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Role of Placental Cord Drainage in Reducing Duration of Third Stage of Labour and Prevention of Postpartum Hemorrhage in Vaginal Deliveries

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ABSTRACT
Globally, postpartum hemorrhage (PPH) remains the largest direct cause of maternal morbidity and mortality, it complicates about 4% of vaginal and 6% of caesarean deliveries. Postpartum hemorrhage is defined as estimated blood loss of >500 ml within 24 hours of a vaginal birth or 1000 ml after caesarean section, or any blood loss sufficient to compromise hemodynamic stability. To evaluate the effectiveness of placental blood drainage via umbilical cord In reducing duration, blood loss and complication in third stage of labor and in reducing the incidence of PPH, maternal morbidity and mortality. It is prospective, cross sectional comparative study to evaluate effectiveness of placental cord drainage in reducing duration of third stage of labour, the amount of blood loss in third stage thereby reducing the incidence of postpartum hemorrhage. To conduct this study is maximum 400 cases, 200 cases will be in each Group A (STUDY) Group B (Control). The main source of data for this study are patients from teaching hospitals attached to J.J.M. Medical College Davangere during the study period February 2021 to July 2022. Mean duration of III stage of labour was 5.06 minutes in control group and 3.5 minutes in study group and the difference is highly significant statistically. Mean blood loss during III stage of labour was 308 ml in control and185 ml in study group and the difference is highly significant. Incidence of Postpartum Hemorrhage was 8.5% in control group and 2% in study group and none of the cases required surgical management of PPH . Placental blood drainage does not need any extra cost, equipment (or) effort and it is a simple, non-invasive safe method that can be practiced even by midwives in rural settings as a part of management of third stage of labour in reducing the blood loss during third stage.

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Key Words
PPH, active management of 3rd stage of labour, placental cord drainage

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INTRODUCTION

Most of these deaths occur in low-resource countries where 45 million women give birth without a skilled birth attendant each year[1]. In high resource countries such as the United Kingdom (UK), the maternal death rate from PPH is very low[2]. However, the reported incidence of severe PPH is increasing and it is the leading cause of severe maternal morbidity[3]. It has been estimated that 295,000 (UI 279,000-340,000) maternal deaths occurred globally in 2017[1]. Most of these deaths (86% or 254,000) occurred in sub-Saharan Africa (SSA) and Southern Asia (SA). Sixty-three percent of all maternal deaths globally are due to direct causes, most (27.1%) of these are due to hemorrhage. Hemorrhage is the primary underlying cause of 24.5% and 30.3% maternal deaths respectively in SSA and SA respectively. Sixty-two percent of all deaths due to hemorrhage globally occur in the postpartum period (62% in SSA and 86% in SA)[4]. Visual estimation is described as the most useful and frequently used method to assess blood loss, particularly following vaginal delivery[5], but the method is universally acknowledged as inaccurate. Many research studies and training initiatives have therefore focused on improving clinicians' skills in visual estimation of blood loss as a volume, believing this to be the pre-requisite to more timely diagnosis of PPH. However, while immediate and profuse blood loss at birth may be easy to diagnose and treat, insidious blood loss can be more difficult to recognize. This is compounded by the fact that the physiological response to insidious blood loss may also be more subtle. Experts have suggested that most deaths from PPH could be avoided by 'appropriate diagnosis' and treatment[6] as delays in diagnosis are thought to contribute to progression of blood loss to severe PPH and complications such as coagulopathy[7]. The majority of postpartum hemorrhage (PPH) maternal deaths could be avoided by the use of prophylactic uterotonics during the third stage of labour. Prevention of PPH is mainly achieved by active management of the third stage of labour which is widely practiced in high resource countries (WHO 2012). Third stage of labour begins immediately with the delivery of the foetus or foetuses and it involves separation and expulsion of placenta with its attached membranes[8]. Although it occupies a very short period of time compared to labour, which last several hours, this crucial phase poses dangers to the life and health of the mother, it can be managed actively or conservatively[9]. Placental cord drainage is a very simple, non-invasive method and doesn't need any costly equipment[10]. For prevention and treatment PPH drugs such as oxytocin, metheglin and carboprost are used, which reduce incidence by 40%[11]. In rural areas, the availability of such drugs and facilities are limited[8]. Hence, this study was designed to evaluate and compare the efficacy of placental cord drainage after vaginal delivery, which reduces the bulkiness of the placenta, allowing the uterus to contract and retract effectively, resulting in placental detachment and reducing the duration of third stage of labour[12] and the study aims at the following:

- Postpartum hemorrhage is the most common cause of maternal mortality and it complicates about 4% of vaginal and 6% of caesarean.
- Within a minute, postpartum hemorrhage can turn the normal successful labour into abnormal labour.
- The best management of 3rd stage of labour is the one that effectively reduces the blood loss and postpartum hemorrhage, while not interfering much with physiological mechanisms of 3rd stage of labour.

After labour, draining placental cord naturally is a simple and non invasive method also cost effective. So the present study was undertaken to evaluate the efficacy of the above method in reducing the blood loss during 3rd stage as a part of management of third stage of labour.

MATERIALS AND METHODS

It is prospective, cross sectional comparative study to evaluate effectiveness of placental cord drainage in reducing duration of third stage of labour, the amount of blood loss in third stage thereby reducing the incidence of postpartum hemorrhage. The main source of data for this study are patients from teaching hospitals attached to J.J.M. Medical College Davangere, namely.

- Bapuji Hospital, Davangere.
- Women and Child Hospital, Davangere
- Chigateri General Hospital, Davangere.

Study Period: Study will be conducted over a period of 15 months (From February 2021 to July 2022).

Sample Size: Sample size needed to conduct this study is maximum 400 cases, 200 cases will be in each group.

- **Group A (Study) 200 Patients:** Placental blood was drained.
- **Group B (Control) 200 Patients:** Placental blood was not drained.

Sample Method: Random sampling method will be used for allocation of cases into 2 group.

Inclusion Criteria:

- Primigravida or Multigravida (upto Gravida 3).
- Term, singleton , viable pregnancy.
- Vertex presentation with adequate liquor.
- Age group between 18-30 years.

Exclusion Criteria:
- Hemoglobin <8gm/dl.
- Over distended uterus (Hydromnios/multiple pregnancy/big baby).
- Antepartum hemorrhage.
- Instrumental delivery.
- Previous LSCS.
- PROM.
- Known coagulation disorders.

Procedure of the Study:
Study Protocol:
- Enrollment of eligible women in the study, presenting to labour room was done by screening them using exclusion and inclusion criteria.
- Informed consent was taken from those who fulfilled the criteria.
- Once the patient delivered without any instrumentation, she was randomized into study or control group.

Method: After detailed history taking including complications of present pregnancy, general physical examination and obstetric examination are made.
- Gestational age is confirmed by menstrual history, clinical examination and ultrasonogram.
- Routine hematological and urine examination are done.
- All women will be monitored carefully through 1st and 2nd stages of labour with vital parameters and fetal heart rate.
- Those with ineffective uterine contractions shall receive augmentation with oxytocin as IV infusion or ARM, as per individual needs.
- Once the patient delivered vaginally she was randomized into study group or control group.
- All the patient in the study group was counselled regarding the procedure of cord drainage and informed consent was obtained.

Types of Intervention: 400 pregnant women.
- **Study Group 200:** Placental end of previously clamped and cut umbilical cord was unclamped immediately and it was left open to drain the blood until the flow ceases and this blood was collected in a separate kidney tray.
- **Control Group 200:** Placental end of umbilical cord remains clamped.
- Blood collection drape was applied in both groups after delivery of placenta.
- After the signs of placental separation appear, the placenta is delivered by Brand-Andrews method of controlled cord traction in both the groups.
- Injection oxytocin 10units intramuscularly was given after delivery of fetus in both groups.
- Prophylactic intravenous Methergin 0.2mg for active management of third stage of labour was given after delivery of placenta in both groups.
- If there is uterine atony 10 units oxytocin in 500ml saline was used, if still uterus not contracted injection carboprost (PGF2a) 250mcg was given intramuscularly.
- As soon as the placenta delivered, it was examined thoroughly to find out any missing cotyledons or membranes.
- All women in both groups were examined carefully, for tears in cervix, vagina, perineum or paraurethral area.
- Episiotomy was sutured in layers if it was given.
- Women in both the groups were observed and vitals monitored for next 2 hours to watch for complications if any.
- Every 15 minutes uterus was palpated and assured that the uterus is contracted well.

Types of Outcome Measured:
- Duration of 3rd stage of labour.
- Measurement of blood loss.
- Other outcome measures.
- Need for blood transfusion, whenever the blood loss is more than 1000ml (or) if indicated by clinical status of the patient.
- Hemoglobin difference between antenatal and postnatal period will be
- The patients will be carefully watched in the postnatal ward for 48 hours for any observed.
- Morbidity measured after 24 hours of delivery in both groups and difference from that of the antenatal value is After collecting all the data it is tabulated and statistically analyzed using tables and charts.

Statistical Analysis:
- Data were entered in a Microsoft Excel spreadsheet and statistical analysis was done using SPSS software version 25.
- The qualitative data was expressed as percentages/proportion and quantitative data as mean±SD.
- Chi square test was used to check the association between the variables.
- Unpaired t test was used to compare the means.
- P-value<0.05 was considered to be statistically significant.

RESULTS AND DISCUSSIONS

Age of selected women, varies between 18-30yrs. While comparing the age group between the study and control groups, 12% of both control and study group were between 18-20yrs., 42% of control and 45% of study group are in the age group of 21-25 years., 46.5% of control and 42.5% of study group are in the age group of 26-30 years. Mean age of control group was 25.8±4.18 and study group was 25.78±4.23. Using Chi Square test, P Value was calculated. P value is 0.9621 which is not significant. While comparing obstetric

formula between control and study groups, 48.5% of control group and 52.5% of study group were primigravida. 51.5% of control and 47.5% of study group were multigravida. P-value calculated using chi-square test. P value was 0.4236 which is not significant.

Table 1: Anthropometric Parameters

Parameters	Study group	Control group	p-value
Height (in cm)	155±4.99	154±5.19	0.0502
Weight (in Kg)	59.15±6.51	59.21±6.91	0.8934
BMI	24.77±2.61	24.86±2.73	0.7363

*values as mean±SD [BMI-Body mass Index., S.D-Standard deviation]

Quantitative parameters like height, weight and BMI were calculated and compared between control and study groups. Mean height was 154±5.19 cm in control group and 155±4.99 cm in the study group. Mean weight was 59.21±6.91 kg in control group and 59.15±6.51 kg in study group. Body mass index calculated by weight/height(in m2) Mean value of BMI in control group was 24.86±2.73 and 24.77±2.61 in study group. P value was calculated by using t test and as shown in table there was no significant difference between control and study group regarding height, weight and BMI. Those who have completed 37 gestational weeks were included in the study. Mean gestational age in the control group was 38.2±o059 and in the study group was 38.31±0.59. P value was calculated using t test. P value was 0.0675 which is not significant.

Table 2: Augmentation of Labour with Oxytocin

Oxytocin Acceleration	Study group	Control group	p-value
Yes	178(89)	180(90)	0.7442
No	22(11)	20(10)	
Total	**200(100)**	**200(100)**	

*Values in n(%)

Labour was augmented with oxytocin drip, in active phase of labour in both groups. Almost 90% of control group and 89% of study group were augmented with oxytocin. P Value was calculated using chi-square test. P value was 0.7442 which is not significant.

Table 3: Duration of Stages of Labour

Duration of stages of labour	Study group	Control group	p-value
I (in hours)	8.17±2.68	8.13±2.72	0.8823
II (in min)	21.87±8.12	26.6±9.03	<0.0001
III (in min)	3.56±1.33	5.06±1.9	<0.0001

*values as mean±SD., [S.D-Standard Deviation]

Since prolonged labour precipitates postpartum haemorrhage, duration of stages of labour was compared between study and control groups. Mean duration of first stage is 8.13±2.72 hrs in control group and 8.17±2.68 hrs in study group. P value was calculated by t test which was 0.8823, that is not significant. Mean duration of second stage of labour in control group was 26.6±9.03 minutes. Mean duration in study group was 21.87±8.12 minutes. P value (calculated by t test) was 0.0001, that is highly significant. Mean duration of third stage of labour in control group was 5.06±1.9 minutes and in study group was 3.56±1.33 minutes. P Value was <0.0001(t test) which is highly significant.

Table 4: Mode of Delivery

Mode of delivery	Study group	Control group	p-value
FTND	4(2)	3(1.5)	0.1807
FTVD+RMLE	174(87)	185(92.5)	
FTVD	22(11)	12(6)	
FTND+RMLE	0(0)	0(0)	

*Values in n(%)

Mode of delivery was compared between control and study groups. In 6% control group and 11% study group, the mode of delivery is by FTVD. 92.5% in control group and 87% in study group is by FTVD+RMLE. FTND in 1.5% of control and 2%in study group was the mode of delivery. P Value calculated by chi-square test. P value was 0.1807 which is not significant.

Table 5: Blood Loss During Stage III of Labour

Blood loss during III stage (in ml)	Study group	Control group	p-values
≤100	31(15.5)	10(5)	<0.0001
101-200	94(47)	40(20)	
201-300	51(25.5)	85(42.5)	
301-400	16(8)	39(19.5)	
401-499	4(2)	9(4.5)	
≥500	4(2)	17(8.5)	
Mean±SD	187±109.1	308.95±172.35	

*Values in n(%)

Blood loss during third stage of labour was measured using a calibrated drape. Mops used for episiotomy wound were discarded. 5% in control group and 15.5% in study group had blood loss <100 ml. 20% in control group and 47% in study group had blood loss between 101-200 ml. 42.5% in control group and 25.5% in study group had blood loss between 201-300 ml. 19.5% in control group and 8% in study group had blood loss between 301-400 ml. 4.5% in control group and 2% in study group had blood loss between 401-500 ml. 8.5% in control group and 2% in study group had blood loss >500 ml. Mean blood loss in study group was 187±109.1 ml and in control group was 308.95±172.35 ml .Difference between two groups was 122ml. None of the cases in both groups had blood loss >1000ml. P value was calculated by using chi-square test which was <0.0001 which is highly significant. Birth weight of the baby was calculated using standard weighing machine. Average birth weight in control group was 2.8 kg and in study group was 2.87 kg. Standard deviation and P value were calculated using t test. P Value was 0.0662 which is not significant.

Table 6: Occurrence of Postpartum Hemorrhage (PPH)

Occurrence of PPH	Study group	Control group	p-value
Yes	4(2)	17(8.5)	0.004
No	196(98)	183(91.5)	

*Values in n(%)

8.5% of control group and 2% of study group had blood loss >500 ml. None of both groups had >1000 ml of blood loss. P value was calculated using chi-square test. P value was 0.004. Hence the difference between control and study group is significant. 7.5% in control

group and 2% in study group needed blood transfusion. P Value was calculated using Chi-square test, which was 0.010, that is significant. Hemoglobin% was estimated in all cases antenatal and repeat Hb% was seen in all cases 48 hrs after delivery. Hemoglobin difference before and after delivery was calculated in both control and study groups. The mean difference in Hb% in control group was 0.7. In study group it was 0.28. P Value was calculated using t test. P value was <0.001 and it is highly significant.

Table 7: Blood Loss in Different Modes of Delivery

Mode of delivery	Blood loss (in ml)		
	Study group	Control group	p-value
FTVD	163±64.67	253±105.3	<0.0001
FTVD+RMLE	191±114.19	314±175.7	<0.0001
FTND	173±38.62	177±83.27	0.5381
FTND+RMLE	0	0	-

*Values in mean±SD

Blood loss in FTVD in control group and study group is 253±105.3 and 163±64.67 respectively whose p-value is <0.0001 which is highly significant. In FTVD+RMLE the blood loss in control group and study is of respective values 314±175.7 and 191±114.19 whose p-value is 0.0001 which is also highly significant. In FTND blood loss in control group is 177±83.27 and study group is 173±38.62 with p- value 0.5381 which is not significant.

Age of selected women, varies between 18-30yrs. While comparing the age group between the study and control groups, 12% of both control and study group were between 18-20yrs., 42% of control and 45% of study group are in the age group of 21-25 years., 46.5% of control and 42.5% of study group are in the age group of 26-30 years. Mean age of control group was 25.8±4.18 and study group was 25.78±4.23. Using Chi Square test, P Value was calculated. P value is 0.9621 which is not significant. In a similar randomized controlled trail of placental cord blood drainage conducted in Department of Obstetrics and Gynecology at J.N. Medical College, Belgaum, 2007 47 for the prevention of post-partum hemorrhage, mean age of both groups were between 23-24 years.

Antenatal Care: Those women, who had at least 5 antenatal visits, not only in our hospital but also outside were considered as booked cases. In our study, all antenatal mothers were booked, in both groups.

Obstetric Score: In our study there were more primigravida in both control and study groups, when compared with multi gravida. Multi gravida-up to third gravida were included. In the control group -Around 48.5% were primigravida and 51.5% were multi gravida. In the study group:-Around 52.5% were primigravida and 47.5% were multi gravida. Hence parity was comparable in both control and study groups. In a similar study, by Shravage[13] both groups were comparable in terms of gravidity and parity.

Period of Gestation: In our study pregnant women between 37-40 completed weeks were included in the study. Preterm labour was excluded from the study. All were singleton, viable pregnancies. The mean gestational age was 38.2 weeks in control group and 38.31 weeks in study group. Hence it was comparable in both groups. In a similar randomized controlled trial by Shravage JC and Silpa[13], (Journal of Obstetrics and Gynecology of India, Article, 2007) mean gestational age was 38.7 weeks in study group and 38.5 weeks in control group.

Quantitative Parameters:

- In our study, in terms of height, weight and body mass index, both control and study groups were comparable.
- Those with blood pressure ≥140/90 mm of Hg were excluded.
- Routine urine and blood examination was normal in both control and study groups. Previous studies also showed the same result.

Augmentation of Labour: 400 pregnant women with spontaneous onset of labour were included for the study. Progress of labour was monitored using partogram. Labour was augmented with oxytocin in active phase of labour. Majority of women in both control and study groups were augmented with oxytocin. In our study, around 90% in control group and 89% in study group were augmented with oxytocin and both groups were comparable in terms of oxytocin acceleration. In a similar study by Soltani Hora[14], both groups were comparable in terms of augmentation of labour.

Duration of Labour: (I and II Stage) As prolonged labour precipitates post partum hemorrhage, duration of first and second stages was compared in both groups. Duration of first stage, calculated from onset of true labour pains up to full dilatation of cervix. Mean duration of first stage was 8.13 hrs in control group and 8.17 hrs in study group, which was comparable and the 'P' Value was not significant. Second stage of labour calculated from full dilatation of cervix up to delivery of foetus. Mean duration of second stage was 26.6 minutes in control group and 21.87 minutes in study group which was also comparable and the P Value was not significant. In a similar study by Shravage[13] in 200 pregnant women, mean duration of I stage of labour in control group was 9.6 hrs and in study group was 10.17 hrs, II stage of labour in control group was 22.05 min. and in study group was 24.15 min. Both stages (I and II) were comparable between 2 groups.

Mode of Delivery: Mode of delivery was compared between control and study groups. In 6% control group

and 11% study group, the mode of delivery is by FTVD. 92.5% in control group and 87% in study group is by FTVD+RMLE. FTND in 1.5%of control and 2%in study group was the mode of delivery. P Value calculated by chi-square test. P value was 0.1807 which is not significant. In a similar study by Soltani[14], mode of delivery was comparable.

Birth Weight: Birth weight between 2-4 kg were taken for the study. Mean birth weight was 2.84 kg in control group and 2.87 kg in study group and hence it was comparable. P Value was not significant. This was similar to a study done by Sharma[15]. The mean birth weight was 2.9 kg in study and 2.8 kg in control group.

Outcome Parameters:

Duration of III Stage of Labour: In our study the duration of III stage of labour from the delivery of the baby up to the delivery and expulsion of placenta with its entire membranes was calculated using stop watch. The mean duration of III stage of labour was 5.06 minutes (303.6 seconds) in control group and in study group it was 3.56 minutes (214 seconds) and the difference was 1.5 minutes and the result was statistically highly significant (P value is <0.001 which is highly significant. Several studies had similar reports. Gulati[16] showed that, in a study of 200 pregnant women, mean duration was 2.9 minutes in study group and 5.72 minutes in control group. In a study by Giaclaone[17], involving 500 patients, the mean value in control group was 15 minutes and 8 minutes in study group.

Blood Loss During Third Stage: In our study, cord blood was drained and collected in a separate clean kidney tray and the blood loss during third stage was measured using a calibrated blood collection drape. Great effect was taken to measure the blood loss accurately and separate mops were used for episiotomy wound suturing. Another major confounding factor in such studies could be the variation in the use of oxytocic drugs both in relation to the time of administration and the type of drug used. It could have a significant effect on the duration of 3rd stage of labour. But it was avoided in our study by giving injection oxytocin 10 units intramuscularly within 1 minute of delivery of foetus as part of active management of third stage of labour, in all cases. Similarly the timing of umbilical cord clamping may confound the result. In our study, fortunately in all cases both in control and study groups, the umbilical cord was clamped immediately or within 30 seconds after delivery. In our study, mean blood loss was 308.95 ml in control group and 187ml in study group. Hence cord blood drainage reduced the blood loss by 122ml. 'P' Value was <0.0001 which is highly significant. In a similar study conducted by Soltani H, Poulose TA, Hutchon[14] and French Cochrane review 2012 cord blood drainage reduced the blood loss during third stage by average of 77 ml.

Postpartum Hemorrhage and Need for Blood Transfusion: As per the standard definition of postpartum hemorrhage, it was calculated that any blood loss of equal to or >500 ml was considered as postpartum Hemorrhage. In our study 8.5% in control group and 2% in study group had blood loss >500 ml. None of both groups had blood loss >1000 ml. Among the control group 7.5% and 2% of study group needed blood transfusion. Repeat blood transfusion was planned if repeat Hb% was <8gms/dl. None of the cases either in control or in study group needed >2 blood transfusions. In those patients who had postpartum hemorrhage, it was managed with general measures and medical management (40 units of oxytocin added in saline drip / inj. Carboprost (15-methyl PGF2 I) one ampoule i.m / inj. Methergine 2 ampoules i.v/ rectal misoprostol 800 µg kept rectally) and blood transfusion. None of the cases either in control or in the study group needed surgical management of PPH. In our study the incidence of postpartum Hemorrhage in the control was 8.5% and in the study group it was 2%. P Value was 0.004 which is significant. In a similar study by Sharavage *et al.*, J.N. Medical College, Belgaum[13] the incidence was 3% in the study and 10% in the control groups. Hb% difference between antenatal and post-natal period Routine Hb% measurement was done in all cases of study and control group. Repeat hemoglobin (Hb%) was done 48 hours after delivery. Difference between antenatal and post-natal values were calculated in both study and control groups. Mean difference in control group was 0.7gms and in the study group was 0.28gms. The difference between the control and study group was statistically highly significant as shown by the P-value which is <0.001. In a similar study by Melal Mohammed 201016 in 200 women and another study by Giaclone[17] in 200 women, the difference in Hb% (before and 2 days postnatal) was more in control group than in study group and the result was significant.

CONCLUSION

Placental cord blood drainage reduces the duration of third stage of labour. It reduces the blood loss during third stage of labour. Incidence of Postpartum Hemorrhage is reduced in cord blood drainage group and the need for blood transfusion after delivery is also decreased in placental blood drainage group. The decrease in Hb% after delivery is less with the placental blood drainage group. Placental blood drainage does not need any extra cost, equipment (or) effort and it is a simple, non-invasive safe method that can be practiced even by midwives in rural settings as a part

of management of third stage of labour in reducing the blood loss during third stage.

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