

Original Article

Assessment of the ratio of cross-matched to transfused blood amounts in pregnant patients in Alzahra Hospital in Tabriz before and after the implementation of the health reform program in 2013-2015

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Abstract

Background: Postpartum hemorrhage is the most common cause of mortality in women with vaginal or cesarean delivery. WHO statistics shows that about 500 thousands women have died of complications related to pregnancy or during childbirth in 2013. haemorrhage probability is the main reason to order blood requests in delivery and cesarean units. The purpose of this study is to evaluate the ratio of cross-matched to transfused blood in pregnant women during one year before and after the implementation of health reform program.

Materials and Methods: In this retrospective descriptive study, the requests of blood reserves for pregnant patients with the gravid of 34 ± 7 weeks and the age of 30 ± 16 years old in two periods, before and after the implementation of health reform program were being collected and compared. Blood group antisera and anti-human globulins with bovine albumins were purchased from LORN company and Baharafshan Company respectively.

Results: The total number of requests for reserved cross-matched blood during the year before the health reform program were 2837 units which 277 of them had been transfused and a year later the total number of requests was for 3029 units, which 270 of them had been transfused. This study showed 6.76 percent increase in requests and 2.53 percent decrease in transfusion in comparison with its past year.

Conclusion: The implementation of health reform program have accompanied by relative reduction of cesarean but considerable increase in vaginal delivery, and to prevent blood loss complications, the requests for reserved cross-matched blood have been increased without noticeable change in the proportion of necessarily transfused amount of them.

Keywords: Postpartum Haemorrhage, cesarean section, Albumins, Pregnancy, Health care reform

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Introduction

Postpartum hemorrhage is the most common cause of maternal mortality is due to natural vaginal delivery, cesarean section. World Health Organization statistics indicates that in 2013 about 500 thousand women have lost their lives as the result of pregnancy or childbirth-related diseases. This means that every minute a woman dies of pregnancy or childbirth (1-2). Maternal mortality is the major health inequity in the world. The risk probability of is the main cause for blood request in cesarean and delivery sections and bleeding is defined as the dramatic drop in hemoglobin or losing a certain volume of blood that can be problematic for the health of the fetus and the mother. Blood is being used as a valuable drug in the treatment of the cases that leads to the inevitable death and because of its significance World Health Organization has named 2000 the year of healthy blood(4). Blood transfusion plays an important role in the management of patients with hemorrhage, so nowadays order bookings and cross-matched blood have been commonly used by medics. At the moment the most of the cross-matched blood ordering is done habitually, this in turn leads to the lack of blood supply and delay in surgical procedure and the loss of quality of the blood bags (3-5). There is no precise measure and the decision to begin blood transfusions and the decision is based on clinical and hematological findings. Given that using autologous blood is not recommended during pregnancy due to bacterial contamination and insufficiency of the placenta in supplying blood to the fetus after blood donation(2), so conscious control of the third stage of the childbirth to reduce bleeding and clotting disorders using low molecular weight heparin is recommended to reduce blood loss(1-5-8). Studies show that only 30% of cross-matched blood in elective surgeries such as cesarean section is used and even in trauma patients taking blood units is less than 50% and 10-7 percent blood bags are destroyed annually in South Africa due to high demand for blood reserve. Disagreement on the brink of low hemoglobin levels for the transfusion and the difference in surgical technique and anesthesia practice and preoperative anemia and the lack of available transfusion protocols are what makes

unusual demands on the blood reserve remaining are imposing costs on patients and increasing the technologists workload and chemical reagent consumption and time(5-7). Boral Henry was the first offering the cross-matched blood transfusion in 1975 and concluded that this ratio is desirable compared to 2.5 percent for blood transfusion and booked bags are not available for other patients (5-7). Great Britain Standards Committee of Hematology considers the overall number of cross-matched blood units to transfuse two to one ratio desirable. Mead et al considers the possibility of blood transfusion by 30% in 1980, and the average number of patients using cross-matched blood units transfused were indicated by an indicator titled transfusion indicator(6-8). Creating a regular blood ordering schedule as a guide to blood transfusion to be used in patients and developing processes that reduce blood order takes place by managing unnecessary compatibility tests application. Applying reservation policies has been successful in restricting unnecessary transfusions and the formula can be obtained from the relationship (8-9).

C: T ratio = No of units cross matched ÷ No of units Transfused

Transfusion probability (%T) = (No of patients Transfused ÷ No of patients cross matched) × 100

Transfusion Index (TI) = No of units Transfused ÷ No of units cross matched

MSBOS (Maximal surgical Blood Order Schedule) = $1.5 \times TI$

Most of the studies show that blood reservation requests have always been more than the patients' need and implementing ordering maximum blood schedule in surgery can lead to more safety and effectiveness and economical good. Improved surgical techniques and anesthesia care may reduce the patient's need for blood transfusions. Using various units of blood results in complications, sepsis and surgical spite bleeding are the most common. Currently, blood reservation for hospitalized patients in delivery and cesarean sections by Gynecology and Obstetrics specialists is performed routinely and the most frequent cause of this action is the risk of bleeding which is the most common cause of maternal mortality. Therefore, the purpose of this study is to review the rate of cross-matched blood to injection in

pregnant women before and after the implementation of healthcare reform program and compare its effects on the treatment system of the Centre.

Methods

In this retrospective study with the permission of hospital ethics committee, the reservation request and cross-match of the blood for hospitalized patients of natural vaginal delivery and cesarean sections of Al-Zahra training hospital in Tabriz were collected by Central Blood Bank and controlled through the hospital's computer system from June 2013 to June 2015. Cross matches were done using the standard protocol, blood group antiserum of Lauren company and anti-Human globulin and albumin of Bahar Afshan Company. Patients consisted of pregnant women with gravid of 7 ± 34 weeks and age of 16 ± 30 years. Using statistical methods, the number of total requests and the consumption rate of natural vaginal delivery and cesarean delivery by the patients were calculated in two consecutive years and index of the proportion of cross-matched blood to injection and transfusion index was calculated in all patients in two consecutive years. The results before and after the implementation of health reform program were compared using Excel and MINITAB16 software. Results are presented in Tables and diagrams.

Results

The results of this study show that the proportion of cross-matched blood to injection before the implementation of health reform program during one year had an average of 10.24 ± 1.17 units. While in one year after the implementation of health reform

program this proportion was 11.21 ± 3.67 units which indicates 9.47 percent increase in the number of blood units cross-matched to injection. Request rate of blood for cross-match in one year after the implementation of health reform program was increased by 6.76% and transfused blood volume was also dropped by 2.53%. Using the software MINITAB 16, comparing the results before and after the implementation of health reform program didn't show a significant difference and rejected the null hypothesis with confidence interval of 95% and P value of 0.052. Transfusion index varied between 0.08 and 0.12 before the implementation of healthcare reform program but after the implementation of healthcare reform program this index is variable between 0.06 and 0.12. Maximum C / T ratio before the implementation of healthcare reform program was 11.84 in June 2013 and minimum C / T ratio was 8.0 in September 2013. After the implementation of healthcare reform program, these amounts were 15.28 in June 2014 and 8.28 in May 2015. Maximum request of blood for cross-match and blood transfusion before the implementation of healthcare reform program belonged to July 2013 with 326 units of cross-matched blood bags and 31 injected units. In the year after the implementation, maximum request of blood for cross-match with 333 units was in February 2015 and maximum injection was in April 2015 with 38 units. MSBOS before the implementation of health reform program was in the range of 0.12 to 0.18 and after the implementation of health reform program was between 0.09 and 0.18, by analyzing and calculation of data and results, differences of the months of the year overlap and there is no significant difference before and after the implementation of healthcare reform program.

Table 1: Comparison of cross-matched blood bags to injection in natural vaginal and cesarean delivery, before and after the implementation of healthcare reform program

Both natural vaginal and cesarean delivery sections	2837	3029	277	270
Natural vaginal delivery	1127	1093	109	100
cesarean delivery	1710	196	168	170

Table 2: The proportion of cross-matched blood to injection during the year before the implementation of healthcare reform program is 10.24. There desirable rate is 2.5. so this rate indicates indiscriminate increase in blood request for patients.

Monthly Statistics	The number of Cross-match units in the delivery	The number of Transfusion units in the delivery	The number of Cross-match units in the Cesaren section	The number of Transfusion units in the Cesaren section	The total cross-matched units	The total injection units	C/T Ratio	Transfusion Index	MSBOS
June 2013	142	12	83	7	225	19	11.84	0.08	0.12
July 2013	168	16	158	15	326	31	10.51	0.09	0.14
August 2013	45	4	213	19	258	23	11.21	0.08	0.13
September 2013	32	4	48	6	80	10	8	0.12	0.18
October 2013	85	9	132	14	217	23	9.43	0.1	0.15
November 2013	127	13	147	15	274	28	9.78	0.1	0.15
December 2013	220	19	70	6	290	25	11.6	0.08	0.12
January 2013	86	9	154	16	240	25	9.6	0.1	0.15
February 2013	82	9	183	20	265	29	9.13	0.1	0.16
March 2013	72	8	136	15	208	2	9.04	0.11	0.16
April 2014	22	2	166	16	188	18	10.44	0.09	0.14
May 2014	46	4	220	19	266	23	11.56	0.08	0.12

Discussion

With the implementation of healthcare reform program, 6.76 percent increase can be seen in the number of cross-matched blood units for reservation along with 2.53 percent decrease in blood transfusion of patients which shows that compared to global statistics, we are faced with 5-fold increase in reservation requests and blood cross-match. Direct mortality rate of pregnant mothers in America was 7-10 per 100000 live births and it seems that 8 percent of these cases were due to bleeding after childbirth.

In some developing countries, maternal mortality was 1000 cases per 100,000 live births in 2009. With the implementation of health reform program and free natural vaginal delivery charge, the relative amount of this type of delivery has dramatically increased. Additionally, admission fees for caesarean delivery have also declined which in its turn causes a large number of these patients to be hospitalized. Increase in the proportion of cross-matched blood bags to injection before the implementation of healthcare reform program was 10.24 which were 11.21 a year later and we are confronted with 9.47 percent increase.

Table 3: The proportion of cross-matched blood to injection during the year after the implementation of healthcare reform program is 11.21 which indicates an increase of 6.76 percent in reservation request of cross-matched blood and a 2.53% decrease in blood transfusion.

Monthly Statistics	The number of Cross-match units in the delivery	The number of Transfusion units in the delivery	The number of Cross-match units in the Cesaren section	The number of Transfusion units in the Cesaren section	The total cross-matched units	The total injection units	C/T Ratio	Transfusion Index	MSBOS
June 2014	46	3	168	11	214	14	15.28	0.06	0.09
July 2014	30	2	156	11	186	13	14.3	0.06	0.1
August 2014	119	9	160	12	279	21	13.28	0.07	0.11
September 2014	77	6	166	13	243	19	12.78	0.07	0.11
October 2014	65	6	87	8	152	14	10.85	0.09	0.13
November 2014	138	13	127	12	265	25	10.6	0.09	0.14
December 2014	123	12	83	8	206	20	10.3	0.09	0.14
January 2014	136	11	149	12	285	23	12.39	0.08	0.12
February 2014	61	4	260	17	321	21	15.28	0.06	0.09
March 2014	72	8	261	29	333	37	9	0.11	0.16
April 2015	110	12	120	13	230	25	9.2	0.1	0.16
May 2015	116	14	199	24	315	38	8.28	0.12	0.18

Due to the risk of abnormal bleeding, such as atonic uterus for different reasons in natural vaginal delivery and increased bleeding in caesarean delivery, such as placenta previa, most of gynecology and obstetrics professionals proceed to reserve and cross-match to blood bags in order to prevent adverse effects which has become a routine program. The proportion of cross-matched blood bags to injection before and after implementation of healthcare reform program had no significant difference in delivery and cesarean sections. According to these findings and review of medical records, the amount of patient reception particularly for elective surgeries such as cesarean has significantly decreased in April due to Norouz holidays. This represents an increase in

admissions for elective surgeries such as cesarean section in March before Norouz holidays and in May, after Norouz holidays. This represents an increase in cross-match and blood transfusion in these months of the year.

Conclusion

Nowadays, there are no precise criteria to start blood transfusions as a general rule and decision for blood transfusion is mostly on the basis of clinical conditions and hematological findings of the patients. Loss of a given volume of blood during any delivery will not cause hemodynamic system disorders. Placenta previa, retained placenta or part of it, rupture and uterine inversion, Atonic uterus and clotting

problems are the most common cause of bleeding after delivery. The first and most important cause of bleeding in the delivery phase is placenta previa bleeding which in most cases, regardless of fetal lung maturity, caesarean delivery is indicated. Using programs such as ordering up blood in the surgeries like cesarean and regular surgery programs and new techniques of anesthesia we can prevent aberrant injection of blood units and blood transfusion complications such as bleeding from the surgical site or sepsis due to multiple blood transfusions. Moreover, request for blood reservation as well as consumption will decrease.

Conflicts of Interest

The authors declare that there is no conflict of interest in this study.

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