BLOOD TRANSFUSION SUPPORT IN MASS DISASTER AND TRAUMA SITUATIONS AN EXPERIENCE AT A TERTIARY CARE CENTER

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ABSTRACT

Objectives: To assess the blood transfusion support requirements in mass disaster and trauma situations.
Study Design: Cross-sectional observational study.
Place and Duration of Study: This study was conducted at Combined Military Hospital Quetta from, Jan 2013 to Dec 2015.
Material and Methods: Nature of injuries, triage details, details of surgical procedures and duration of hospital stay were noted. Data was analyzed with respect to cross match to transfusion ratio and the number of units of each component transfused. Patients requiring massive transfusion and any associated complications were also studied.
Results: A total of 2228 casualties were received during the study period, of these, males were 18 (75%) and 6 (25%) were females. Mean age was29.7 years. 1636 (73.4%) casualties had sustained major injuries. Mean hospital stay was 6.31 days. Only 199 (12.2%) patients required blood transfusion with a mean of 2.9 units of RCC, 8.7 bags of FFP and 4.6 bags of platelets. Fifteen (7.5%) patients received massive transfusion. Following massive transfusion, one case of metabolic acidosis and two cases of coagulopathy were reported.
Conclusion: Mass disasters and trauma casualties pose a serious challenge to any healthcare facility in general and the blood transfusion services in particular. Only a well-organized blood transfusion center and blood transfusion emergency preparedness can result in better patient care and outcome. Not all patients need transfusion and a delicate balance between demand and supply has to be maintained.

Keywords: Cross-match to transfusion ratio, Mass disaster, Trauma,

INTRODUCTION

Mass disaster is a sudden event or calamity which causes excessive damage or loss to human lives resulting in inability of medical set up to provide its defined role[1]. Injured patients presenting with poly-trauma are victims road traffic accidents[2]. Over the years, nature of weapons has dramatically changed and as a result injuries inflicted are very different from those inflicted by conventional weapons and it is very frequent to see cases of poly-trauma[3]. Traditional limb and life-saving procedures may have to be replaced by more complicated and complex management by team of specialists with full diagnostic and transfusion support[4]. In severe trauma, haemorrhage is the most important cause of death. While active haemorrhage control is the mainstay of treatment, the early provision of blood and blood components cannot be overemphasized[2]. Transfusion services, thus, play a pivotal role in effective management of casualties in mass disasters[5] Blood transfusion support provides the life line not only during initial management but also for complicated surgeries[6]. Prompt and adequate delivery of blood and blood components during these situations is a challenge to the blood transfusion services[7]. Effective management of mass casualties can result in better outcome and improved survival[8]. Optimum transfusion support with early provision of RCC and hemostatic components provides the foundation to better management[3]. This, however, requires proper planning and preparation for mass disasters with assessment of transfusion

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demand and focusing on capability planning and resource management[9]. However, blood components cannot be accumulated in large stocks in anticipation[10]. Thus, balancing the demand and supply remains a major challenge to the blood transfusion services[4]. This study has been conducted in Quetta, Balochistan. In a developing country like Pakistan with limited resources, Balochistan has been faced with mass disasters. In this study, we have highlighted the blood transfusion requirements in mass disasters. We have also discussed the strategies we adopted for early and optimum delivery of blood components.

MATERIAL AND METHODS

A total of one hundred and thirty-four patients were analyzed in study period of three years (Jan 2013 to Dec 2015). Patients were between the ages of 45-80 years. Nature of injuries, triage details and vital signs at time of presentation were noted. Details of surgical procedures performed and duration of hospital stay were noted. Collected data was entered and analyzed using SPSS version 20. We also assessed the challenges faced by the transfusion services and appropriate steps taken. Data was analyzed with respect to cross match to transfusion ratio and the number of units of each component transfused. Patients requiring massive transfusion and any associated complications were also studied.

RESULTS

A total of 2228 casualties were received during the study period, of these, males were 1899 (85.3%) and 329 (14.7%) were females. Median age was 27 years (1-71 years). Table-I shows the characteristics of these patients. Regarding the nature of injuries, 63.6% (1417) patients had been victims of blast injuries followed by 22.1% (494) patients from target killings and 14.3% (317) were from road traffic accidents. About 73.4% (1636) casualties had sustained major injuries. Forty three point three percent (928) patients had polytrauma while 56.7% (708) had trauma at a single site. Fig-1(a) shows the site of injuries in these patients with majority of patients having mixed injuries followed by those who had sustained orthopedic injuries. The major surgical procedures performed were ORIF/ external fixation and are shown in fig-1(b). Fig-1(c) and 1d show the mean hospital stay of these patients. Seventy four point nine percent of the patients had a hospital stay from 1-7 days while only 1.9% of the patients had a hospital stay of more than 28 days. The mean hospital stay was 6.31 days. Cross-match to transfusion ratio was 1.46:1 as shown in fig-2. Table-II shows the transfusion support given in terms of different components. Only 199 (12.2%) patients required blood transfusion with a mean of 2.9 units of RCC, 8.7 bags of FFP and 4.6 bags of platelets. Massive transfusion was defined as

Table-I: Characteristics of the patients.

Variable	
Age (mean ± SD; years)	29.7 ± 15.8
Males	85.3%
Clinical Findings	
Mean Systolic blood pressure (mmHg)	108.6 ± 39.6
Mean Pulse (b/min)	92 ± 38.9
Mean Temperature (oC)	36.9 ±1.2

Table-II: Blood components transfused.

	RCC	FFP	PLT
Mean	2.98	8.71	4.67
Maximum	13	32	12
Minimum	1	2	2
Total	594	505	70

transfusion of four or more red cell concentrates within one hour or replacement of 50% of the total blood volume within three hours. Fifteen (7.5%) patients required massive transfusion. Following massive transfusion, one case of metabolic acidosis and two cases of coagulopathy were reported.

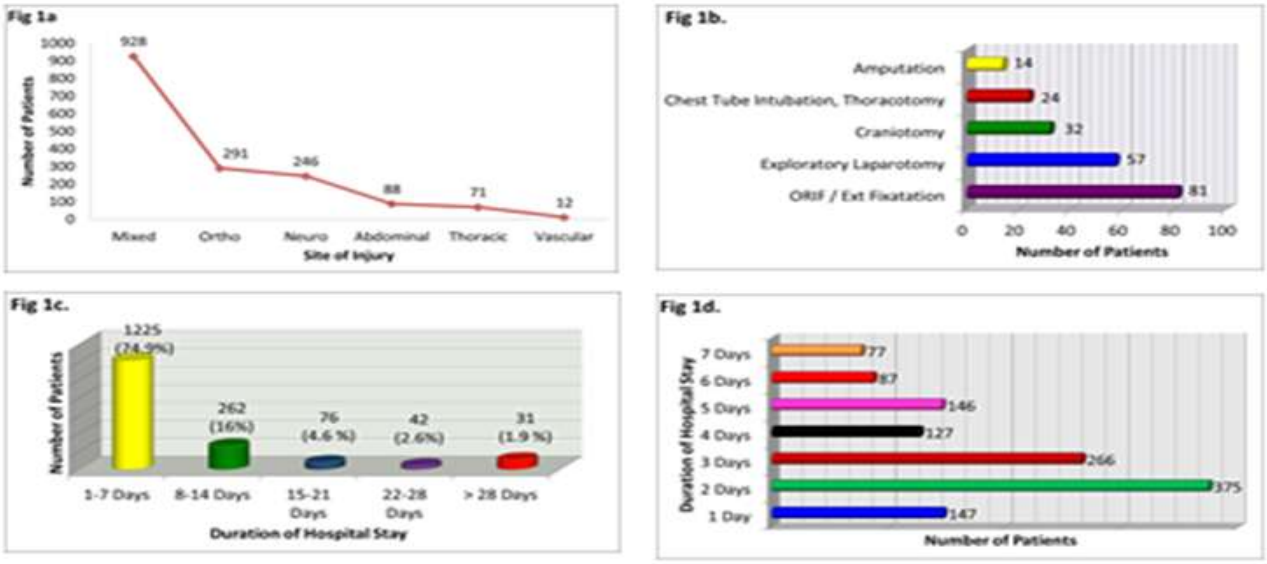

Figure-1(a): Shows the site of injuries in these patients while the major surgical procedures performed are shown in fig-1(b). Figure-1(c) and 1(d) show the mean hospital stay of these patients.

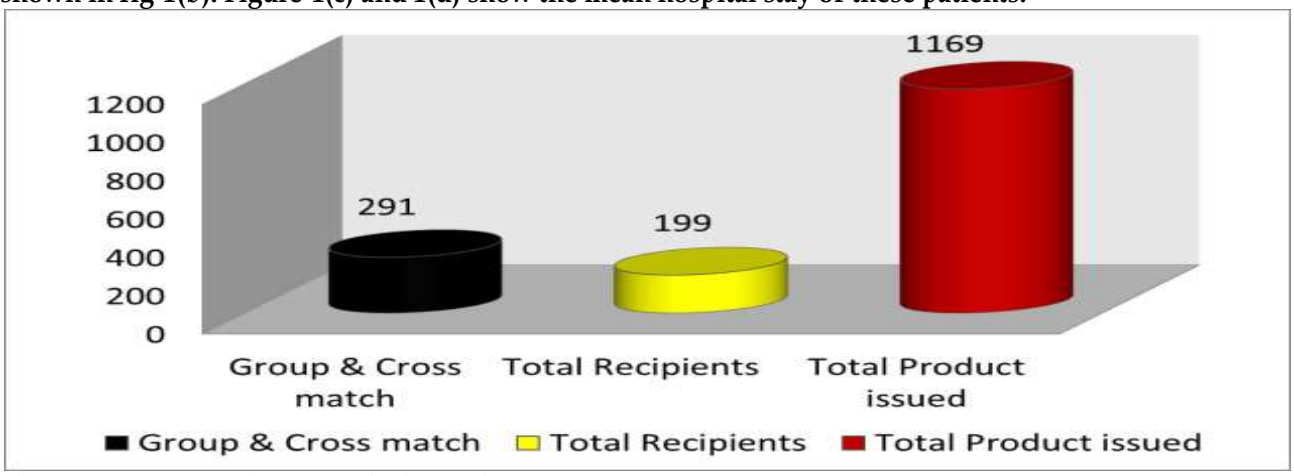

Figure-2: Cross-match to transfusion ratio.

DISCUSSION

Blood transfusion services play a pivotal role in the management of casualties of mass disasters. Not only are blood components required in adequate quantities but also within a very short time. Well organized and well prepared transfusion services with adequate infrastructure and trained manpower are vital to effectively and timely provide safe blood products. At Combined Military Hospital Quetta, the inventory comprised of a blood group mix with an average stock of 125 units of RCC and 450 units of FFPs. The average daily issue was of 7-8 RCCs and 20 FFPs. There is usually considerable pressure and increased initial demand of the universal components, that is, group O RhD negative red blood cells and group AB FFP. In our inventory, 35-40 units of RCC were Rh D negative while 10-12 units were blood group O RhD negative. More than 100 units of

AB group FFPs were present. As per our disaster policy, cross-matched blood is issued if the patient's condition permits. In urgent requirement during the initial hours, blood group specific components were immediately issued. However, where blood grouping was not done due to shortage of time, blood group O, RhD negative RCC were issued. Where blood group O RhD negative blood was in shortage or not available, blood group O RhD positive RCC were issued to male patients. AB negative plasma was issued. The challenges we faced were patient identification issues, an environment of panic, emotionally charged relatives, rapidly changing location of the patients, overwhelming response of donors leading to suffocation of the transfusion services and increased demand for urgent issue of blood. The steps taken included creating an ambient environment, providing separate designated space to donors and minimizing donors waiting time. Identification wrist bands provided to all patients. Sympathetic and trained staff following the well rehearsed standard policies solved most of the problems. Stanworth *et al*[11] has reported mean age of the patients in a study in UK as 38 years which is comparable to the mean age of 30 yrs in our study. However, our study reports a much higher percentage of male patients 85.3% while Stanworth *et al*[11] reports 73% male patients. Mean systolic blood pressure of 85.2 mmHg was reported from Doha, Qatar[12] while our study reports a mean systolic blood pressure of 108.6mm Hg. The overall length of hospital stay was 2 days as reported by Peralta *et al*[12] while in our study the median length of hospital stay was 33 days. In our study, 12.2% patients required blood transfusion while the data from University of Maryland's Shock Trauma Center[13] shows that only 9.1% required transfusion. In the retrospective analysis by Como and colleagues[14], massive transfusion occurred in 1.7% of all patients while in our study 7.5% required massive transfusion. In a study conducted by Gonzalez *et al*[15] in Houston has reported a mean of 10 ± 1 RCC units and a mean of 10 ± 1 units of FFP with a ratio of FFP : RCC of 1:1. In our study, the mean RCC used were 2.98 units and 8.7 units of FFP with a FFP:RCC ratio of 3:1. In our hospital, we have seen good results by using a high FFP: RCC ratio for preventing or correcting coagulopathy, achieving hemostasis and better overall survival.

CONCLUSION

Mass disasters and trauma casualties pose a serious challenge to any healthcare facility in general and the blood transfusion services in particular. Only a well-organized blood transfusion center and blood transfusion emergency preparedness can result in better patient care and outcome. Not all patients need transfusion and a delicate balance between demand and supply has to be maintained.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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