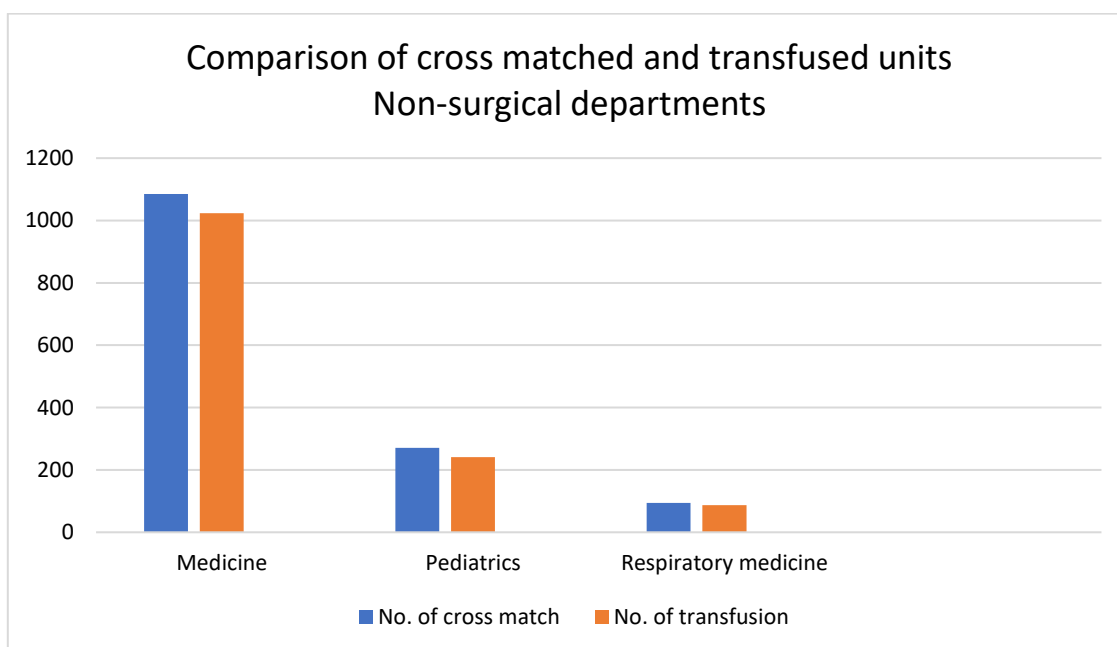
Maximum number of blood units were cross-matched for general surgery and minimum number of blood units were cross-matched for respiratory medicine. Maximum number of blood units were transfused in General surgery and minimum number of blood units were transfused in Urosurgery.

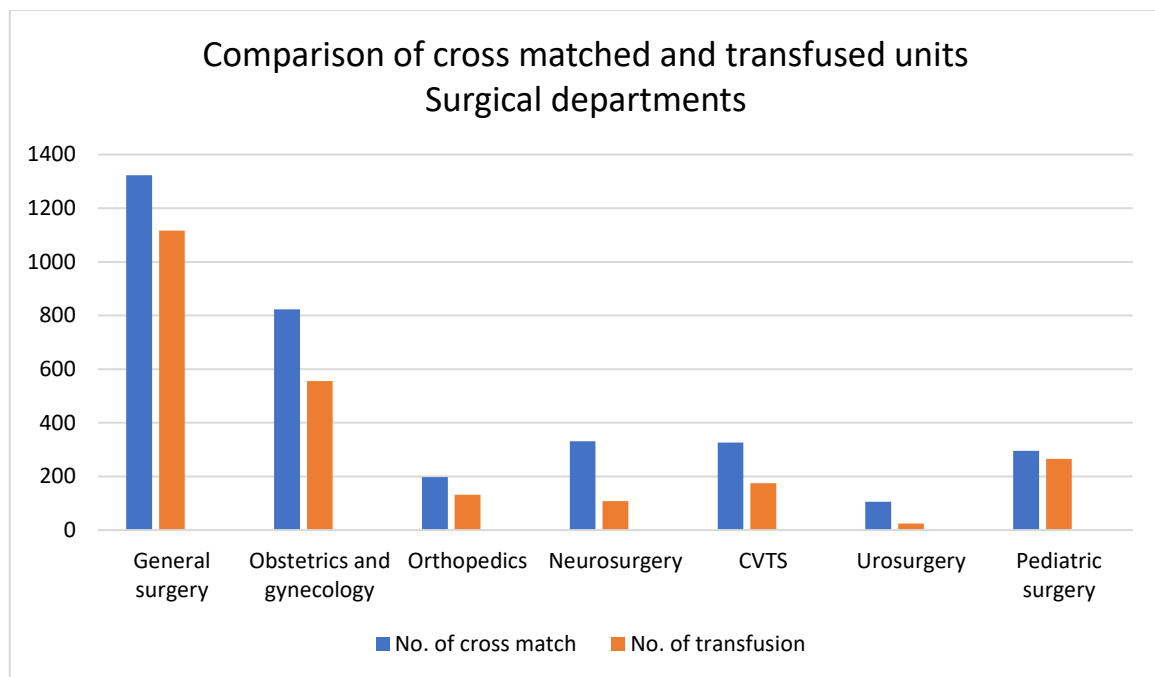
**NON - SURGICAL DEPARTMENTS**

Department	Total number of cross match	Total number of transfusion	C/T Ratio
Medicine	1085	1023	1.06
Pediatrics	271	241	1.12
Respiratory medicine	94	87	1.08

**SURGICAL DEPARTMENTS**

Department	Total number of cross match	Total number of transfusion	C/T Ratio
General surgery	1323	1116	1.18
Obstetrics and Gynecology	823	556	1.48
Orthopedics	197	132	1.49
Neurosurgery	331	108	3.06
CVTS	326	175	1.86
Urosurgery	106	24	4.4
Pediatric surgery	295	266	1.11





### Discussion

Whole blood, packed red cells and fresh frozen plasma are blood components important in patient care. These blood components are of limited supply. The proper use of blood and blood components is highly cost-effective practice but holding blood units for elective surgery and not transfusing the demanded blood adds to the testing costs for patient and overburdens the blood center<sup>(3)</sup>.

Today, the ratio between the cross-matched and transfused blood or blood products is important for evaluating the working performance of blood centers. The C / T ratio is the total number of units cross-matched divided by the total units actually transfused. According to international standards of blood centers C / T ratio is desired to be <2<sup>(23)</sup>.

The present study was conducted to analyse the C/T ratio. Our result showed that overall C/T ratio is 1.32 which indicates efficient usage of blood. Many studies have reported C/T ratio which was comparable with present study.

In present study, the overall C/T ratio does not exceed 2.5 which is comparable to study done by Pradyuth I et al. The calculated C/T ratios for Neurosurgery, General surgery and Obstetrics and Gynecology departments in the present study are 3.06, 1.18, 1.48 respectively. The C/T ratios for Neurosurgery, General surgery and Obstetrics and Gynecology departments are comparable to study done by S. Muthuragavan et al, S. Kumari et al and MONDAL B et al.

Department	S. Muthuragavan et al <sup>(3)</sup> (2017)	S. Kumari et al <sup>(1)</sup> (2021)	MONDAL B. et al (2022)	Present study
Neurosurgery	2.29	1.2	-	3.06
General surgery	1.89	2.0	1.48	1.18
Obstetrics and gynecology	1.64	2.7	1.35	1.48

As there is over ordering of blood in surgical departments, there is need to follow guidelines in Surgical and Obstetrics departments. American Society of Anesthesiologist (ASA) has recommended Maximum surgical blood ordering schedule (MSBOS) in order to improve efficiency of blood ordering practices. The MSBOS was intended to provide guidelines and recommendations for preoperative pre-transfusion testing and RBC ordering<sup>(14)</sup>. MSBOS is a list of common elective surgical procedures performed, along with the maximum number of blood units being cross-matched preoperatively for each procedure<sup>(4)</sup>. The MSBOS specifies the number of blood units to be routinely cross-matched for elective surgical procedures based on retrospective analysis of actual blood usage for these procedures<sup>(27)</sup>.

### CONCLUSION

Present study concluded that there was optimum usage of blood by medical departments and wastage in ordering of blood in pre-operative elective surgeries and in obstetric patients reflected by high C/T ratio. To reduce the injudicious usage of blood, efforts should be made to acquire more conservative transfusion practices and periodic feedback to improve blood ordering. Implementation of the MSBOS can be useful tool in reducing C/T ratio.

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