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Research Article

# A COMPARATIVE STUDY OF POSTPARTUM BLOOD LOSS BY VISUAL ESTIMATION METHOD AND BY GRAVIMETRIC METHOD

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**ABSTRACT**

**Objectives:** The aim of the study was to estimate postpartum blood loss visually and by gravimetric method and compare the both.

**Methods:** This study was conducted in the Department of Obstetrics and Gynaecology, GMC Amritsar on 100 pregnant women satisfying the inclusion criteria over a period of 1.5 years. Patient's consent was taken and visual estimation was done by the attending obstetrician and obstetric nurse. Total blood loss was calculated using gravimetric method and was compared to value given by visual estimation. Furthermore, comparison was done between the visual estimation values of the attending obstetrician and the obstetric nurse.

**Results:** Obstetrician observed 21.47% less blood loss than the actual (by gravimetric method) blood loss. Obstetric nurse observed 20.01% less blood loss than the obstetrician and 37.19% less than the actual loss.

**Conclusion:** Visual estimation underestimates the actual blood loss and, hence, an objective gravimetric method should be used for early and effective management of PPH.

**Keywords:** Postpartum hemorrhage, Visual estimation of blood loss, Gravimetric method, BNMCCC.

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## INTRODUCTION

Postpartum blood loss is the total blood loss after the birth of a baby either by vaginal delivery or by cesarean section. The average blood loss after a vaginal delivery is up to 500 ml and the average blood loss after uncomplicated cesarean delivery should not exceed 1000 ml [1]. Postpartum hemorrhage is classically defined as blood loss from the genital tract exceeding 500 ml following a vaginal delivery and loss of blood exceeding 1000 ml during a caesarean section. Postpartum hemorrhage (PPH) is the most common cause of maternal mortality worldwide including India. PPH accounts for a quarter of maternal deaths worldwide [2] and its incidence in developed world is increasing [3-5]. The point of error includes under recognition and inaccurate assessment of postpartum blood loss. Visual estimation of postpartum blood loss (VEBL) remains the most common method. Other methods to quantify include direct collection in a drape, gravimetric method, and venous blood sampling. Studies show that visual estimation underestimates the actual blood loss. The accuracy is improved with quantitative measurement (gravimetric) techniques.

### Aims and objectives

The aim of the study was to estimate postpartum blood loss visually and by gravimetric method and compare the both.

## METHODS

This comparative study was conducted in the Department of Obstetrics and Gynaecology, GMC Amritsar on 100 pregnant women satisfying the inclusion criteria over a period of 1.5 years. Patient's consent was taken and visual estimation was done by the attending obstetrician and obstetric nurse. Total blood loss was calculated using gravimetric method and was compared to value given by visual estimation. Furthermore, comparison was done between the visual estimation values of the attending obstetrician and the obstetric nurse.

### Study design: Comparative study

Study Location: This was a tertiary care teaching hospital based study done in Department of Obstetrics and Gynaecology at Bebe Nanki Mother and Child Care Centre (BNMCCC), Government Medical College, Amritsar.

### Study duration

The duration of the study was from February 2020 to August 2021.

### Sample size

The sample size was 100 patients.

### Subjects and selection method

One hundred patients satisfying the inclusion criteria were selected who were booked in BNMCCC and came for delivery. Furthermore, patients who presented in our emergency satisfying the inclusion criteria were taken.

### Inclusion criteria

Primigravidae, second gravidae, singleton pregnancy, she had no contraindications for vaginal delivery, and patients free of medical/obstetrical complications were included in the study.

### Exclusion criteria

A woman in active labor (cervical dilatation >4 cm) who had difficulty in giving consent, Patients having history of antepartum hemorrhage, patients delivering by cesarean section, patients having pregnancy-related complications such as anemia, pregnancy induced hypertension, and gestational diabetes mellitus, and patients having any other medical illness such as chronic hypertension, overt diabetes, and bleeding disorders were excluded from the study.

### Procedure and methodology

Consent and history taken from all the patients and a general physical examination conducted. Patient was placed in lithotomy position as she reached second stage of labor and the drape was put beneath the buttocks. Then, blood was allowed to collect in the drape. All the blood soaked materials such as gauze pieces and pads were placed over a specific sheet for better observation. Now, visual estimation of all the materials over the specific sheet and the blood collected in

the drape was individually done by the attending obstetrician and by the obstetric nurse attending the delivery. The weight of the dry pads and gauze pieces that were to be used was measured prior, using a calibrated weighing machine. Then, the weight of the used blood soaked pads and gauze pieces was measured and the difference was considered for the calculation of total blood loss. Then, weight of the blood collected in the drape was measured. Total blood loss using gravimetric method using weighing machine was calculated by adding both the values. This value was compared to the value that was given by visual estimation. Furthermore, the comparison was done between the visual estimation values of the attending obstetrician and the obstetric nurse.

Statistical Analysis: Statistical analysis was done using statistics software SPSS 21, IBM, USA. Pearson's Chi-squared test was used to determine statistically significant difference between the expected frequencies and the observed frequencies in one or more categories. t-test and ANOVA analysis were used to differentiate means among the two or more groups.

## RESULTS

In this study, 64% patients were primigravida and 36% multigravida. About 62% were booked and remaining 38% were unbooked. About 54% belonged to urban area and 46% belonged to rural household. Maximum patients were in age group 21–25 years and mean age being 24.91±3.74 years.

About 79% patients went into labor spontaneously whereas in 21% labor was induced. Labor was induced using different methods, including PGE1 (Misoprostol), PGE2 (Dinoprostone), oxytocin, and transcervical Foley's catheter. Of the induced, in 57.2% cases, inducing agent was misoprostol and in 19% it was oxytocin. About 14.3% of patients were induced with transcervical Foley's catheter and 9.5% with dinoprostone gel. Mean blood loss observed in multigravida was 346.56±126.02ml which is more than the mean blood loss calculated in primigravida, which is 280.41±161.15 ml.

Incidence of PPH in our study was 9%. Out of which minor PPH was 7% and major PPH 2%. Mean of total blood loss calculated by gravimetric method was 304.22±152.18 ml. Mean of visual estimation by obstetrician was 238.92±93.51 ml and mean of visual estimation by obstetric nurse was 191.09±85.62 ml. There was underestimation of the postpartum blood loss by both the observers in our study including the obstetrician and the obstetric nurse. Underestimation by obstetrician by visual method in comparison to gravimetric method was to the tune of 21.47%. Underestimation by obstetric nurse in comparison to gravimetric method was to the tune of 37.19%. Furthermore, obstetric nurse observed 20.01% less blood loss than the obstetrician. It was observed that as the blood loss increased, the underestimation also increased, as shown in Tables 1 and 2 with "p"<0.001 whereas accuracy of estimation decreased with increasing blood loss.

Table 1 is showing accuracy and underestimation of visual estimation given by obstetrician against the corresponding blood loss calculated by gravimetric method. It is seen that between 100 and 200 ml actual blood loss, underestimation was 20% whereas accuracy was 80%, between 201 and 300 ml, underestimation was 33.33%, between 301 and 400 ml blood loss, underestimation elevated to 57.14% and between 401 and 800 ml, underestimation was 100%. Furthermore, between 1001 and 1100 ml range which was major PPH, underestimation was 100%. It is seen, as the blood loss increases, the underestimation increases. p<0.001 which implies this is highly significant. There were no cases found between 801 and 1000 ml total postpartum blood loss.

Table 2 is showing accuracy and underestimation of visual estimation given by obstetric nurse against the corresponding blood loss calculated by gravimetric method. It is seen that between 100 and 200 ml actual blood loss, underestimation was 53.33% whereas accuracy was 46.6%,

**Table 1: Comparison betweem visual estimation done by obstetrician and the actual blood loss calculated by gravimetric method**

| Gravimetric method (in ml) | Visual Estimation (in ml) | | | | | | | Accuracy (%) | Underestimation (%) |
|---|---|---|---|---|---|---|---|---|---|
| | 0–100 | 101–200 | 201–300 | 301–400 | 401–500 | 501–600 | 601–700 | | |
| 100–200 | 3 | 12 | 0 | 0 | 0 | 0 | 0 | 80.00 | 20.00 |
| 201–-300 | 0 | 15 | 30 | 0 | 0 | 0 | 0 | 66.67 | 33.33 |
| 301–400 | 0 | 0 | 16 | 12 | 0 | 0 | 0 | 42.86 | 57.14 |
| 401–500 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0.00 | 100.00 |
| 501–600 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0.00 | 100.00 |
| 601–700 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0.00 | 100.00 |
| 701–800 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0.00 | 100.00 |
| 801–900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 |
| 901–1000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 |
| 1001–1100 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0.00 | 100.00 |

"p"<0.001 (Highly Significant)

**Table 2: Comparison between visual estimation done by obstetric nurse and the actual blood loss calculated by gravimetric method**

| Gravimetric method (in ml) | Visual estimation (in ml) | | | | | | | Accuracy (%) | Underestimation (%) |
|---|---|---|---|---|---|---|---|---|---|
| | 0–100 | 101–200 | 201–300 | 301–400 | 401–500 | 501–600 | 601–700 | | |
| 100–200 | 8 | 7 | 0 | 0 | 0 | 0 | 0 | 46.67 | 53.33 |
| 201–300 | 0 | 34 | 11 | 0 | 0 | 0 | 0 | 24.44 | 75.56 |
| 301–400 | 0 | 3 | 24 | 1 | 0 | 0 | 0 | 3.57 | 96.43 |
| 401–500 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0.00 | 100.00 |
| 501–600 | 0 | 0 | 3 | 2 | 0 | 0 | 0 | 0.00 | 100.00 |
| 601–700 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0.00 | 100.00 |
| 701–800 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0.00 | 100.00 |
| 801–900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 00.00 |
| 901–1000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 00.00 |
| 1001–1100 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0.00 | 100.00 |

"p"<0.001 (Highly significant)

between 201 and 300 ml, underestimation was 75.56%, between 301 and 400 ml blood loss, underestimation elevated to 96.43% and between 401 and 800 ml, underestimation was 100%. Furthermore, in cases of major PPH, in >1000 ml range, underestimation was found to be 100%. No cases present between 801 and 1000 ml blood loss. p<0.001 which suggests, this data are statistically highly significant.

Fig. 1 shows the accuracy and underestimation of visual estimation by obstetrician and obstetric nurse in comparison to total blood loss calculated by gravimetric method. The graph is depicting the mean of total blood loss (by gravimetric method) and mean of visual estimation by obstetrician and obstetric nurse.

Fig. 2 graph is showing that obstetrician observed 21.47% less than total blood loss whereas obstetric nurse observed 37.19% less than total blood loss. Furthermore, obstetric nurse observed 20.01% less blood loss than the obstetrician.

## DISCUSSION

In our study, it was observed that the mean of total blood loss calculated by gravimetric method was 304.22±152.18 ml whereas mean of visual estimation by obstetrician was 238.92±93.51 ml which is 21.47% less than the total blood loss calculated by gravimetric method. This observation is comparable to the study done by Al Kadri *et al*. [6] in which obstetrician estimated 29.5% less blood loss than the gravimetric calculation of blood loss.

In our study, there is a significant difference between estimation of postpartum blood loss given by obstetrician and obstetric nurse. The obstetrician observed 238.92±93.51 ml blood loss by visual estimation. On the other hand, obstetric nurse observed 191.09±85.62 ml blood loss visually which is 20.01% less blood loss than the obstetrician's observation. Some other studies did not show significant difference between both, such as in the study done by Al Kadri *et al*. [6], the estimation done by the obstetric nurse was 213.0±86.2 ml and that

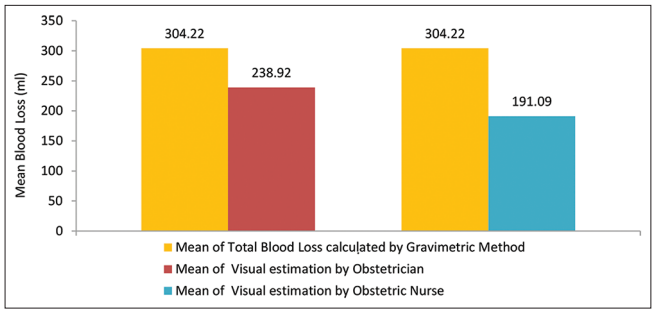


**Fig. 1: Comparison of estimated blood loss by obstetrican and obstetric nurse with total mean blood loss**

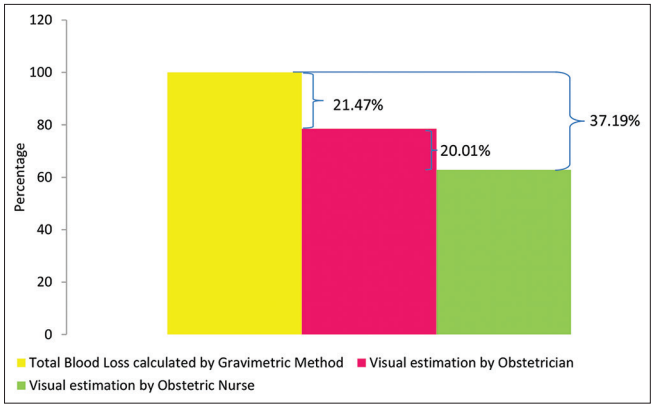


**Fig. 2: Comparison of underestimation of blood loss by obstetrician and obstetric nurse**

of attending physician was 214.3±88.1 ml which does not have any significant difference.

In our study, accuracy and underestimation of visual estimation given by obstetrician against the corresponding blood loss calculated by gravimetric method were obtained. It is seen that between 100–200ml actual blood loss, underestimation was 20%, between 201 and 300 ml, underestimation was 33.33%, between 301 and 400 ml blood loss, underestimation elevated to 57.14% and between 401 and 800 ml, underestimation was 100%. Furthermore, between 1001 and 1100 ml range which was major PPH, underestimation was 100%. It is seen, as the blood loss increases, the underestimation increases which is comparable to study done by Lertbunnaphong *et al*. [7] in 2016 where it was found that as the blood loss started rising, underestimation also started increasing. Furthermore, it was found that this data are statistically highly significant with p<0.001.

It is also observed that at 100–200 ml blood loss, accuracy was 80% by obstetrician, which fell to 66.67% at 201–300 ml and further fell to 42.86% at 301–400 ml blood loss. Further at higher blood losses, more than 400 ml blood loss, accuracy was nil.

In our study, apart from obstetrician, we obtained that the accuracy and underestimation of visual estimation given by obstetric nurse against the corresponding blood loss calculated by gravimetric method were calculated. It is seen that between 100 and 200 ml actual blood loss, underestimation was 53.33% whereas, between 201 and 300 ml, underestimation was 75.56%, between 301 and 400 ml blood loss, underestimation elevated to 96.43% and between 401 and 800 ml, underestimation was 100%. Furthermore, in cases of major PPH, in >1000 ml range, underestimation was found to be 100%. As the blood loss increased, underestimation also increased. p<0.001 which suggests, this data are statistically highly significant.

This has been found that the accuracy of visual estimation by obstetric nurse was 46.67% at 100–200 ml blood loss, decreased to 24.44% and 3.57% at 201–300 ml and 301–400 ml blood loss, respectively. At >400 ml blood loss, accuracy was nil. The overall accuracy by obstetric nurse was 62.81% in comparison to study by Liu *et al*. [8] where accuracy was 30.52%.

## CONCLUSION

Underestimation is a big problem in diagnosing postpartum hemorrhage when estimation is done visually, which does not give the patients having PPH the attention and care which they require. Therefore, there is a need of a more accurate and objective method to quantify postpartum blood loss so as to diagnose and manage postpartum hemorrhage judiciously. Hence, gravimetric method of calculation of postpartum blood loss should be promoted to save the mothers from this life-threatening complication of childbirth called postpartum hemorrhage.

## AUTHOR'S CONTRIBUTION

I, Dr. Namrata Hazarika, have conducted this study in a Tertiary Care Hospital, Bebe Nanki Mother and Child Care Centre in Government Medical College. Amritsar for a period of 1.5 years. All the cases were taken by me and the entire study was done by me as my thesis research work. This study was conducted under the esteemed guidance and supervision of Dr. Amrit Pal Kaur, Professor and Head, Department of Obstetrics and Gynaecology, Government Medical College, Amritsar and under the coguidance of Dr. Anita Madan, Associate Professor, Department of Obstetrics and Gynaecology, Government Medical College, Amritsar.

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