Trend and utilization pattern of whole blood at a teaching hospital, Western India

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ABSTRACT
BACKGROUND: Blood transfusion is the very important measure in health care services to reduce patient morbidity and mortality especially in developing countries like in India where there is high prevalence of anemia. Many maternal deaths can be prevented by timely, effective and safe blood transfusion. Blood cannot be produced artificially and till date no effective substitute of blood is invented. In developing countries like India there is more demand of blood than availability of blood. So optimum utilization of blood should be done and at the same time to avoid misuse and overuse of blood which supply is limited. So we conducted this study with the aim to know utilization pattern of whole blood by the patient of our hospital.

MATERIALS AND METHODS: The present retrospective study was carried out at blood bank of GMERS medical college and civil hospital, Gandhinagar, Gujarat, India over a period of 6 years from 1st January 2009 to 31st December 2014. Patients Details like age, sex, blood group, ward in which patient admitted were recorded in specific proforma and analysed. RESULTS: It is noted that out of 13887 utilised whole blood female patient utilized more 9993(72%) than the male patients 3894(28%). Patients comprising of 21-30 years age group utilized 39.84% of total whole blood utilization, which is highest in all age groups. Obstetrics and gynecology department utilized most of the whole blood comprising of 43.60%. Among ABO blood group system Blood group B comprising of 35.03% is the most utilized blood group.

CONCLUSION: Periodic analysis of trends and pattern of utilization of blood helps to improving local blood transfusion services and to make future policies to implement modern blood transfusion services.

Keywords: Blood transfusion, utilization pattern.

INTRODUCTION
Blood is the connective tissue that carries oxygen and carbon dioxides between lungs and tissue. Thus, blood is the transport media for respiratory gases and also for the nutrients. Blood is a vital component of healthcare services used in a broad range of hospital procedures, accidents, emergency obstetric services, and other surgeries. Till today, no substitute is invented for blood, so blood is very much precious. The demand for blood is increasing day by day because of advancement of medical science, advancement of surgical procedure like cardiac surgery, transplant surgery. Due to urbanization and industrialization there is also increase road traffic accident that also require huge amount of blood. Blood demand will increases in future.1

Blood transfusion considered life saving measure to patient if used appropriately but at the same time it is harmful and potential vector of transfusion transmitted infection like HIV, Hepatitis B, Hepatitis C, syphilis, malaria and many other.2

In developing countries like India due to lack of proper nutrition, prevalence of anemia is very high. Especially it is cause of concern for women in the child bearing age. At the time of labour, there is may be possibility of hemorrhage due to post-partum hemorrhage, placenta previa, abruptio placenta, or rupture of uterus, all of which requiring blood transfusion. Obstetrical hemorrhage is one of the leading causes of maternal mortality. Anemia is leading cause of maternal morbidity, mortality and
infant morbidity, mortality. Infant mortality rate is also high in the developing countries. Adequate supply of blood can prevent maternal and infant death thus reducing Maternal Mortality Rate and Infant Mortality Rate. Road traffic accident mortality can also be prevented by in time blood transfusion to the patients. Transfusion is considered appropriate when it is used to treat condition which prevents or managed morbidity and mortality when it is not prevented or managed by other therapeutic measure. 

About 80% of world population has access only 20% of world’s safe blood supply. Worldwide, more than half a million women die each year during childbirth or in the postpartum period. Severe bleeding during delivery or after childbirth is the most common cause of maternal mortality globally (25%) and contributes to around 31% of maternal deaths in Asia. Because of the unpredictable nature of postpartum bleeding, blood transfusion has been identified as one of the key lifesaving functions that should be available in healthcare facilities providing comprehensive emergency obstetric care. Access to a safe and sufficient blood supply could help prevent deaths of a significant number of mothers and their newborn children.

So, utilization pattern will help the blood banks to maintain the adequate inventory of different blood groups to reduce patient morbidity and mortality. This study is carried out to evaluate pattern of utilization of blood by the patients of a teaching hospital and use of these data to improve local blood transfusion services.

MATERIALS AND METHODS

The present retrospective study was carried out at blood bank of GMERS medical college and civil hospital, Gandhinagar, Gujarat, India. The period of the study included 6 calendar years from 1st January 2009 to 31st December 2014. All the patients having transfusion of whole blood were considered as the part of the study. Primary details of the patient like name, age, sex, blood group etc. were noted. The department and ward in which the patient was admitted like general surgery, general medicine, obstetrics and gynaecology, paediatrics, orthopaedics or ENT was also noted down in the specially designed proforma. The whole blood issued to these patients was received through voluntary or replacement donors with their preliminary details. Before issue, all the blood units were screened for TTIs like HIV, HBsAg, HCV, syphilis, malaria. Before issue of the whole blood unit, the donor blood was cross-matched with that of the recipient with regard to ABO and Rh system of blood grouping.

All these records were obtained from blood bank registers and noted on specially formed proforma, tabulated, analyzed and compared with the similar studies by other authors.

RESULTS

It can be seen from table no. 1 that during the study period of 6 years the female patient had utilized more blood than male patient. Out of 13887 total issued whole blood during 6 years period female patient utilised 9993(72%) whole blood units and male patient utilized 3894(28%). Male female ratio of utilization of blood is 1:2.5. There is significant increase in consumption of whole blood by the patient of the hospital over the past 2 years.

Table 1: Patient’s details who received blood transfusion

<table>
<thead>
<tr>
<th>Year</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>481(25%)</td>
<td>1442(75%)</td>
<td>1922(13.78%)</td>
</tr>
<tr>
<td>2010</td>
<td>623(28%)</td>
<td>1601(72%)</td>
<td>2224(15.95%)</td>
</tr>
<tr>
<td>2011</td>
<td>711(32%)</td>
<td>1511(68%)</td>
<td>2222(15.93%)</td>
</tr>
<tr>
<td>2012</td>
<td>608(29%)</td>
<td>1487(71%)</td>
<td>2095(15.02%)</td>
</tr>
<tr>
<td>2013</td>
<td>621(24%)</td>
<td>1968(76%)</td>
<td>2589(18.56%)</td>
</tr>
<tr>
<td>2014</td>
<td>851(30%)</td>
<td>1985(70%)</td>
<td>2835(20.33%)</td>
</tr>
<tr>
<td>Total</td>
<td>3894(28%)</td>
<td>9993(72%)</td>
<td>13887(100.00%)</td>
</tr>
</tbody>
</table>

Month and year wise whole blood utilization shown in table no. 2. Monthly average of utilization of whole blood is 1157/month. It show that in june, july, august, September and October has higher utilisation of whole blood. In January, February, march, april, may, november, december has lower utilization of whole blood. In rainy (monsoon) season have
higher utilization than winter & summer season.

Table 2: Month and Year wise utilization of blood

<table>
<thead>
<tr>
<th>Months</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>Total utilisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>178</td>
<td>232</td>
<td>147</td>
<td>182</td>
<td>199</td>
<td>189</td>
<td>1127(8.12%)</td>
</tr>
<tr>
<td>February</td>
<td>160</td>
<td>113</td>
<td>155</td>
<td>183</td>
<td>167</td>
<td>170</td>
<td>948(6.83%)</td>
</tr>
<tr>
<td>March</td>
<td>128</td>
<td>133</td>
<td>272</td>
<td>166</td>
<td>186</td>
<td>244</td>
<td>1129(8.13%)</td>
</tr>
<tr>
<td>April</td>
<td>139</td>
<td>138</td>
<td>151</td>
<td>144</td>
<td>180</td>
<td>188</td>
<td>940(6.77%)</td>
</tr>
<tr>
<td>May</td>
<td>162</td>
<td>164</td>
<td>172</td>
<td>209</td>
<td>183</td>
<td>272</td>
<td>1162(8.37%)</td>
</tr>
<tr>
<td>June</td>
<td>140</td>
<td>235</td>
<td>178</td>
<td>188</td>
<td>225</td>
<td>255</td>
<td>1221(8.79%)</td>
</tr>
<tr>
<td>July</td>
<td>193</td>
<td>220</td>
<td>195</td>
<td>171</td>
<td>243</td>
<td>256</td>
<td>1278(9.20%)</td>
</tr>
<tr>
<td>August</td>
<td>160</td>
<td>212</td>
<td>220</td>
<td>184</td>
<td>275</td>
<td>276</td>
<td>1327(9.56%)</td>
</tr>
<tr>
<td>September</td>
<td>145</td>
<td>206</td>
<td>226</td>
<td>196</td>
<td>271</td>
<td>256</td>
<td>1300(9.36%)</td>
</tr>
<tr>
<td>October</td>
<td>153</td>
<td>253</td>
<td>147</td>
<td>201</td>
<td>269</td>
<td>243</td>
<td>1266(9.12%)</td>
</tr>
<tr>
<td>November</td>
<td>197</td>
<td>131</td>
<td>187</td>
<td>126</td>
<td>195</td>
<td>240</td>
<td>1076(7.75%)</td>
</tr>
<tr>
<td>December</td>
<td>167</td>
<td>187</td>
<td>172</td>
<td>145</td>
<td>196</td>
<td>246</td>
<td>1113(8.01%)</td>
</tr>
<tr>
<td>Total</td>
<td>1922</td>
<td>2224</td>
<td>2222</td>
<td>2095</td>
<td>2589</td>
<td>2835</td>
<td>13887(100.00%)</td>
</tr>
</tbody>
</table>

Age group wise distribution of utilization of whole blood in the year 2014 shown in table no 3. It shows that out of total utilization of 2835 blood units among all patients, Age group 21-30 years age group are main group that utilized most amount 1130 (39.84%) of whole blood and 81-90 age group has least utilized whole blood. Among all patient, female patient utilized most of the blood in age between 11 to 50 years than the male.

It is seen from table 4 that out of 2835 total whole blood utilization in the year 2014, Obstetrics & gynecology has consumed most amount of whole blood comprising of 1236(43.60%), followed by Medicine 862 (30.41%), Pediatric 275 (9.71%), orthopedic 246 (8.69%) and Surgery 215(7.59%).

It can be seen from table 5 that out of 2835 whole blood utilization in the year 2014, B group 993(35.03%) is the most common group utilised followed by O group 42(29.71%), A group 679 (23.95%) and AB group 321(11.31%). Rh positive blood groups were 2746(96.86%) and Rh negative blood groups were 89(3.14%). There is no significant difference in prevalence of blood groups between male and female.
DISCUSSION

Blood and blood product is considered drug by Drug and Cosmetic act, 1940 and food and drug control administration department (FDCA). Blood bank provides blood to the various needy patients.

In recent years, blood transfusion requirements have been increasing due to the increasing burden of chronic disease in an aging population, improvement in life-support technology, increasing severity of illness in patients treated in the ICU, and other blood-intensive surgical procedures. 7,8

The availability of blood and demand of blood must be balanced to provide blood to needy patient. So the blood banks have to keep inventory adequate. So every needy patient should not be deprived of blood so we should judiciously use blood which supply is limited. Otherwise there will be shortage of blood occur in blood bank that leads to unavailability of blood to the life threatening condition. It may endanger patient life. So every blood bank should analyse the trend and pattern of utilization of blood to provide blood to needy patients to reduce morbidity and mortality.

Till date there is no effective substitute is invented for blood. So there is necessary to reduce unnecessary transfusion through appropriate use of blood and if possible use alternatives of blood transfusion with other pharmaceutical product. 9,10 At present, the supply of donated blood is unable to keep up with component demand. 11 Taking this into account, most developed nations have implemented Patient Blood Management initiatives and started retrospective status quo analysis of the flow of blood components. 12

Indian statistics for blood demand and supply is not readily available. 13 Data of pattern of utilization of blood is sparse in developing countries. So it is important to know trend and Pattern of utilization of blood by the patients in developing countries. So we have analysed trend and pattern of utilisation of blood by the patients of our hospital situated in western India.

Table no 1 show Male female ratio of utilization of blood is 1:2.5. Out of 13887 total utilised whole blood during 6 years period, female patient utilised 9993(72%) whole blood units and male patient utilized 3894(28%). It is similar finding in study done by Venkatachalapathy T S et al in karnataka India 21 there is steady increase in blood utilization from last three year from 2011 to
2014. The demand is increasing due to anemia, maternal problems during pregnancy, development of complex surgery, intensive life support system, vehicular accident, urbanization, industrialization. This is same as per other study finding that blood demand is increasing world wide. 14,15

Age group wise study shows that there is about 39.48% patient who has received whole blood is in age group of 21-30 years. 6% patient is below 10 years and approximately only 4% of patient who utilized whole blood is above 70 years. Among 21-30 year age group majority of patient is female comprising of 87.82% and male comprising of 12.18%. This is due to very high prevalence of anemia and obstetrics hemorrhage during labour in woman of childbearing age. The higher demand of Red Cells among females could be due to higher prevalence of anemia among women in the study population. 16 This is in contrast to observation made by Mathew A S et al17 in India and by Gonzalez T et al18 in Brazil shows that over 40% of a patient were in the age group of 40-59 years. In our study it is found that about 5% of transfused patients were above 70 years old, while 6% patients were under the age of 10 years. Similar observation is made in India by Mathew A S et al17 and in brazil by Gonzalez T et al18.

Month wise utilization of whole blood throughout the year show Blood utilization is high during rainy season and lesser in winter and summer season. It is due to outbreak of vector born diseases like malaria in the rainy season. Malaria is very much prevalent in tropical countries like India. It causes rapid hemolysis and decrease in hemoglobin concentration in patient. This is the main reason for increased utilization of blood in July, august, September and October. Similar finding observed by Gaur D S et al19 in India.

Department wise utilization of blood shows that obstetrics and gynecology department especially obstetrics patient who is pregnant female have consumed most amount of blood about 43.60(%). This is so because in India like other developing country anemia is very much prevalent in women especially when the woman is in child bearing age. This is due to lack of proper nutrition and inadequate antenatal care due to low education, poverty and limited healthcare facility and myth about pregnancy. Anemia is more pronounced in woman having pregnancy is due to physiological hematological changes. Obstetrics hemorrhage is the other reason for increased utilization of whole blood by obstetrics department. Same finding is made by Venkatachalapathy T S et al21 in India and kagu M B et al20 in Nigeria.

Medical patient 862 (30.41%) utilised more blood than surgical patient 215(7.59%). in our study it is again due to high prevalence of anemia and high prevalence of infectious diseases, chronic diseases and vector born diseases like malaria which is admitted in medical ward. This finding is same in study done by Mathew A S et al17 in India and Wallis J P et al22 in England In which blood products were utilised more by medical specialities (65%), than surgical specialities (20%). This is different from other studies done by Gaur D S19 in India and in England by Stanworth S J et al23 which showed that blood products are required more by surgical specialities. 12,24

Blood group wise utilization of blood by patient of a hospital show Rh positive patients are 2475 (96.87%) and Rh negative patients were 80( 3.13%). Among ABO blood group, B blood group is most common blood group utilized comprised of 35.03%,followed by O, A and AB were 29.71%, 23.95%,11.31% respectively. There is no significant difference between prevalence of different blood groups among male and female patients. This is same in studies done by Nidhi et al25 and Giri et al26 in western India and by Chandra et al27 in northern india. This is different in the south India stated in studies done by Periyavan et al28, Venkatachalapathy T S et al21 in which O group is common followed by B group, A group and AB group. studies done in countries like Britain,USA29 shows the O blood group is common followed by A, B and AB and Rh
negative prevalence is high as compared to India. This is due to different prevalence of blood groups in the population among different geographical region.

CONCLUSION

Periodic analysis of Trend and utilization pattern of blood by patient in hospital helps to understand local blood transfusion practices. It can be used for preparation of future transfusion policies to improve local blood transfusion practices so optimum utilization of blood can be done and to avoid wastage and shortage of blood in blood bank and also to reduce risk of transfusion transmitted infection. Educational seminar, CME should be arranged to educate clinician, and health care personnel to promote appropriate clinical use of blood and to avoid misuse and overuse of blood so the blood can be available to every needy patient. The more amount of blood is utilized in rainy season due to various infectious and vector born disease like malaria, this information helps the blood bank to keep adequate inventory of blood in this season.

REFERENCES


