

Preoperative and postoperative hemoglobin estimation in hypertensive disorders of pregnancy undergoing cesarean section

Sabina Parveen*, Meera and Chennupati Lakshmi Sravya

Department of Obstetrics and Gynaecology, Al Ameen Medical College and Hospital, Athani Road, Vijayapura-586108, Karnataka, India

Received: 03rd July 2024; Accepted: 01st September 2024; Published: 01st October 2024

Abstract: *Aim:* To study preoperative and post operative hemoglobin in patients with hypertensive disease of pregnancy under going Cesarean Section. *Methods:* This is a retrospective study conducted in Al-Ameen Medical College, Hospital & research center Vijayapura, over a period of one year from Jan 2023 to Dec 2023. Required data was collected and hemoglobin estimation was done using CBC auto analyzer. Pregnant patients with hypertensive disease of pregnancy who had systolic blood pressure ≥ 140 mmhg or diastolic blood pressure ≥ 90 mmhg were studied. Blood pressure was measured in sitting position arm at the level of heart. Proteinuria was determined by dipstick method. Statistical analysis results are represented as frequency and percentage. The data analysis was done using SPSS v 24. *Results:* We had a total of 109 patients with hypertensive disease of pregnancy over a period of one year of which 12 patients had vaginal delivery and 97 patients under went Cesarean section, 3 patients were excluded as they did not meet inclusion criteria. Of 94 patients with hypertensive disease of pregnancy, the indication for cesarean section were severe preeclampsia, eclampsia, cephalopelvic disproportion, failed induction, severe oligohydromnios, fetal distress, postdated, breech, intrauterine-growth restriction, previous 2 lower segment cesarean section. Hemoglobin estimation was done preoperatively and after 24hrs post operatively. The mean gestational age is 38 weeks, mean birth weight of babies is 2.7Kg. The mean preoperative hemoglobin in hypertensive disease of pregnancy patient is 11.3(SD-1.2); and postoperative hemoglobin is 10.6(SD-1.2) and is statistically significant ($p < 0.0001$). *Conclusion:* Blood loss in pregnant women with hypertensive disease of pregnancy undergoing cesarean section though statistically significant does not require any intervention in postoperative period. Blood loss is clinically insignificant.

Keywords: Hypertensive Disease of Pregnancy, Cesarean-Section, Blood Loss, Preoperative, Postoperative.

Introduction

In normal pregnancy liquid component increases more than solid component leading to hemodilution but in hypertensive disorder of pregnancy due to imbalance between vasoconstriction and vasodilatation increased capillary permeability inside blood vessels leads to hemoconcentration and edema by accumulation of fluid in third space. Hypertensive disease of pregnancy is a multisystem disorder, complicate 5 to 10 percent. Hypertensive disease of pregnancy, hemorrhage and infection make deadly triad associated with significant maternal morbidity and mortality [1].

According to ACOG 2020 hypertensive disease of pregnancy is classified as gestational hypertension, preeclampsia, eclampsia, chronic

hypertension pre eclampsia superimposed on chronic hypertension.

Gestational hypertension is defined as hypertension after 20 weeks of pregnancy without proteinuria where as pre eclampsia is defined as hypertension after 20 weeks of pregnancy with proteinuria. Eclampsia is hypertension with convulsion generalized tonic clonic seizures. Chronic hypertension is onset of hypertension before pregnancy. New onset proteinuria in patients with chronic hypertension is pre eclampsia superimposed on chronic hypertension. Hypertension in pregnancy is diagnosed when systolic blood pressure ≥ 140 and/or diastolic blood pressure ≥ 90 . Hypertensive disease of pregnancy can be catastrophic to both mother and fetus if not intervened timely and treated adequately.

Women who have hypertensive disease of pregnancy are at higher risk of developing hypertension in future pregnancies, the earlier pre eclampsia is diagnosed during the index pregnancy, the greater the likelihood of recurrence. Pre eclampsia in nulli paras before 30 weeks of pregnancy has a recurrence risk of up to 40% in a subsequent pregnancy [2-3]. In a prospective study of 500 women previously delivered for pre eclampsia at 37 weeks, the recurrence rate in a subsequent gestation was 23 percent [4]. Hypertension during pregnancy is a marker for an increased risk for morbidity and mortality in later life [5]. Preeclampsia appears to also be a marker for subsequent renal disease. It was suggested in an early study that the continuous presence of cells in urine sediment could serve as a marker for renal disease [6].

Angiogenic factors play a vital role in normal vascular development [7]. Remodeling of uterine spiral arterioles is defective. In a normal pregnancy trophoblasts replace vascular endothelial with muscular lining to enlarge the vessel diameter, whereas in patients with hypertension it is invaded superficially. However, partial trophoblastic invasion may occur in certain preeclamptic situations. Because of this, endovascular trophoblasts line decidual vessels but not myometrial vessels. With a mean exterior diameter that is only half that of equivalent vessels in normal placentas, the deeper myometrial arterioles retain their musculoelastic tissue and endothelial lining [8].

Endothelial damage, plasma components invade into vessel walls, myointimal cell growth, and medial necrosis were among the preeclamptic alterations. First, lipid accumulated in myointimal cells, and subsequently, macrophages. In 2014, Nelson et al. finished the placental investigation of over 1200 preeclamptic women [9]. These investigators reported that vascular lesions including spiral arteriole narrowing, atherosclerosis, and infarcts were more common in placentas from women diagnosed with hypertensive disease of pregnancy before 34 weeks. In women with hypertensive disease of pregnancy, the volume of extracellular fluid, manifest as edema, is usually much greater than that in normal pregnant women. The mechanism responsible for pathological fluid retention is thought to be endothelial injury [10].

The definitive treatment for hypertensive disorder of pregnancy is delivery either vaginally or by cesarean section. If not timely intervened it can result in grave maternal and fetal complications like abruption, postpartum hemorrhage, HELLP syndrome, disseminated intravascular coagulation, death, still birth. The amount of blood loss in vaginal delivery is <500ml [11], whereas the amount of blood loss in cesarean section is 500-1000ml [12].

Cesarean section is most commonly performed surgery in obstetrics. According to WHO the ideal rate of cesarean section for any country should be less than 15%. In India the rate of cesarean section is 17.2% [13]. Karnataka the rate of cesarean section is 31.5% [14]. Cesarean section is associated with increased morbidity [15]. Judicious estimation of bloodloss during cesarean section is very crucial to avoid intraoperative and postoperative complication. There are number of methods by which bloodloss can be estimated.

Although obstetric hemorrhage as a cause of maternal morbidity and mortality is rising, it is potentially preventable. An essential component of lowering morbidity during cesarean delivery is the prevention and early recognition of blood loss through an effective means of measurement [16]. Routine hemoglobin (Hb) testing after 24 hours of cesarean section is commonly performed test which helps in early diagnosis and effective management of anaemia there by reducing postoperative morbidity hence decreasing the incidence of wound infection, wound dehiscence, need of secondary suturing.

Material and Methods

This is a retrospective study conducted in Al-Ameen Medical College, Hospital & research center Vijayapura, Karnataka, India. Over a period of one year from Jan 2023 to Dec 2023. After obtaining ethical clearance. Relevant Data was collected after following the inclusion criteria hemoglobin estimation was done using CBC autoanalyzer. Pregnant patients with hypertensive disease of pregnancy who had systolic blood pressure ≥ 140 mmhg or diastolic blood pressure ≥ 90 mmhg were studied. Blood pressure was

measured in sitting position arm at the level of heart. Proteinuria was determined by dipstick method. Statistical analysis results are represented as frequency and percentage. The data analysis was done using SPSS v 24.

Inclusion criteria:

- Age ≥ 18 years.
- Term pregnancy ≥ 37 weeks
- Pre-term pregnancy (< 37 weeks)
- Patients with blood pressure ≥ 140/90 mmHg with or without Proteinuria.

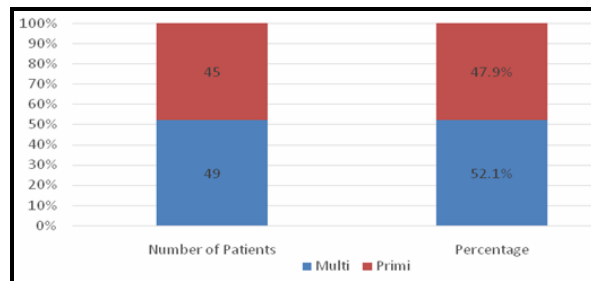
Exclusion criteria:

- Multifetal pregnancy
- Pregnancy with anemia (< 10 gm%)

Results

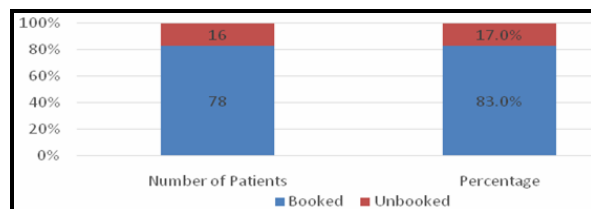
As per Fig-1 shows out of 104 patients 49 were multigravida and 45 were primigravida which contributes to 52.1% and 47.9% respectively.

Fig-1: Frequency and percentage in Obstetric score and for both multi and primigravida



As per Fig-2 shows out of 104 patients number of booked cases were 78 and unbooked were 16 which corresponding to 83% and 17% respectively.

Fig-2: Frequency and percentage of booked and unbooked cases



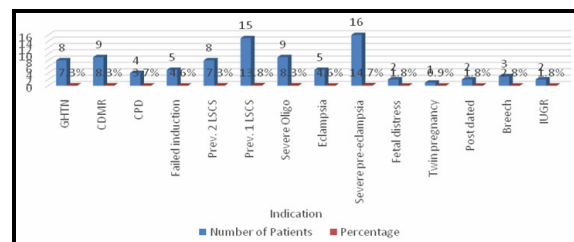
The table-1 shows mean preoperative hemoglobin is 11.3% and mean postoperative hemoglobin is 10.6%. The difference of preoperative and

postoperative hemoglobin is not statistically difference.

	Mean	SD	P value
PREOP HB	11.3	1.2	<0.0001
POST OP HB	10.6	1.2	

As per Fig-3 shows severe preeclampsia is highest that is 14.7%, Lowest being Twin pregnancy that is 0.9%.

Fig-3: Frequency and percentage of indication for cesarean section



Discussion

Pregnancy is a state of hyperdynamic circulation. There is increase in plasma volume, hemoglobin concentration, fibrinogen, coagulation factors. However due to disproportionate increase in plasma volume and hemoglobin, there is a state of physiological anaemia during pregnancy. Anaemia during pregnancy is defined as hemoglobin < 10gms [17].

Pregnant women with good hemoglobin reserve can withstand blood loss compared with anaemic women. Apart from mode of delivery, the amount of blood loss during delivery is also determined by various maternal and fetal factors. Maternal factors like age, parity, associated medical conditions, amount of liquor etc [18].

Fetal factors include number of fetus, size of baby. Blood loss during vaginal delivery is < 500ml. The amount of blood loss during cesarean section 500-1000ml. In term uterus, the amount of blood flow to uterus is 750ml/min, which explains increased loss of blood during cesarean section. The mean age of our study group was 24 years, 47.7% were primigravida, 52.3% were multigravida.

The most common indication for cesarean section in our study was previous cesarean section in hypertensive disease of pregnancy next being severe preeclampsia. In our study preoperative Hemoglobin in hypertensive disease of pregnancy patient is 11.3 (SD-1.2); and postoperative Hemoglobin is 10.6(SD-1.2).

The ability of pregnant women to withstand blood loss during Cesarean Section depends on the preoperative haemoglobin level [19]. Accurate estimation of blood loss during Cesarean section is important so as to avoid grave complication arising out of blood loss during surgery. There are different methods by which intraoperative blood loss can be assessed visual method [20], weighing gauze, amount of blood in suction apparatus [21]. Visual method of assessing blood loss intraoperative is subjected to observer variability, amount of bloodloss in suction and weighing gauze, are also associated with significant errors as they are mixed with amniotic fluid. CBC autoanalyzer is quiet accurate as it is not associated with inter observer variability.

In our study the preoperative haemoglobin in patients with hypertensive disease of pregnancy undergoing cesarean section was 11.3gms (SD 1.2) and postoperative hemoglobin estimation done after 24hrs was 10.6gm (SD 1.2), statistically significant. However blood loss did not result in clinical deterioration or warranted intervention like blood transfusion or parenteral iron supplementation. Corina schoen et al [22] in there retrospective study evaluated whether there was a quantitative difference in blood loss in patients receiving magnesium sulfate at the time of cesarean delivery (CD) compared to those who were not. They identified 124 patients with preeclampsia with severe features or eclampsia at time of CD. There were 57 (46%) that received magnesium sulfate during CD and 67 (54%) in which magnesium was stopped during the CD.

The primary outcome was calculated estimated blood loss (cEBL) compared between patients who received magnesium sulfate during CD and

those who did not. cEBL was derived through a validated equation by multiplying the patient's blood volume by percent of blood volume loss. The mean differences for hematocrit value (0.8, 95% confidence interval (CI) -0.3 to 1.8) and cEBL (108, 95% CI -102 to 318) were not significantly different after adjusting for obesity and history of CD [22].

E Horowitz, Y yogev et al [23] in the study a total of 383 consecutive women had an elective Cesarean section during the 12-month study period. Method they did was the charts of all women who underwent elective Cesarean section at a public teaching hospital during 2001 were reviewed for pre- and postoperative hemoglobin values, demographic data, indication for surgery and need for blood transfusion. Mean (\pm SD) hemoglobin level was 12.24 ± 1.09 g/dl prior to surgery and 10.87 ± 1.2 g/dl after, a mean loss of 1.37 ± 0.87 g/dl ($p < 0.001$). There was no significant difference in blood loss by indication for surgery [23]. Similar to our study this study also showed no significant blood loss but patients studied here did not have hypertensive disease of pregnancy.

There is paucity of studies investigating blood loss in patients with hypertensive disease of pregnancy undergoing caesarean section, There is theoretical increased risk of bleeding intraoperative and postoperative in patients with hypertensive disease of pregnancy undergoing caesarean section. However in our study blood loss was not clinically significant warranting intervention and correction.

Conclusion

Blood loss in pregnant women with hypertensive disease of pregnancy undergoing cesarean section though statistically significant does not require any intervention in postoperative period. Blood loss is clinically insignificant.

Financial Support and sponsorship: Nil

Conflicts of interest: There are no conflicts of interest.

References

- Gary F, Cunningham Kenneth J, Williams L. Obstetrics 24th Report of the National High Blood pressure Education Working program group on high blood pressure in pregnancy. *Am J Obstet Gynecol.* 2000; 183:S1-S3 (Consensus report).
- Sibai BM, El-Nazer A, Gonzalez-Ruiz A. Severe preeclampsia - eclampsia in young primigravid women: subsequent pregnancy outcome and remote prognosis. *Am J Obstet Gynecol.* 1986; 155:1011.
- Sibai BM, Mercer B, Sarinoglu C. Severe preeclampsia in the second trimester: recurrence risk and long-term prognosis. *Am J ObstetGynecol.* 1991; 165:1408.
- Bramham K, Briley AL, Seed P, Poston L, Shennan AH, Chappell LC. Adverse maternal and perinatal outcomes in women with previous preeclampsia: a prospective study. *Am J Obstet Gynecol.* 2011; 204(6):512.e1-9.
- American College of Obstetricians and Gynecologists Committee on Obstetric Practice Society for Maternal-Fetal Medicine. Committee Opinion No. 573: Magnesium sulfate use in obstetrics. *Obstet Gynecol.* 2013; 122(3):727-728.
- Garrett A, Craici I, White W et al. Persistent urinary podocyte loss after preeclamptic pregnancies may be a possible mechanism of chronic renal injury. Abstract No. 618. *Am J ObstetGynecol.* 2013; 208(1):S263.
- Eskild A, Vatten LJ. Abnormal bleeding associated with preeclampsia: a population study of 315,085 pregnancies. *Acta Obstet Gynecol Scand.* 2009; 88(2):154-158.
- Fisher S, Roberts JM. The placenta in normal pregnancy and preeclampsia. In Taylor RN, Roberts JM, Cunningham FG (eds): Chesley's Hypertensive Disorders in Pregnancy, 4th ed. *Amsterdam, Academic Press*, 2014.
- Nelson DB, Ziadie MS, McIntire DD et al. Placental pathology suggesting that preeclampsia is more than one disease. *Am J ObstetGynecol.* 2014; 210:66.e1
- Davidge S, de Groot C, Taylor RN: Endothelial cell dysfunction and oxidative stress. In Taylor RN, Roberts JM, Cunningham FG (eds): Chesley's Hypertensive Disorders in Pregnancy, 4th ed. *Amsterdam, Academic Press*, 2014.
- Brown MA, Hague WM, Higgins J, Lowe S, McCowan L, Oats J, Peek MJ, Rowan JA, Walters BN; Australasian Society of the Study of Hypertension in Pregnancy. The detection, investigation and management of hypertension in pregnancy: full consensus statement. *Aust N Z J Obstet Gynaecol.* 2000; 40(2):139-155.
- Brown MA, Lindheimer MD, de Swiet M, Van Assche A, Moutquin JM. The classification and diagnosis of the hypertensive disorders of pregnancy: statement from the International Society for the Study of Hypertension in Pregnancy (ISSHP). *Hypertens Pregnancy.* 2001; 20(1):IX-XIV.
- Desai G, Anand A, Modi D et al. Rates, Indications and outcome of cesarean section deliveries: A comparison of tribal and non tribal women in Gujarat, India. *PLOS one.* 2017; 12(12):e0189260.
- Roy N, Mishra PK, Mishra VK, Chattu VK, Varandani S, Batham SK. Changing scenario of C-section delivery in India: Understanding the maternal health concern and its associated predictors. *J Family Med Prim Care.* 2021; 10(11):4182-4188.
- Korb D, Goffinet F, Seco A, Chevret S, Deneux-Tharoux C; EPIMOMS Study Group. Risk of severe maternal morbidity associated with cesarean delivery and the role of maternal age: a population-based propensity score analysis. *CMAJ.* 2019; 191(13):E352-E360.
- Gari A, Hussein K, Daghestani M, Aljuhani S, Bukhari M, Alqahtani A, Almarwani M. Estimating blood loss during cesarean delivery: A comparison of methods. *J Taibah Univ Med Sci.* 2022; 17(5):732-736.
- Konar H. Dc Dutta's textbook of Obstetrics, Including perinatology & contraception. 10th edi. *Jaypee Brothers Medical Publishers.* 2022.
- Oyelese Y, Ananth CV. Postpartum hemorrhage: epidemiology, risk factors, and causes. *Clin Obstet Gynecol.* 2010; 53:147-156.
- Duthie SJ, Gosh A, NgA, Ho PC. Intra-operative blood loss during elective lower segment caesarean section. *Br J Obstet Gynaecol.* 1992; 99:364-367.
- Anya SU, Onyekwulu FA, Onuora EC. Comparison of visual estimation of intra-operative blood loss with haemoglobin estimation in patients undergoing caesarean section. *Niger Postgrad Med J.* 2019; 26(1):25-30.
- Konig G, Waters JH, Hsieh E et al. In vitro evaluation of a novel image processing device to estimate surgical blood loss in suction canisters. *Anesth Analg.* 2018; 126:621-628.
- Schoen C, Graham N, Corlin T, Knee A, Berghella V, Roman A. Calculated blood loss at cesarean delivery in patients with preeclampsia with severe features on magnesium sulfate. *J Matern Fetal Neonatal Med.* 2022; 35(25):8103-8106.
- Horowitz E, Yogev Y, Ben-Haroush A, Rabinerson D, Feldberg D, Kaplan B. Routine hemoglobin testing following an elective Cesarean section: is it necessary?. *J Matern Fetal Neonatal Med.* 2003; 14(4):223-225.

Cite this article as: Parveen S, Meera and Sravya CL. Preoperative and postoperative hemoglobin estimation in hypertensive disorders of pregnancy undergoing cesarean section. *Al Ameen J Med Sci* 2024; 17(4): 313-317.

This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial (CC BY-NC 4.0) License, which allows others to remix, adapt and build upon this work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

*All correspondences to: Dr. Sabina Parveen, Assistant professor, Department of Obstetrics and Gynaecology, Al Ameen Medical College and Hospital, Athani Road, Vijayapura-586108, Karnataka, India. Email: sabina.zulfiqarali@gmail.com