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Effects of Early Versus Late Cordclamping on Maternal Andneonatal Outcome

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ABSTRACT

The aim of this study was to see how early cord clamping compared to delayed cord clamping affected the maternal and neonatal outcomes. The primary outcomes were the measurement of intrapartum maternal blood loss, neonatal packed cell number, and serum bilirubin 72 hours after birth. The mean pre-labour packed cell volume (PCV) of 33.13 and post-labour PCV of 32.65 were identical between groups and were not statistically important (p=0.166 and 0.496, respectively). The differences in PCV were not statistically meaningful and were comparable across categories. Furthermore, based on the results of this research, it can be inferred that DCC has little effect on the duration of the third stage of labor or the need for manual placenta removal.

Keywords:hemoglobulin, blood loss, anemia, hypotension, Respiratory distress syndrome, Necrotizing enterocolitis and Retinopathy of prematurity

1. INTRODUCTION

The clamping and cutting of the umbilical cord is one of the most unique aspects of the delivery process; however, the best time to do so is also up for debate, with various scheduling methods providing benefits and drawbacks. The clamping and cutting of the umbilical cord are crucial because they avoid maternal blood loss and enable the infant to be removed from the mother for resuscitation. The placenta can provide a significant blood transfusion to the newborn baby within the first few minutes after birth. During the first three minutes of development, a term infant kept 10 cm below the level of the uterus raises the blood flow by an average of 32 percent. [1, 3, 4]

Delaying umbilical cord clamping in term babies raises hemoglobin levels at birth and

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boosts iron reserves in the first few months of life, potentially improving developmental results. Improved transitional circulation, higher establishment of red blood cell volume, reduced need for blood transfusion, and lower occurrence of necrotizing enterocolitis and intraventricular hemorrhage are both associated with delayed umbilical cord clamping in preterm infants. [5,6]

In term babies experiencing delayed umbilical cord clamping, there is a slight rise in the prevalence of jaundice that involves phototherapy. As a result, when obstetrician–gynecologists and other obstetric care professionals prolong umbilical cord clamping in term babies, they must ensure the mechanisms are in place. Anemia, hypotension, Respiratory distress syndrome, Necrotizing enterocolitis, Retinopathy of prematurity, and intraventricular hemorrhage at any grade are all linked to increased placental transfusion by delaying cord clamping, according to the 2015 ILCOR systematic review and many other systematic reviews. According to some research, delaying cord clamping may have negative neonatal consequences, including an elevated risk of respiratory complications, polycythemia, hyperbilirubinemia, and the need for phototherapy.[6-9]

2.MATERIALS AND METHODS

- **Study design**: Prospective.
- **Study period**: August 2016 to February 2019
- **Study population**: Women who delivered a term infant (≥ 37 completed weeks of gestation) by normal vaginal delivery at SreeBalaji Medical college and hospital.

SAMPLE SIZE

Sample size was 200 calculated by using formula for comparison of two proportions and estimated sample size was 100 in each group.

INCLUSION CRITERIA

Women who had given birth to a term (equal or greater than 37 completed weeks of gestation) neonate by vaginal delivery.

EXCLUSION CRITERIA

- Women who have given birth to a pretermneoantes.
- HIV affectedmothers.

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- Multiplepregnancies.
- RH incompatibilitymothers
- IUGRbabies
- Fetus with Congenitalanomalies.

STATISTICAL ANALYSIS

Statistical analysis was done using IBM SPSS statistics. v20 software.Categorical variables were analyzed by Chi square test. Quantitative variables were analyzed by Student Unpaired T-test and Man Whitney U test.

2. RESULTS

The mean maternal age was 27.0 ± 2.6 and 27.1 ± 2.8 for groups A and B respectively. Fifty-five percent of the participants were prim gravida in both groups A and Brespectively while 45% of the participants were multigravida in groups both A and B respectively.Among the two study groups, B positive blood group was commonly observed contributing to 74% and 76% respectively.

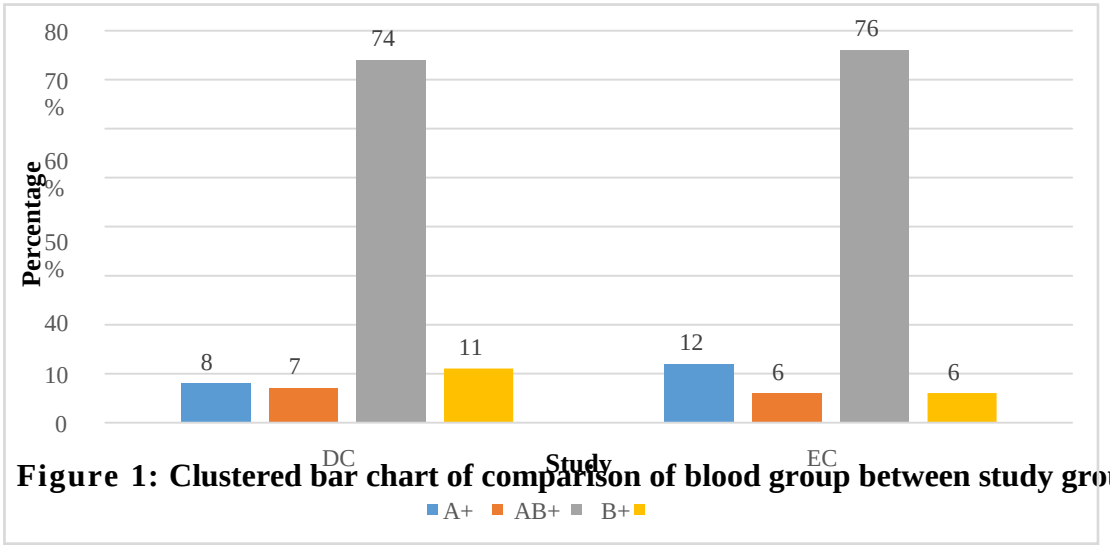

Figure 1: Clustered bar chart of comparison of blood group between study group

Table 1. Baseline characteristics of neonates

Characteristics	ECC (n=100)	DCC (n=100)

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Sex Male Female	 47 53	 46 54
Estimated Fetal Weight (gm): Mean ± SD	2847.9 ±280.32	2852.28 ±259.04
Birth weight(gm): <2500 gm 2500 – 3000gm 3000 – 3999 gm	 07 55 38	 04 61 35

Immediate neonatal outcomes with respect to birth weight was similar for DCC to babies in the other group. The mean birth weight in ECC babies was 2847.9 ± 28 grams and DCC babies was 2852.28 ± 25 grams.Majority of the babies were in the subgroup of 2500 to 3000 grams both in ECC and DCC groups.

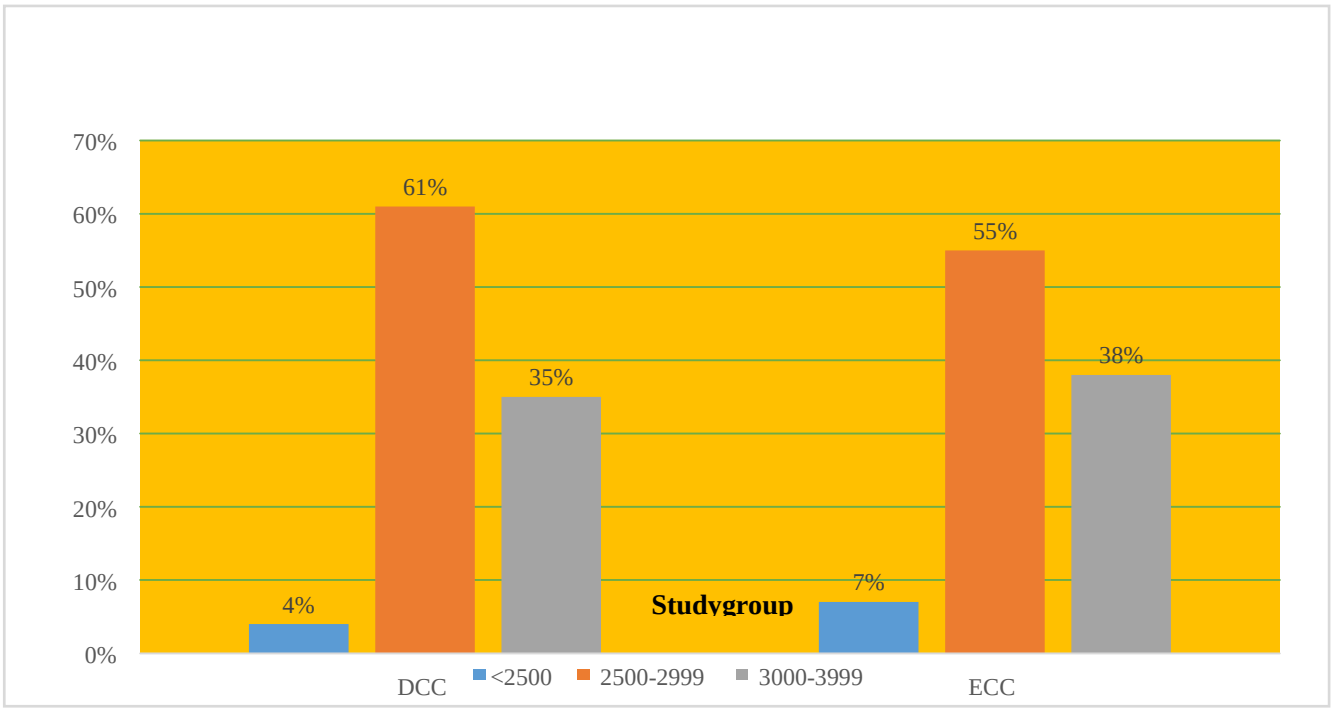

Figure 2: Clustered bar chart of comparison of birth weight between studygroups.

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Table 2.Baseline characteristics ofneonates

Characteristic	ECC(n=100)	DCC(n=100)
Gestational age (completed weeks): Mean ±SD	38.47 ±0.87	38.61 ±0.7
37 weeks	17	05
38 weeks	27	36
39 weeks	48	52
40 weeks	08	07
APGAR score at 1 min Median (IQ 75th – 25th)	9(9,8)	9(9,8)
APGAR score at 5 min Median (IQ 75th – 25th)	9(9,8)	9(9,8)

The mean gestational age in ECC group was 38.47 ± 0.87 weeks and DCC group was 38.61 ± 0.7 weeks.75% babies were in the group between 38 -39 weeks in ECC arm and 88% babies were in the group between 38-39 weeks in DCC arm.The APGAR score at one minute and 5th minute were similar in both study arms.

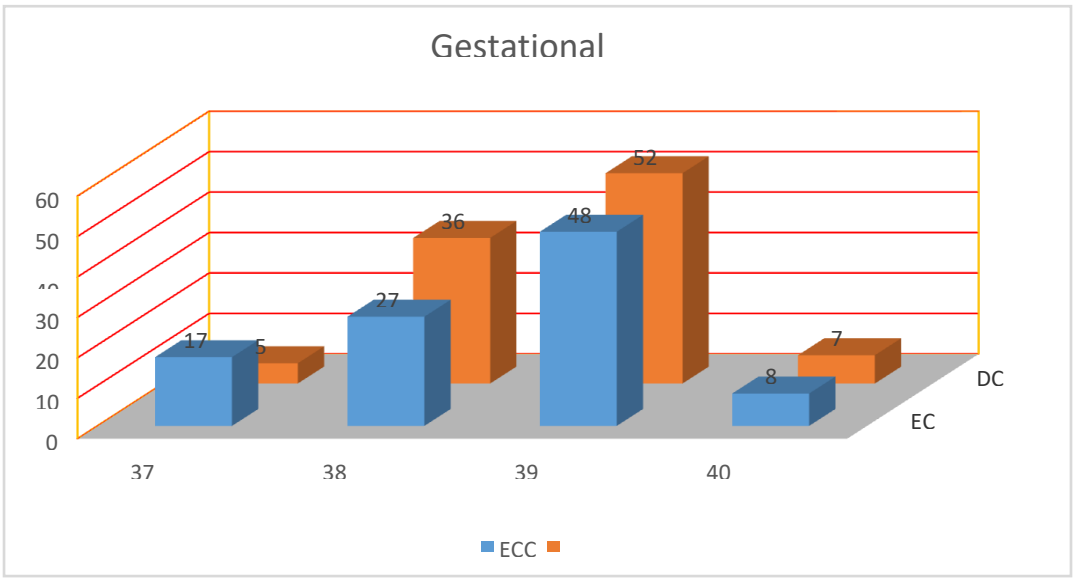

Figure 3: Clustered bar chart of comparison of gestationalage between study groups.

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Table 3: Comparison of hematocrit changesbetween two groups-ECC vsDCC

Laboratory parameter	ECC (n=100)	DCC (n=100)	p value
Pre – Labour PCV Mean ± SD	33.13 ±2.62	32.65 ±2.16	0.166
Post – Labour PCV Mean ± SD	31.81 ±2.74	31.56 ±2.37	0.496
PCV difference (%) Mean ± SD	1.32 ± 1.3	1.09 ± 1.22	0.206

The maternal pre-labour packed cell volume (PCV) and post-partum PCV were comparable between classes and did not reach statistical significance (p=0.166 and 0.496, respectively). The results of this study specifically indicate that delayed cord clamping is not associated with an elevated risk of maternal blood loss or postpartum haemorrhage (PCV difference: p=0.206). Although the PCV variation was used to increase the objectivity of the predicted blood loss, it revealed no statistical differences between the sample arms.
This is consistent with previous results [1,2, 5, 6, 7–12, 14–16].

McDonald et al. (2013) found no substantial difference in postpartum hemorrhage when ECC and DCC were compared in a Cochrane study of 15 randomized clinical trials affecting a total of 3911 women and infants pairs.

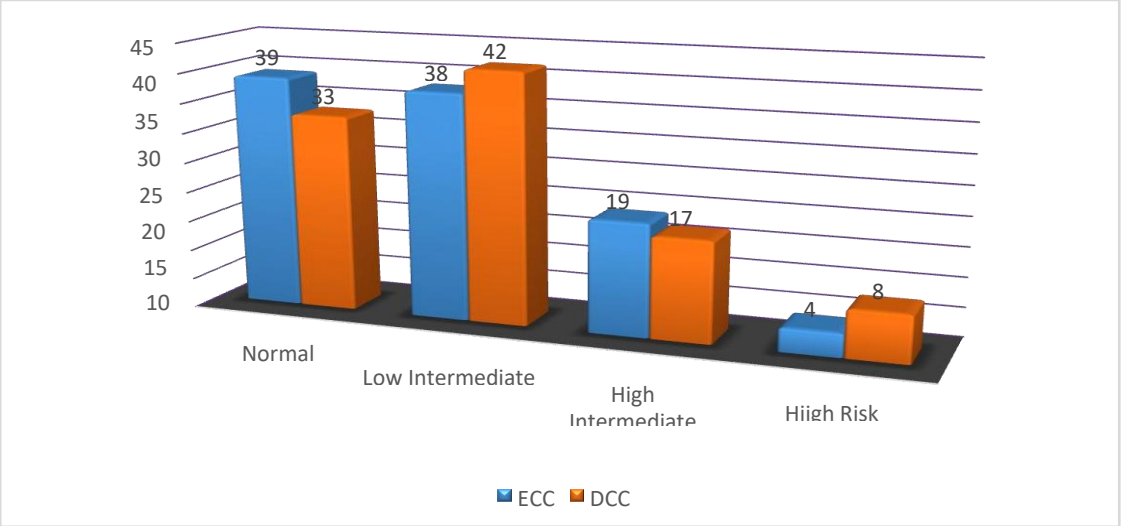

Figure 4: Clustered bar diagrams in comparison of NNH values between studygroups.

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Table 5. Polycythemia in the study population

Laboratory parameter	ECC (n=100)	DCC (n=100)	p value
Polycythemia			
Yes	02	04	0.657
No	98	96	

There were 4 neonates with polycythemia in the DCC group, none of the neonates required exchange transfusion in either of the groups.Similarly, in a study done by Ranjit et al (13), there was no significant difference in the incidence of polycythemia between the two groups.

3. DISCUSSION

Clamping the umbilical cord is one of the most unique operations performed during childbirth; however, the best time to do so is still up for debate [10-12]. There is evidence of neonatal advantages and a low chance of injury to the mother where the delivery is postponed to allow for placenta transfusion without harming the mother [1-7]. This research explicitly demonstrated that delaying umbilical cord clamping is advantageous rather than detrimental, with no increased risk to either the mother or the child.The mean maternal age in our study was 27 years in both ECC and DCC groups. This was similar to a randomized open trial conducted by Jombo et al (7) , where the mean maternal age was 27 years in ECC group and 28 inDCC group. In our study majority of the subjects were primigravida (55%) both in DCC and ECC group. Incidence of primigravida in other studies,

In group A (ECC) in our study, it was observed that 12% of the mothers had A blood group and 76% had „B" blood group, remaining 12 % was shared by „AB" and O blood group. Similarly in DCC group, majority of the mothers had „B" positive blood group, and 8% had A blood group, with 11% in O blood group.In our study we found that in DCC group, 58 (58%) participants had mild anemia. Among the people with ECC group, 46 (46%) participants had mild anemia and 1 (1%) participant had moderate anemia. In addition, the mean maternal hemoglobin level before delivery of both groups were 11.04 ± 0.91 and 10.88 ± 0.73, respectively.In our study, among the DCC group, 46 (46%) were male babies and 54 (54%) were female babies. In ECC group, 47 (47%) were boy babies and 53 (53%) were girl babies. The difference in the proportion of neonate"s gender between study group was statistically not significant (P

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value 0.887).[13]

The mean birth weight of DCC group was 2852.28 ± 0.7 gram and ECC group was 2847,9 ± 0.87 gram, and the mean difference between two groups was statistically not significant (P value 0.210). Among the DCC group, 4 (4%) babies had <2500gm, 61 (61%) babies had 2500 -2999 gm and 35 (35%) babies had 3000 -3999 gm. Among the ECC group, 7 (7%) babies had <2500gm, 55 (55%) babies had 2500-2999 gm and 38 (38%) babies had 3000 -3999 gm. The difference in the proportion of neonate‟s birth weight between study group was statistically not significant (P value 0.909).In a study conducted by Jeff Bolstridge et al [14] – "A quality improvement initiative for delayed umbilical cordclamping in very low-birthweight infants" found that meanbirth weight of neonates in ECC group was 1010 ± 297 vs DCC group 1050 ± 306 which was significant. This difference can be attributed to VLBW babies, where significant weight difference was observed on delayed cord clamping.Farrar et. al., has looked at birth weight variation between DCC and ECC with the babies weighed with the placenta intact and found increased birth weight among DCC groups [15-17].

Among the DCC group, 5% women had 37 weeks of gestation, 36% of women were in 38 weeks, 52% of women had 39 weeks of gestation and 7% women had 40 weeks. In ECC group, 17% women were in 37 weeks, 27% of women were in 38 weeks, 48% women had 39 weeks and 8% women had 40 weeks. The difference in the proportion of gestational age between study group was statistically significant (P value 0.045). While clinically meaningful, the average birth weight for group B (DCC) is higher than for group A (ECC). This might not be statistically significant since the average birth weight in our environment is 3.1 kg, which is the same for all groups. 18 and 19

In both research weapons, the APGAR score at one minute and five minutes was close. In a related analysis by Heba et al [20], no statistically significant variations (P >0.05) were seen between the DCC and ECC classes in terms of Apgar score at 1st or 5th minute. For the DCC and ECC classes, the mean Apgar score at the first minute was 9.34 1.19 and 8.96 1.35, respectively. The mean Apgar score at the 5th minute for the DCC and ECC classes was 9.85 0.39 and 9.80 0.46, respectively. The DCC party had a mean pre-labour PCV of 32.65 2.16 percent, while the ECC group had a mean PCV of 33.13 2.62 percent, with no statistically meaningful difference between the two groups (P value 0.166). The DCC party had a mean post-labour PCV of 31.56 2.37 percent, while the ECC group had a mean PCV of 31.81 2.74 percent, with no statistically meaningful difference between the two parties (P value 0.496). The mean PCV difference between the DCC and ECC groups was 1.09 1.22 percent and 1.32 1.3 percent, respectively, and the mean difference between the two groups was statistically insignificant (P value

0.206). 21 and 22]

The maternal pre-labour packed cell volume (PCV) and post-partum PCV were comparable between classes and did not reach statistical significance (p=0.166 and 0.496, respectively). As a result, our research explicitly reveals that delayed cord clamping is not associated with an elevated risk of maternal blood loss or postpartum haemorrhage (PCV difference: p=0.206). In our sample, two neonates in the ECC cohort had hematocrits of more than 65 percent. In the DCC population, there were four neonates with polycythemia; none of the neonates in either group needed an exchange transfusion. Similarly, there was no substantial gap in the prevalence of polycythemia between the two classes in a survey conducted by Ranjit et al (20). DCC did not raise the risk of maternal PPH, the length of the third stage of labor, or the need for manual placental removal, according to the results of this report. In addition, neonatal hemoglobin, hematocrit, and RBCs have all improved dramatically. Furthermore, the mean overall bilirubin level was slightly higher in the DCC population, but it was still within a low intermediate risk (below 75th percentile) that did not necessitate massive intervention, indicating that delayed cord clamping could significantly increase neonatal treatment without harming the mother.[23-25]5.

CONCLUSION

This study found that DCC increases the packed cell volume of newborns at 72 hours after birth, which remained higher in the DCC community relative to the ECC group, with no substantial maternal risk of postpartum hemorrhage or neonatal hyperbilirubinemia. Furthermore, based on the results of this research, it can be inferred that DCC has little effect on the duration of the third stage of labor or the need for manual placenta removal. It also emerged that neonatal hemoglobin, hematocrit, and RBCs have all improved dramatically. Furthermore, although the mean overall bilirubin level in the DCC population was considerably higher, it was still within a low intermediate risk (below the 75th percentile) that did not necessitate massive action, implying that delayed cord clamping could significantly increase neonatal treatment without causing harm to the mother. As a result, it is advised that both the mother and the neonate benefit from delayed cord clamping rather than the opposite.

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Ethical approval: The study was approved by the Institutional Ethics Committee

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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References

1. ACOG. Timing of the umbilical cord clamping at birth. Committee opinion NO. 543. 2012;120(6): 1522-6.
2. Hutton EK, Hassan ES. Late versus early clamping of the umbilical in full term neonates: systematic review and Meta – analysis of controlled trials. JAMA. 2007 Mar 21;297 (11): 1241 -52.3.
3. WafaaTaha Ibrahim Elgzar, Heba Abdel-Fatah Ibrahim, HananHeibaElkhateeb. American Journal of Nursing Research, 2017, Vol. 5, No. 4, 115 -128.
4. RCOG Scientific Advisory Committee Opinion paper 14. Clamping of the umbilical cord and placental transfusion. May 2009.
5. RCOG. Prevention and management of PPH: Guideline No. 52. May 2009.
6. Mc Donald S.J et al.Effect of timing of umbilical cord of terminfantson maternal and fetal outcomes. Cochrane data base of systemic reviews 2008, issue 2. Art NO: CD 004074.
7. JomboS. E, Eifediyi R A. Effects of Delayed Umbilical Cord Clamping On Maternal and Neonatal Outcomes in IRRUA: A Randomized Controlled (Open Label) Trial.International Journal of Obstetrics and Gynaecology Research (IJOGR) Vol. 4 (2017) No.1, pp. 491-517
8. Raju TN. et al. Timing of umbilical cord clamping after birth for optimizing placenta transfusion. Current opinion paedtr 2013;25 (2): 180 -187.
9. Jeff Bolstridge, Tracy Bell. A quality improvement initiative for delayed umbilical cord clamping in very low-birth weight infant‖ BMC Pediatric 16(1):155.2016.
10. P J Wangwe, B Balandya. Accuracy in diagnosis of PPH using visual estimation of blood loss versus change in haematocrit in a tertiary hospital in Tanzania. Tanzania journal of health research, April 2012 vol. 14 No 2.
11. Gharoro E P,Enabudoso E. Relationship between VEBL at delivery and postpartum change in PCV. Journal of Obs&Gyn2009:29; pg 517 – 520.
12. Ogundeyi MM, Olarewaju DM, Njokanma OF. Haematological profile of apparently healthy term babies age one day, three days and 6 weeks delivered in sagamu, Nigeria. NigJournal ofPaediatrics 2011; 38 (3) 125-130.
13. Week's A. Umbilical cord clamping after birth. BMJ (clin. Res. Ed) 2007; 335:3123.
14. Hutchon DRJ. Immediate or early cord clamping vs delayed cord clamping. Journal of Obstetrics and Gynaecology. Nov. 2012; 32 724 -729.
15. Boere I, RoestAAW, Umbilical blood flow pattern directly after birth before delayed cord clamping

— Archives of disease in Childhood – Fetal and neonataledition, F121-125;2015.

16. DipakNK, NanavatRN, Kabra NK, Srinivasan A, AnanthanA. Effect of Delayed Cord Clamping on Hematocrit, and Thermal and Hemodynamic Stability in Preterm Neonates: A Randomized Controlled Trial. Indian Pediatr. 2017 Feb 15;54(2):112 -115.
17. American academy of pediatrics. Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation. American journal of pediatrics; 2004:114(1): 297-316.
18. Backes, C.H., Huang, H., Cua, C.L., Garg, V., Smith, C.V., Yin, H., Galantowicz, M., Bauer, J.A., & Hoffman, T.M. Early versus delayed umbilical cord clamping in infants with congenital heart disease: a pilot, randomized, controlled trial. J Perinatol. 2015 Oct;35(10): 826-831
19. Chidre Y.V., &Chirumamilla, v. Impact of early versus delayed umbilical cord clamping on post-partum blood loss: a randomized controlled trial. Int J ReprodContraceptObstet Gynecol. 2015 Aug;4(4): 1103-1108.
20. El Sakka, A., El chimi, M.S., Ibrahium, R., Farid, Y.A., Salama, M., &Tawfik,H. Effect of Delayed Umbilical Cord Clamping on Blood Sugar and Venous Hematocrit levels in Term Infants of Diabetic Mothers. Journal of American Science, 2012; 8(12): 574-578.
21. Kugelman, A., Borenstein-Levin, L., Riskin, A., Chistyakov, I., Ohel, G., Gonen, R., & Bader, D. Immediate versus delayed umbilical cord clamping in premature neonates born < 35 weeks: a prospective, randomized, controlled study. Am J Perinatol. 2007 May; 24(5): 307 -315.
22. Katheria, A.C., Lakshminrusimha, S., Rabe, H., McAdams, R., & Mercer, J.S. Placental transfusion: a review. J Perinatol. 2017 Feb; 37(2): 105 -111.
23. Garabedian, C., Rakza, T., Drumez, E., Poleszczuk, M., Ghesquiere, L., Wibaut, B., Depoortere, M.H., Vaast, P., Storme, L., &Houfflin-Debarge, V. Benefits of Delayed Cord Clamping in Red Blood Cell Alloimmunization. Pediatrics. 2016 Mar; 137(3): e20153236.
24. Raju, T.N. Timing of umbilical cord clamping after birth for optimizing placental transfusion. CurrOpinPediatr. 2013 Apr; 25(2): 180 -7.
25. Alandangady N,‖ Infants blood volume in controlled trial of placental transfusion at preterm delivery‖ Am J Obstet Gynecol,2014.
26. Prendiville, W.J., Harding, J.E., Elbourne, D.R., &Stirrat, G.M. The Bristol third stage trial: active versus physiological management of third stage of labour.BMJ. 1988 Nov 19; 297(6659): 1295 -300.
27. Eichenbaum-Pikser, G., &Zasloff, J.S. Delayed clamping of the umbilical cord: a review with implications for practice. J Midwifery Womens Health. 2009 Jul-Aug; 54(4): 321-326.