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THE MEAN PRE AND POST OP HEMOGLOBIN LEVEL IN PATIENTS IN CASE WITH BLOOD LOSS UNDERGOING CAESARIAN SECTION DEPARTMENT OF GYNECOLOGY AND OBSTETRICS SAIDU GROUP OF TEACHING HOSPITAL SWAT

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Abstract

Background: *Obstetric hemorrhage can cause severe complication but it could be preventable. A key factor in lowering mortality and morbidity associated with C-sections is the early detection of blood loss and timely management. The mean pre and post-op hemoglobin level is an indicator of blood loss in patients undergoing Caesarian section.*

Methodology: *It was a Quasi Experimental study, conducted in department of Gynecology and Obstetrics Saidu Group of teaching Hospital (SGTH) Swat. It was a six-month study and data collection were started after the approval from CPSP Pakistan. Sample size was calculated using open epi.com software Data was collected using Written proforma through non-probability sampling technique.*

Results: *The study of 60 patients (mean age 28.54 ± 1.32 years) found mean operation time was 44.08 ± 7.91 minutes and mean intraoperative blood loss was 660 ± 86 ml, with no significant differences between age groups. Mean pre- and post-operative hemoglobin levels were 11.59 ± 1.01 g/dl and 9.85 ± 0.14 g/dl, respectively (paired t-test $p = 0.0003$). There was a significant negative correlation between intraoperative blood loss and drop in post-op hemoglobin ($r = -0.45$, $p < 0.05$).*

Conclusion: *Our study concludes that older patients (34-40 years) tended to have higher blood loss and lower postoperative hemoglobin levels (9.85±0.14 g/dl) compared to younger groups. Overall hemoglobin drop (1.74 g/dl) after C-section was clinically significant, showing a direct relationship between increased blood loss and lower postoperative*

hemoglobin levels. The findings suggest age may influence surgical outcomes, but larger studies are needed to confirm these trends.

INTRODUCTION

Biochemically the human hemoglobin is a complex structure composed of the polypeptide chains i.e. the Alpha and beta (α2β2) forming tetrameric structure and functional unit. The main function of Hemoglobin is the transport of Oxygen molecule and three other molecule including Carbon dioxide, carbon monoxide and Nitrogenous Oxide[1]. The normal range of hemoglobin level change and it's depend on age, gender and other pathophysiological conditions. In Adult male the normal level of blood hemoglobin (Hb) varies between 13.5 to 16.6 gram per deciliter (g/dl) while in adult female it varies between 12 to 15.5 g/dl[2]. Multiple factors are associated with decrease in Hb level including loss of blood (the most common case), decrease synthesis of hemoglobin (Iron and Other mineral deficiency) and defective synthesis of blood hemoglobin molecule (including thalassemia, sickle cell anemia etc.)[3]. Caesarian Section or formally known as C-section is a surgical procedure used to delivered baby which due to some factors not possibly delivered through Normal Vaginal delivery (NVD). Just like other surgical interventions, C section are associated with multiple complications, one the most common complication associated with C section is blood loss and decrease in mean hemoglobin level [4,5].

Post-partum hemorrhage (PPH) after Caesarian section can result in significant loss of blood resulting in maternal hemodynamic instability that can lead to severe complications including organ dysfunctions and maternal mortality. Epidemiologically, it occurs in 1 to 6 percent of all delivery and the rate are much more common in developing countries due to lack of awareness, infrastructure and lack of basic lifesaving facilities[6]. Moreover, aside from PPH, multiple other causes are associated with loss of blood including surgical trauma, uterine atony, multiple pregnancy, coagulation disorders and abnormal placentation [7]. On average around 500ml of blood loss occur in C-section but it could vary from 500ml to above one liter of blood loss [8]. Post-partum hemorrhage is the leading cause of maternal death. According to the literature around 27.1% of maternal death occurs due to severe PPH. This number varies between different regions of the globe varies from 8% in developed countries to 32% in Northern African countries[9, 10]. Mostly death from post-partum hemorrhage occurs with first 24 hours of Child delivery [11].

Obstetric hemorrhage can cause severe complication but it could be preventable. The essential component of lowering mortality and morbidity in C-section could be early detection of blood loss and prompt management. The correct estimation of blood loss not only save the patient life but also prevent them from complications associated with blood transfusion[12]. The mean pre and post-op hemoglobin level is an indicator of blood loss in patients undergoing Caesarian section. Other indicators of blood loss include mechanical drape or pad counting, radioactive method and dye dilution techniques [13]. Mechanical drape and/pad method is associated with collecting and measure the weight of soaked surgical gauzes for estimation of blood loss but it didn't provide exact estimation of blood loss due to amniotic and other fluids. Moreover, this technique requires careful handling and calibration. In some literature it has been reported that the surgeon may underestimate up to 40% blood loss [14]. The radioactive and dye dilution technique method is costly, invasive, time consuming procedure that require specialized instrumentation and associated with allergic reactions; all these factors limits their routine clinical use [15]. The mean pre and post-operative technique is usually preferred as it provide relatively correct and clinically relevant estimation of blood loss, inexpensive and simple blood test[16].

As Visual and mechanical method of testing blood loss are not reliable and could provide over or underestimation of blood loss. Study suggest that laboratory based Hemoglobin measurement can provide accurate clinical measurement. Despite all these, there are limited literature studies that compare hb based blood loss estimation with other quantitative measurement in diverse patient's population. Additionally, more studies are needed to standardized time for estimation of blood loss, validate accuracy and to find out clinical relevance in different scenario[17].

The study aims to determine the change in mean pre- and post-operative hemoglobin levels as an indicator of blood loss in patients undergoing C-sections. Accurate intraoperative blood loss estimation is challenging for obstetricians due to several confounding factors, including placental blood, amniotic fluid, and other fluids. By measuring the change in hemoglobin level could provide a more accurate and quantitative assessment of blood loss. All these will help the Obstetric surgeon in early management and transfusion decision in patients undergoing Caesarian Section.

Material and Methods

It was a Quasi Experimental study, conducted in department of Gynecology and Obstetrics Saidu Group of teaching Hospital (SGTH) Swat. Proper Research proposal was documented and Ethical approval was Obtained from College of Physician and Surgeon Pakistan and Ethical Board of Saidu Medical College/ Teaching Hospital Swat (Ref Number; CPSP/REU/OBG-2021-027-11086 and SMC= 43/EBR/023). It was a six-month study and data collection was started after the approval from CPSP Pakistan.

Sample size was calculated using open epi.com software Data was collected using Written proforma and different variable include age, resident, profession, education level, monthly income, parity, complication history, type of C section (Primarily or repeat), blood loss in ml, preoperative and post-operative hemoglobin level in g/dl. Data was collected using non-probability sampling technique. Sample size was calculated using open epi.com software mean difference. By keeping the population size one million, confidance interval 95%, power of test 80. This calculation is based on the preoperative hemoglobin levels of 11.23+1.56 g/dl and postoperative levels of 9.92+1.46 g/dl were obtained from previous literature[8]. For 95 % confidence interval the approximate sample size was 46. However, to ensure higher power and fulfill the normality assumption, we had included a total of 60 participants in the study.

All those patients who give us written informed consent, with age between 18 to 40 years, underwent elective C-Section, uncomplicated pregnancy and had a preoperative Hb >10.00 g/dl were included in the study. While all those who didn't give us informed consents, intraoperative blood loss less than 500 ml, surgery time greater than 45 min, complicated pregnancy including Multiple pregnancies, having known bleeding or coagulating disorder, surgical complications during C section, all those patients requiring blood transfusion before surgery, patients having placental abnormalities, anti-partum hemorrhage and all those patients having history of medical disorders or Pregnancy related disorders including preeclampsia and eclampsia were excluded from the study. Strictly exclusion criteria were followed in order to control cofounder and bias in the study.

For the purpose of the study C section is Define a surgical procedure performed to deliver a baby when vaginal delivery is not possible or advisable due to maternal or fetal complications. It involves making an incision in the abdomen and uterus to safely extract the baby, placenta, and other contents of the uterus. Mean Hemoglobin level refer to the average Concentration of Hemoglobin in blood measured in gram per deciliter. Mean Hemoglobin level is typically used to assess the oxygen caring capacity of blood and to assess blood loss and different medical conditions including anemia[18], Volume of blood loss is measured using difference in mean hemoglobin level, this method involve measuring hemoglobin level before and after surgery.

All data was collected using a pre-designed structured proforma, Data were analyzed using SPSS 25. Mean and SD were calculated for numerical variables such as age, pre and post hemoglobin level, and blood loss (ml). Frequency and percentages were calculated for categorical data such as parity, history of complications (yes or no), and type of CS primary or repeat). Paired t-tests were used to compare pre- and post-operative hemoglobin levels. Pearson correlation tests were used to assess the correlation between the difference in hemoglobin levels (pre and post) and the amount of blood loss. A significance level of P equal or less than 0.05 will be considered significant.

Results

The study includes 60 patients with mean age of 28.54 ±1.32 years with an age range between 19 to 36 years. The age of the patients was subdivide into three

groups I.e. Group A (18 to 25 years {n= 23 [38.33%]}, Group B (26 to 33 years {(n= 27 [40.0%]}) and group C (34 to 40 years {n=10[16.66%]}). Mean duration of operation time were 44.08 ± 7.91 minutes. (Group A = 40.76±4.67min, Group B 44.19±7.31mins and Group C= 47.31±3.11min) (one way anova p= 0.15) mean loss of blood measuring through gravitational methods were 660 ± 86 ml (Group A = 560±34ml, Group B =683±73ml, Group C= 739±53ml) (one way anova p= 0.09). the mean weight of the subjects was around 67.35±4.30 kg while the mean parity of the patients was 3.42±1.01 ranging from 1 to 5.

The mean pre and post-op hemoglobin level was found out from the complete blood count report and their difference were compare between these three groups. The mean pre-op hemoglobin level of the patient was 11.59 ± 1.01 g/dl while the mean post op hemoglobin level of the patients was 9.85 ± 0.14 g/dl. (Paired t test p = 0.0003). there was a significant negative correlation between intraoperative blood loss and drop in post op hemoglobin level (r= - 0.45, p< 0.05), indicating that increase in blood loss with drop post op hemoglobin level. All data are summarized in following table # 1.

Table # 1 (Summarized Data)

Sample Size	Pre-op	n= 30	Mean Age	28.54 ±1.32 years	
	Post-op	n= 30			
Age Group		Prevalence	Mean Operation Time		P-value
Group A (18 to 25 Years)		n= 23 [38.33%]	40.76±4.67min		one way Anova p= 0.15
Group A (26 to 33 Years)		n= 27 [40.0%]	44.19±7.31mins		
Group A (34 to 40 Years)		n=10[16.66%]	47.31±3.11min		
Mean Hemoglobin Level		Pre-op HB level	11.59 ± 1.01 g/dl		Paired t test p = 0.0003
		Post-op HB level	9.85 ± 0.14 g/dl		

Discussion

Blood loss is one of the most common complications after surgery. Just like other surgical interventions, blood loss does occur in Caesarian Section that leads to drop in hemoglobin level and Anemia. Some literature studies had reported around 80 to 90% prevalence of anemia after major surgical interventions[19]. Specifically, in recent literature study, post-partum anemia after Caesarian Section had been reported ranging from 18.5% to a bit higher in other studies, depending upon different factors including pre-op hemoglobin level, blood loss etc[20]. These figure highlights the importance of pre and post-op hemoglobin level in surgical care pathway for Caesarian Section and other surgical interventions.

In our study the mean age of the patients was 28.54 ±1.32 years. It's a normal fertility age and many literature studies had reported around the same age of patients presented for caesarian section. A study conducted in Kingdom of Saudi Arabia (KSA), had reported the peak age of patients presented for caesarian section was 25 to 35 years[21]. Similarly, a study conducted on large base united states population had reported two major age groups population presented for caesarian section were 25 to 29 years and 31 to 25 years[22]. These finding support that our study population reflects the standard fatality age population observed in Caesarian section cohorts. The average amount of blood loss reported in study findings were 660 ± 86 ml. As like other surgical interventions blood loss is a common side effect in caesarian section. After thoroughly searching literature studies, different study had reported different number of blood loss during caesarian section. A study conducted by Abdul Rahim MD et. all had reported around 525 to 560ml of blood loss[8]. Similarly, some other literature studies had reported around 450 ml loss of blood in elective Caesarian section and up to 1000ml loss of blood in emergency caesarian section[23]. These finding shows a bit contrast to our results and the reason could be that in our study caesarian section were performed by CPSP trainee under the supervision of consultants while the

other study was performed by the consultants having expertise of many years.

The mean Hemoglobin drop reported in study was around 1.74g/dl (From 11.59 ± 1.01 g/dl to 9.85 ± 0.14 g/dl). According to the previous literature, approximately 1.36 d/dl hemoglobin drop occurs in normal caesarian section having blood loss equal or less than 500ml[24]. Another study that shows similarity to our study findings reported a drop of mean hemoglobin level preoperative from 11.23 to 9.92 g/dl (p= 0.001)[8]. More over a study conducted by Ibrahim et.all. [25] in Kuwait on 122 women undergoing caesarian section reported a drop of 0.54g/dl mean hemoglobin level and mean intraoperative blood loss equal to 485.9 ± 136.7 ml. the correlation between hemoglobin level and blood loss positive (r=0.22) [26]. Another study conducted in new Delhi India had reported around 1.34g/dl drop in mean hemoglobin level in routinely performed, uneventful caesarian section surgery, in their study 104 female undergoing uneventful caesarian section, post op the mean Hb drop from 11.4g/dl to 10.1±1.34g/dl. Moreover, in a study comparing drop in Hb comparing different C sections including primary and secondary C section had found out more significant decrease in Hb in patients undergoing first caesarian section (1.1g/dl) then patients having history of caesarian section (1.0g/dl) [27]. Although different studies have reported different amounts of mean hemoglobin (Hb) drop, one thing that are common is that the decrease in Hb is directly related to the amount of blood lost. In other words, there is a positive correlation between blood loss and the drop in Hb, which is consistent with the findings of our study (r=0.45).

Just like other study our study also have both strength and weakness. Our study elaborates very clear inclusion and exclusion criteria, objective measurement of mean hemoglobin level with statistical analysis and proper ethical approval. On the other hand, our study was limited to only one center, non-randomized and we used convenience sampling. All these factor could limit generalizability of the study and may introduce potential cofounder and bias in the study. Future research should focus on randomized sampling, multi center and larger sample size for more accurate and generalized results.

Conclusion

Our study concludes that older patients (34-40 years) tended to have higher blood loss and lower postoperative hemoglobin levels (9.85±0.14 g/dl) compared to younger groups, these age-related differences weren't statistically significant. However, the overall hemoglobin drop (1.74 g/dl) after C-section was clinically significant, showing a direct relationship between increased blood loss and lower postoperative hemoglobin levels. All these highlights the importance of monitoring hemoglobin in patients with prolonged surgery times or higher blood loss, particularly in older age groups. The findings suggest age may influence surgical outcomes, but larger studies are needed to confirm these trends.

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Author Contribution:

S.no	Author	Contribution
1.	Dr. Saima	Study Design, Data Collection, Manuscript Writing
2.	Dr. Sania Tanveer Khattak	Final approval and Supervision
3.	Dr. Kaleemullah Jan	Manuscript Writing
4.	Dr. Huma	Data collection, Ethical Approval
5.	Dr. Laila	Data collection, consent
6.	Dr. Bibi Asma	Revision of Manuscript and table of content writing.

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