Blood loss and risk of blood transfusion in patients undergoing caesarean section

Madhusudan Dey*1 and Vanamail Perumal2

1Reader, Department of Obstetrics and Gynaecology, Armed Forces Medical College, Pune, India
2Department of Obstetrics & Gynaecology, AIIMS, New Delhi, India

*Correspondence Info:
Dr. Madhusudan Dey,
Dept of Obstetrics and Gynaecology,
Armed Forces Medical College, Pune,
Maharashtra 411040, India
Email: deym1@yahoo.com

Abstract
Background: Caesarean delivery is one of the most common operations performed worldwide. Maternal morbidity and risk of blood transfusion increased greatly with caesarean compared with that of vaginal delivery.
Aims: This study was carried out to evaluate blood loss and requirement of blood transfusion in patients undergoing caesarean section.
Materials and methods: A prospective observational study was carried out in a peripheral military hospital, India where 173 women underwent caesarean section and data were obtained on age, parity, gestational age, delivery type (elective/elective), indication for caesarean section, pre operative and post operative haemoglobin levels. Number of patients required blood transfusion were also noted.
Results: There was no significant increase in blood loss by indication of caesarean section (p<0.05). A total of 1.7% patients received blood transfusion.
Conclusion: Transfusion risk in patients undergoing caesarean section is low and haemoglobin testing after caesarean section should be limited to women at high risk of blood transfusion.
Keywords: Caesarean section, blood loss, anaemia, blood transfusion, preeclampsia

1. Introduction
Hemorrhage has been identified as the single most important cause of maternal death worldwide, accounting for almost half of all postpartum deaths in developing countries1. The circumstances in which blood or blood products are not readily available, obstetric haemorrhage is usually fatal. Despite advances in the medical field regarding management of obstetric haemorrhage, blood loss during delivery still a major concern for all the obstetricians and prompt blood transfusion is a live saving measure along with prevention of maternal morbidity. Maternal morbidity increased dramatically with caesarean compared with that of vaginal delivery and principal sources are haemorrhage, puerperal infection and thromboembolism. The procedure has been identified as a common indication for blood transfusion in obstetric practice because it involves risk of major intra-operative blood loss2. The increased blood volume associated with normal pregnancy typically accommodates the obligatory blood loss that occurs during vaginal or caesarean delivery3. However, in some patients, blood loss may overwhelm compensatory mechanisms and result in hypovolemia and shock with a significant threat to both the mother and foetus4.

In our centre, anaesthetists usually request for a minimum of two units of cross-matched blood for cases of...
caesarean section irrespective of the pre-operative haemoglobin. Most of these cross-matched pints of blood are seldom used as transfusion practices have changed during the last two decades because of acute awareness of the increased risks associated with blood transfusion as well as an improved knowledge of the patho-physiologic mechanism of oxygen transport and tissue oxygenation.

The study was carried out to evaluate blood loss and requirement of blood transfusion in patients undergoing caesarean section.

2. Materials and Methods

This was a prospective observational study carried out at a peripheral military hospital, India where one-hundred seventy three pregnant women underwent caesarean section in 2 years (between 01 Jul 2009 and 30 Jun 2011), were recruited for the study. The local ethics committee approved the study protocol. Written informed consent was taken from all the women participated in the study. Gestational age was calculated from last menstrual period (LMP) and in cases of unsure data; it was confirmed by first trimester ultrasonography. Surgery was performed according to standardized protocol and placenta was delivered by controlled cord traction except where this was difficult and manual removal was performed.

Data were obtained on age, parity, gestational age, delivery type (elective/emergency), indication for caesarean section, pre-operative and post-operative haemoglobin levels and intra-operative finding of meconium stained liquor (MSL). Number of patients required blood transfusion was also noted. Routine haemoglobin measurement and blood type sampling were performed on the morning prior to surgery in elective cases and during emergency, haemoglobin measurement was carried out prior to the surgery (in the event of a need for an emergency transfusion), and haemoglobin measurement was repeated 18–24 hours after surgery. Haemoglobin was estimated by Drabkin’s method. All the patients underwent caesarean section under spinal anaesthesia except 02 patients of severe preeclampsia received epidural and 02 patients of abruption received general anaesthesia. All the patients received 10 units of oxytocin in 500 ml of normal saline intra-operatively after delivery of the baby and continued till immediate post partum. Patients were treated post-operatively with 2–3 l of isotonic solution for 24 hours.

In this study, preterm was defined as gestation between 28+0 to 36+6 weeks. Hypertensive disorders of pregnancy includes gestational hypertension, preeclampsia, preeclampsia superimposed on chronic hypertension, eclampsia; chronic hypertension was included in the medical disorders in pregnancy with thyroid dysfunction, epilepsy, asthma, pulmonary tuberculosis, heart diseases. Patient was having anaemia when her pre-operative haemoglobin was less than 10 gm/dl. Premature rupture of membrane was diagnosed when rupture of membrane was before the onset of labour pain.

2.1 Statistical analysis

The data were analysed using SPSS version 16.0 software. Difference between pre-operative and post-operative (at 24 hours) haemoglobin levels were computed. Means of differences were tested using student’s unpaired t-test across two categories of different variables. The level of statistical significance was set at P <0.05.

Findings of the study were compared with the other studies on different parameters used in evaluation of blood loss and blood transfusion risk in patients underwent caesarean section given in literature.

3. Result

A total of 173 patients underwent caesarean section out of 633 deliveries during the 2 years period giving a caesarean section rate of 27.3%. Among the patients underwent caesarean section, only three patients (1.7%) received blood transfusion either during or after surgery. Characteristics of patients underwent caesarean section are shown in table 1. Among the multipara patients, 77% of patients were post caesarean pregnancy who underwent either elective or emergency operation. In this study a total of 61% patients were underwent emergency caesarean section.

Assessment of blood loss was carried out in different categories of patients as shown in Table 2 by measuring the difference between pre & post-operative haemoglobin. There was no significant difference in blood loss in post caesarean, hypertensive disorders in pregnancy, preterm or anaemic patients compared to other cases.
Table 1: Characteristics of patients undergoing caesarean section

| Parameters                        | No of patients (n) | Percentage (%) |
|-----------------------------------|--------------------|----------------|
| Parity Primipara                  | 85                 | 49             |
| Multipara                         | 88                 | 51             |
| Preterm                           | 19                 | 11             |
| Post caesarean                    | 69                 | 40             |
| Hypertensive disorders in pregnancy | 16                | 9              |
| Medical disorders in pregnancy    | 37                 | 21             |
| Anaemia                           | 30                 | 17             |
| Premature rupture of membrane     | 28                 | 15             |
| Elective caesarean                | 67                 | 39             |
| Meconium stained liquor           | 20                 | 12             |

Blood loss was also similar in elective vs emergency caesarean (Table 2), premature rupture of membrane, medical disease, meconium stained liquor as compared to other cases.

Table 2. Difference in haemoglobin (Pre – Post operative at 24 hours) levels

| Sr. No | Characteristics | Difference of Hb (Mean ± SD) | P value |
|--------|----------------|------------------------------|---------|
| 1      | Post caesarean (69) Vs Others (104) | -0.38±11.12 1.14±0.87 | 0.166 |
| 2      | Elective (67) Vs emergency (106)    | -0.49±11.2 1.19±0.83 | 0.13 |
| 3      | Hypertension (16) Vs Others (157)   | 1.23±0.79 0.46±7.41 | 0.68 |
| 4      | Preterm (19) Vs Term (154)          | 1.16±1.05 0.45±7.48 | 0.68 |
| 5      | Anaemia (30) Vs Others (143)        | 0.83±0.49 0.47±7.77 | 0.8 |
| 6      | Medical disease (37) Vs Others (136)| 1.21±0.89 0.35±7.95 | 0.51 |
| 7      | PROM (28) Vs Others (145)           | 1.34±1.01 0.38±7.70 | 0.51 |
| 8      | MSL (20) Vs Others (153)            | 1.21±0.74 0.44±7.50 | 0.65 |

PROM: Premature rupture of membranes; MSL: Meconium stained liquor

Out of three patients received blood transfusion, transfusion was given in two cases of abruption (05 units of packed cell) and one case of severe preeclampsia (02 units of packed cell). No transfusion was carried out in 19 anaemic patients and three cases of placenta previa.

4. Discussion

The ability of pregnant women to withstand blood loss at the time of delivery depends on the haemoglobin level, the blood volume, the volume of blood loss, any associated co-existing disease and complications. Accurate estimation of blood loss at the time of caesarean section delivery is important in transfusion practice. It is difficult to estimate the blood loss accurately in this surgery because of dispersion of blood loss and secondly due to blood being mixed with amniotic fluid. The blood volume of a pregnant woman with a normal pregnancy induced hypervolemia usually increases by 30 to 60%, which amounts to 1500 to 2000 ml for an average sized woman. Women undergoing caesarean delivery had a mean drop in haematocrit of 4.2 volume percent, but 20% had no decline.

Post-operative haemoglobin measurement following a caesarean section is always performed; however, its necessity has not been proven. The rationale to support this management is to diagnose and treat anaemia in earlier stages,
thus improving maternal morbidity. However, this study showed that the finding of a low haemoglobin level in the absence of clinical symptoms was rare. Therefore, the routine haemoglobin test after surgery had a limited use as a screening procedure.

Improvement in obstetrics surgical techniques and practice have decreased the use of homologous blood transfusion at the time of caesarean section, the risk of requiring blood transfusion is still significant especially in high-risk cases. Certain trends or consideration have contributed to decreasing transfusion rate. These include physician's acceptance of lower pre-operative haemoglobin concentration or haematocrit levels, reduced patient's willingness to accept the risk of transmission of blood borne infectious agents, more restrictive indications for blood transfusion and the fact that the obstetrics population is largely young and healthy. The caesarean rate in this study was 27.3% and blood transfusion rate was 1.7% and this is consistent with transfusion rate of 1-14% as suggested by review of literature for blood transfusion following caesarean section.

Emergency caesarean section was found to have increased blood loss compared to those that had elective surgery. This finding is consistent with the report by Tolby and Scott who found a statistically significant risk of transfusion in their subjects undergoing emergency caesarean section. In this study, patients underwent emergency caesarean had similar blood loss like elective surgery. There was no significant blood loss in patients underwent repeat caesarean as compared to primary caesarean and this finding is in contrast with that of Imarengiaye who found a significant risk of transfusion with repeat caesarean section.

Ransom and colleagues studied 3962 patients who underwent caesarean section and found that most of the blood transfusions were related to previously identified risk factors, such as anaemia on admission. They concluded that, in the absence of significant risk factors, routine blood typing and screening at admission for caesarean section did not enhance patient care and should be eliminated. Increased blood loss and transfusion risk in cases of anaemia was reported in other studies. The role of anaemia as represented by pre-operative haemoglobin level was also found to be not significantly associated with increased blood loss risk in this study (P >0.05).

Preeclampsia/eclampsia and acute fatty liver of pregnancy were associated with higher incidence of blood loss and increased risk of blood transfusion. Hypertensive disorders are common and form one of the deadly triad along with hemorrhage and infection that results in much of the maternal morbidity and mortality related to pregnancy. Though a transfusion haematocrit threshold of 30% or less has been suggested as appropriate, while women who underwent caesarean section may tolerate post-operative haematocrit of 20% without significant complications, transfusion with red blood cells may be appropriate when the haematocrit is 21-30% if there is active bleeding or cardio-pulmonary disturbance. This study did not show any significant blood loss in hypertensive disorders of pregnancy as compared to non-hypertensive cases (Table 2). One case of severe preeclampsia received two units of packed cell as her post operative haemoglobin was 6.9 gm/dl. Two cases of abruption received intra operative blood transfusion due to increased blood loss during surgery.

The strengths of the study include prospective design and follow up. In addition caesarean was performed by the single surgeon with similar post-operative management. Several important limitations must be considered when interpreting the results of our study. First, evaluation of blood loss was measured only by haemoglobin parameter. Secondly, the study was carried out in a single centre with a relatively small number of patients.

This study shows that blood transfusion risk in patients undergoing caesarean section is low and haemoglobin testing after caesarean section should be limited to women at high risk of blood transfusion, owing to clinical evidence of excessive blood loss intra- or postoperatively. Patients should be assessed on an individual basis according to symptoms and clinical course.

References
1. McCormic ML, Sangghvi HC, McIntosh N: Preventing post partum haemorrhage in low resource settings. Int J Gynaecol Obstet. 2002; 77:267.
2. Matot I, Einav S, Goodman S, Zeldin A, Weissman C, Elchalal U. A survey of physician's attitude towards blood transfusion in patients undergoing caesarean section. Am J Obstet Gynecol. 2004;190:462–7.
3. Waterstone M, Wofe C, Hooper R, Bewley S. Postnatal morbidity after childbirth and severe obstetric morbidity. Br J Obstet Gynaecol. 2003;110:728–33.
4. Häger RM, Daltveit AK, Hofoss D, Nilsen ST, Kolaas T, Øian P, et al. Complications of caesarian deliveries: rates and
risk factors. *Am J Obstet Gynecol.* 2004;190:428–34.

5. Matot I, Einav S, Goodman S, Zeldin A, Weissman C, Elchalal U. A survey of physician's attitude towards blood transfusion in patients undergoing caesarean section. *Am J Obstet Gynecol.* 2004;190:462–7.

6. Duthie SJ, Gosh A, NgA, Ho PC. Intra-operative blood loss during elective lower segment caesarean section. *Br J Obstet Gynaecol* 1992; 99: 364-7.

7. Pritchard JA: Changes in the blood volume during pregnancy and delivery. *Anaesthesiology.* 1965; 26:393.

8. Combs CA, Murphy EL, Laros RK Jr: Factors associated with haemorrhage in caesarean deliveries. *Obstet Gynaecol.* 1991a; 77:77-82.

9. Rebarber A, Lonser R, Jackson S, Copel JA, Sipes S. The safety of intra-operative autologous blood collection and auto transfusion during caesarean section. *Am J Obstet Gynecol.* 1998;179:715–20.

10. Carmann WR, Datta S. Red cell use during caesarean delivery. *Transfusion.* 1991;31:12–15.

11. Oluwarotimi I A, Adetokunbo O F,Adetokunbo O T, Kabiru A R, Yussuf A O, Chioma A O. Evaluation of blood reservations and use of caesarean section in a tertiary maternity unit in south western Nigeria. *BMC Pregnancy Childbirth* 2010;10:57.

12. Tolby M, Scott DB. Blood loss during caesarean section under general anaesthesia. *Br J Anaesth.* 1969;41:868–73

13. Imarengiaye CO, Ande ABA. Risk factors for blood transfusion during caesarean section in a tertiary hospital in Nigeria. *Med Sci Monit.* 2006;12:CR269–272.

14. Ransom SB, Fundaro G, Dombrowski MP. Cost effectiveness of routine blood type and screen testing for cesarean section. *J Reprod Med* 1999;44:592–4

15. Rouse DJ, MacPherson C, Landom M, Varver MW, Levono KJ, Moawad AH, et al. Blood transfusion and caesarean delivery. *Br J Anaesth.* 1998;80:195–8.

16. Ozumba BC, Ezegwui HU. Blood transfusion and caesarean section in a developing country. *J Obstet Gynaecol.* 2006;26:746–48

17. Dey M, Kumar R. Acute fatty liver of pregnancy. *North American Journal of Medical Sciences.* 2012; 4(11): 661-12.

18. Dey M, Arora D, Narayan N, Kumar R. Serum cholesterol and ceruloplasmin levels in second trimester can predict development of pre-eclampsia. *North Am J Med Sci* 2013;5(1):41-6.

19. American College of Obstetricians and Gynaecologists. Blood component therapy. ACOG technical bulletin No 199, Washington DC: *American College of Obstetricians and Gynaecologists.* 1994.