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Original Research Article

Analysing patterns of blood component transfusions over a five-year period at Sawai Man Singh Medical College Jaipur: a cross sectional study

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ABSTRACT

Background: Blood transfusion is a crucial intervention that saves lives and enhances health outcomes. Significant proportion of patients in need of transfusions face challenges accessing to safe blood. Annual collection of approximately 118.5 million units of donated blood worldwide, remains a shortfall in meeting transfusion needs. This study aimed to determine variations in blood requirements annually, seasonally, across different blood groups, components, and assess utilization of Lardly Suraksha Yojana scheme, which is for under 14 girls.
Methods: A retrospective, annual record-based study was conducted at SMS Medical College, Jaipur, utilizing data on blood bag distributions from financial years 2018 to 2022. Data were compiled and analyzed using Microsoft Excel. Ethical clearance was obtained from Research Review Board and Ethics Committee of institute before commencing study, ensuring compliance with ethical standards and protocols.
Results: Analysis of yearly data revealed significant seasonal variations, with notable increase in blood requirements during monsoon season compared to winter. Among blood groups, requirement trend showed an increase in B+ and O+ groups over the past five years, while AB- group exhibited lowest demand. Red Packed Cell SAGM's total requirement demonstrated a consistent annual increase. Moreover, there was an upward trend observed in utilization of blood under Ladali Rakt Seva (LRS).
Conclusions: It's been concluded that a higher demand for blood during and around monsoon season compared to winter months. Increase in requirement for blood groups B+ and O+. Utilization of blood through LSY scheme witnessed a notable rise, signifying improved accessibility to blood resources.

Keywords: Blood components, Blood transfusions, Lardly Suraksha Yojana

INTRODUCTION

Blood transfusions are critical for saving lives and improving health outcomes, yet many patients in need of transfusions face challenges in accessing safe blood promptly. According to the World Health Organization (WHO), approximately 118.5 million units of donated blood are collected globally each year. However, the current collection falls short of meeting the transfusion needs of all patients worldwide. There are about 13,300 blood centers in 169 countries, reporting a total of 106 million donations worldwide, with collection rates varying based on income levels.[1]

In Rajasthan, India, there were reportedly 101 blood banks in 2015, according to the Central Drugs Standard Control Organization (CDSCO). However, subsequent assessments revealed 102 operational blood banks across

the state, comprising 50 NACO supported and 52 non-NACO supported facilities.[2] The demand for O+ blood is particularly high, as it is the most common blood type, representing 37% of the population. Additionally, there is a significant demand for O-blood due to its frequent use in emergency situations.[3]

Initiatives like Ladali Rakt Seva, introduced by the Honorable Health Minister Shri Rajendra Rathore on November 30, 2016, aim to address these challenges. Under this scheme, the Department of Transfusion Medicine (blood bank) provides blood and its components without replacement to all girls under 14 years admitted to SMS Hospital and affiliated hospitals. Despite such efforts, India still faces a substantial supply-demand gap, with an unmet need for 14.6 million units of blood.[4,5] Promoting 100% voluntary blood donations could significantly enhance blood safety in India. However, current statistics show that only 70% of blood donations are voluntary, with the remaining 30% being replacement blood.[6,7] The purpose of this study was to evaluate the annual distribution of blood from the blood bank of our college, shedding light on the local blood supply dynamics. This study aimed to assess the patterns of blood component transfusions over a five-year period. Moreover, objectives of this were to estimate season wise, blood group wise and component wise yearly variation in blood requirements and to find out proportion of voluntary blood donators and utilization of Ladali Rakt Seva (LRS).

METHODS

Study area

A retrolective hospital based observational study conducted in the Sawai Man Singh Hospital, Jaipur, Rajasthan.

Study period

Study was conducted from January 2018 to December 2022.

Inclusion criteria

All blood samples, transfused under the department of Transfusion Medicine in the duration from January 2018 to December 2022 were included.

Exclusion criteria

Sample with incomplete data were excluded.

Source of data

Data were collected from blood bank data centre of SMS medical college with permission of PHOD Transfusion Medicine

Data collection and analysis

Data was compiled and analysed with help of MS excel. Seasonal changes were classified as: 1) Winter: December, January, February; 2) Pre-Monsoon: March, April, May; 3) Monsoon: June, July, August; 4) Post-Monsoon: September, October, November.

Ethical clearance was obtained from Research Review Board and Ethics Committee of institute before commencing study, ensuring compliance with ethical standards and protocols.

RESULTS

The present study entails an in-depth analysis of five years' worth of data, unveiling a consistent and notable increase in the demand for blood supply throughout the examined period. This growing necessity for a sustainable and adequate blood inventory to meet the healthcare demands.

Notably, a modest decline in blood demand was observed in 2020, coinciding with the onset of the COVID-19 pandemic. This reduction in demand likely stems from the pandemic's impact on healthcare systems, leading to alterations in medical procedures and temporary fluctuations in blood supply requirements. However, following the year 2020, there was a swift and significant re-surgencies in the demand for blood supply, indicative of a rebound and restoration of healthcare services post-pandemic.

The trends in blood demand are visually represented in, which graphically illustrate the temporal variations in required blood supply over the five-year period. These visualizations depict the steady increase in demand, the dip during the pandemic year, and the subsequent sharp rise in blood requirement, providing valuable insights into the dynamics of blood supply and healthcare provision Mean±SD = 75721.4±13998.93 (Figure 1).

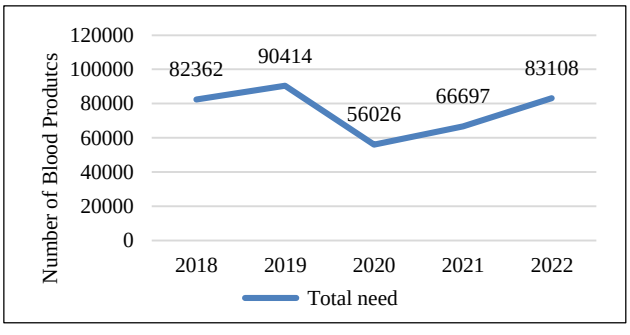

Figure 1: Trends in utilization of total blood products utilisation from 2018 to 2022.

To examine seasonal distribution, the data were segmented into different seasons. This segmentation highlights the consistent increase in demand during the

post-monsoon period, the decline observed during the pandemic year, and the demand decreased during the pre-monsoon season in terms of blood requirement (Figure 2).

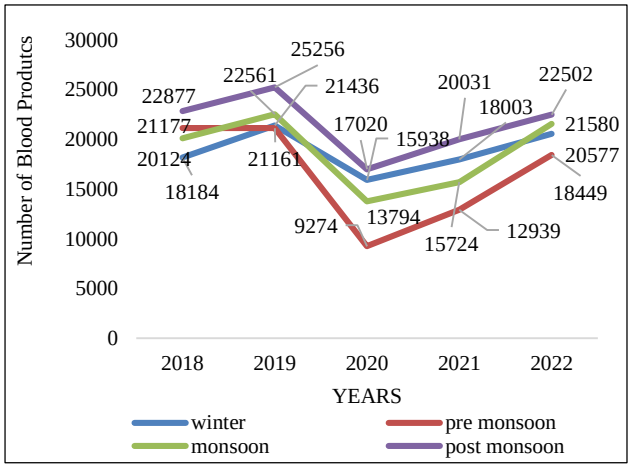

Figure 2: Season was trends in utilization of total blood products utilisation from January 2018 to December 2022.

Seasonal indices were computed, revealing a progressive rise in demand during the post-monsoon and monsoon periods, along with reduced demand during the pre-monsoon season in terms of blood requirement. Additionally, the indices reflect a decline during the pandemic year (Figure 3).

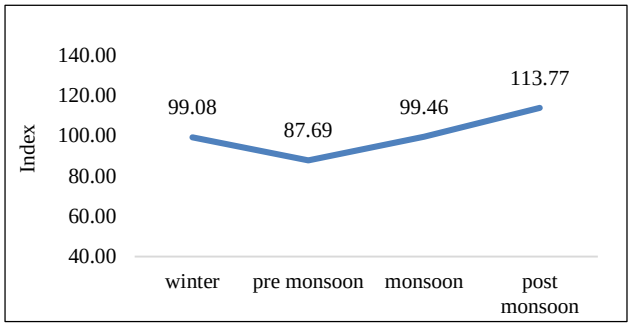

Figure 3: Season wise calculation of seasonal index.

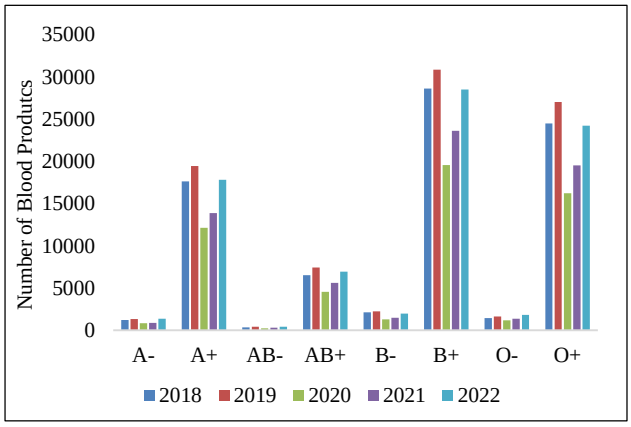

Figure 4: Yearly distribution of blood groups.

An evaluation of blood group-wise distribution revealed that the B+, O+, and A+ blood groups exhibited a higher demand compared to others, showcasing an increasing order. Conversely, the AB-, A-, O-, and B- blood groups demonstrated lower demand, following an increasing order as depicted in Figure 4. Notably, a decline in demand was observed during the pandemic years 2021 and 2022 (Figure 4).

Illustrate the annual trend of blood component distribution. It is evident that red packed cell saline-adenine-glucose-mannitol (SAGM) exhibits the highest demand, followed by fresh frozen plasma and platelet concentrate, while the remaining components display comparatively lower demand (Figure 5).

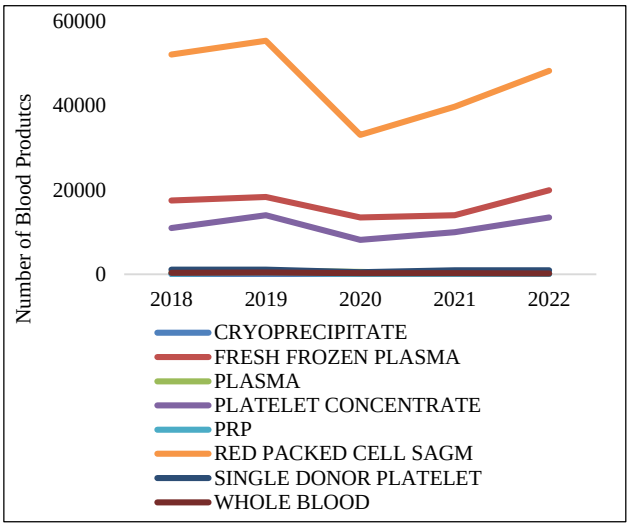

Figure 5: Yearly distribution of blood components.

Annual trend of distribution of blood components, highlighting that patients requiring replacement and those promised to replacement constitute the majority compared to other categories (Figure 6).

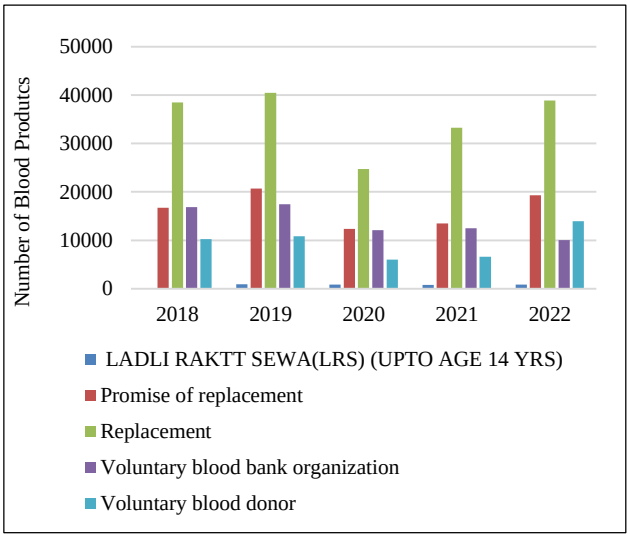

Figure 6: Yearly distribution of blood categories.

While assessing the trend of blood utilization under Ladali Raktt Sewa, it was observed that the program's effectiveness significantly increased from 2019 onwards. Each year, approximately 800 to 900 individuals benefited from this initiative (Figure 7).

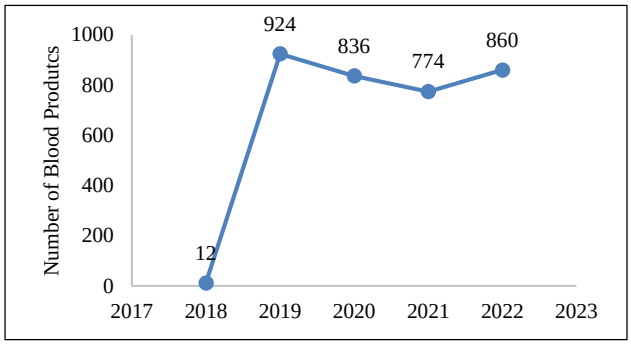

Figure 7: Distribution of blood utilization under Ladli Raktt Sewa.

Among the total blood consumers, only approximately 29% to 33% are voluntary donors each year. The data indicates a declining trend in voluntary blood donations year by year (Figure 8).

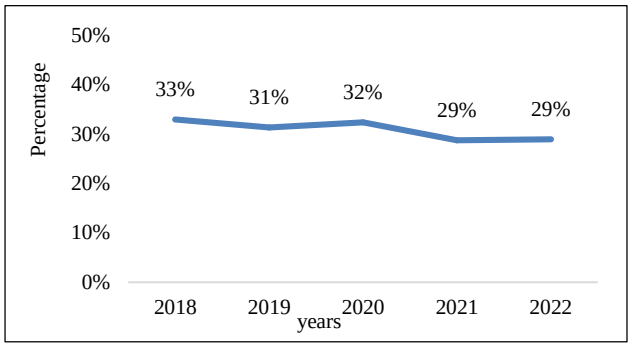

Figure 8: Distribution of blood utilization under Ladli Raktt Sewa.

DISCUSSION

A blood transfusion service is an essential component of modern healthcare, with blood and its components classified as drugs by the Food and Drug Control Authority (FDCA). A similar study by Pachori et al reported 87.47% replacement donors and 12.53% voluntary blood donors, findings in our study regarding blood donation patterns and transfusion requisition demographics align with previous research conducted.[6] Their study reported a predominant proportion of replacement donors compared to voluntary blood donors, with replacement donors accounting for 87.47% and voluntary donors comprising 12.53% which indicated a higher percentage of replacement donors compared to voluntary donors. Firstly, the consistent increase in demand for blood supply observed over five-year period aligns with findings of Giridharan et al, who reported a frequency of usage of packed red blood cells being more than fresh frozen plasma and whole blood which resonates with our study's observation of red packed cell SAGM exhibiting the highest demand.[8] Similarly, the dominance of certain blood groups in terms of demand, such as B+, O+, and A+, as highlighted in our study, correlates with findings of Mourouguessine et al, where majority of transfusion requisition recipients belonged to certain demographics, indicating specific blood group requirements.[9] Moreover, the decline in demand observed during the pandemic years, as noted in our study, is consistent with the findings of Kalpesh et al, where the demand for blood components was reported to be greater as compared to the total collection.[10] This suggests a disruption in regular healthcare services during the pandemic, leading to fluctuations in blood supply requirements. Furthermore, the observation of a decline in voluntary blood donations year by year, as indicated in our study, echoes concerns raised by Mourouguessine et al, where a significant portion of blood recipients required transfusions for surgical and emergency purposes.[9] Makroo et al, highlights the ongoing challenge of maintaining an adequate and sustainable blood inventory, especially with a diminishing pool of voluntary donors.[11] Overall, the comparison of our study with existing research highlights consistent trends in blood demand, utilization patterns, and challenges in maintaining a sufficient blood supply. These findings underscore the importance of ongoing monitoring and strategic planning to ensure the availability of blood and its components to meet the healthcare demands of diverse populations.

Since the data collection was based on pre-existing records, there may be limitations in the completeness and accuracy of the data, potentially introducing bias or missing information. Study's focus on a single hospital, Sawai Man Singh Hospital, in Jaipur, Rajasthan, may limit the generalizability of the findings to other settings or populations.

CONCLUSION

Based on the findings of this study, it can be concluded that there is a significant demand for blood, highlighting the crucial role of blood donation within the population. Achieving a balance between demand and supply poses a significant challenge in the field of hospitality and transfusion medicine.

Recommendations

Greater attention should be directed towards enhancing the preparedness of blood supply facilities for the monsoon and post-monsoon seasons. It is essential to maintain adequate storage facilities, particularly for O+ and B+ blood groups, as well as ensuring availability of rare blood groups. Public encouragement and awareness campaigns for voluntary blood donation, including programs like Ladali Raktt Sewa, are crucial. By promoting understanding and incentivizing voluntary

blood donation, we can effectively address the demand for blood and ensure a sustainable blood supply.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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