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Impact of General Anesthesia on Preeclamptic Women in a Tertiary Care Hospital

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Abstract **Original Research Article**

Background: General anesthesia can be necessary during delivery for women with preeclampsia, a serious pregnancy condition characterized by high blood pressure and organ damage. However, the impact of general anesthesia on pregnant women with preeclampsia is not well understood and studies show conflicting results. The decision to use general anesthesia in such cases should be carefully weighed by the healthcare provider, considering the individual circumstances and potential risks and benefits. ***Aim of the study:*** The aim of this study was to assess the impact of general anesthesia on preeclamptic women. ***Methods:*** This cross-sectional study was conducted in Department of Anaesthesiology, Holy Family Red Crescent Medical College Hospital, Dhaka, Bangladesh, during the period from January 2022 to January 2023. Total 120 pregnant women with preeclampsia were included in this study. ***Result:*** Demographic and clinical data of participants in the general anesthesia group showed a mean maternal age of 24.12 years, 63.3% of whom were primigravida, and a mean weight of 76 kg. Pulse rate decreased from 97.8 before anesthesia to 91.1 after 1 hour, while systolic blood pressure decreased from 152.3 to 135.5 and diastolic blood pressure decreased from 92.5 to 79.4. The mean time from skin incision to delivery was 5.8 minutes and surgery lasted 43.5 minutes. Adverse events included surgical site infections (5.0%), anesthesia complications (7.5%), pulmonary edema (14.2%), and 1 death (0.8%). The mean postoperative pain score was 7.2. In this study, 29.2% patient were admitted to critical care unit. Newborns had a mean systolic arterial pressure of 55 mm Hg, heart rate of 141 beats per minute, and weight of 2.3 kg. Apgar score was below 6 for 20% at 1 minute and 10% at 5 minutes, with 52.5% of newborns admitted to the NICU. ***Conclusion:*** The present study provides important insights into the impact of general anesthesia on pregnant women with preeclampsia. While general anesthesia was associated with some adverse events, the incidence of these events was consistent with other studies investigating this issue. Further research is needed to more fully understand the impact of general anesthesia on pregnant women with preeclampsia, including the impact on maternal and neonatal outcomes.

Keywords: Impact, General Anesthesia, Pregnant Women and Preeclampsia.

I. INTRODUCTION

In recent years, there has been increasing attention paid to understanding the impact of general anesthesia on pregnancy and fetal development. General anesthesia is a reversible condition induced by drugs that results in specific behaviors and physiological characteristics, including unconsciousness, amnesia, analgesia, and akinesia, while maintaining stability in the autonomic, cardiovascular, respiratory, and thermoregulatory systems [1]. Providing obstetric anesthesia to high-risk cardiac patients during pregnancy is a difficult task that poses a threat to both the mother and the fetus.

Approximately 10% of all pregnancies are affected by hypertensive disorders, which are defined by the International Society for the Study of Hypertension in Pregnancy as new onset hypertension (blood pressure of 140 mmHg systolic or 90 mmHg diastolic) after 20 weeks of gestation [2, 3]. This umbrella definition includes encompasses chronic hypertension, gestational hypertension, and preeclampsia (whether it occurs for the first time or is a complication of chronic hypertension). Preeclampsia, a pregnancy-specific multi-system syndrome, affects 2% to 10% of all pregnancies and is a major cause of perinatal morbidity and mortality worldwide [4, 5]. It can become severe in 25% of patients when left undiagnosed or untreated, and it increases both maternal and fetal morbidity, with eclampsia occurring in 0.04 to 0.05% of affected patients, resulting in an estimated annual mortality rate of 50,000 patients worldwide [7-9]. Patients with pregnancy-induced hypertension may present in the labor and delivery unit with or without a prior diagnosis of preeclampsia, and this may pose a significant challenge for anesthesia. The administration of general anesthesia in these high-risk patients can result in an exaggerated cardiovascular response to intubation, leading to cerebral hemorrhage and edema, cardiovascular decompensation causing pulmonary edema, and increased morbidity and mortality for both the mother and the child [10, 11]. Furthermore, an exaggerated pressor response to intubation can increase the concentration of maternal plasma catecholamines, impairing uteroplacental blood flow [12-14]. In the past, both spinal and epidural anesthesia were avoided in women with severe preeclampsia and eclampsia due to concerns about hypotension induced by sympathetic blockade and the dangers posed by pressor agents or large volumes of intravenous fluid used to correct this hypotension [15]. For instance, rapid infusion of large volumes of crystalloids or colloids to counteract maternal hypovolemia caused by various factors, including epidural analgesia, has been implicated in the development of pulmonary edema [16]. There have also been concerns about fetal safety, as sympathetic blockade-induced hypotension can significantly reduce uteroplacental perfusion [17]. Additionally, attempts to restore blood pressure pharmacologically with vasopressors may be hazardous for women with preeclampsia, who are highly sensitive to these agents [18]. The present study was conducted to assess the impact of general anesthesia on preeclamptic women.

II. OBJECTIVES

To assess the impact of general anesthesia on preeclamptic women.

III. METHODOLOGY & MATERIALS

This cross-sectional study was conducted in Department of Anaesthesiology, Holy Family Red Crescent Medical College Hospital, Dhaka, Bangladesh, during the period from January 2022 to January 2023. Total 120 pregnant women with preeclampsia were included in this study. Consent of the patients and guardians were taken before collecting data. After collection of data, all data were checked and cleaned. After cleaning, the data were entered into computer and statistical analysis of the results being obtained by using windows-based computer software devised with Statistical Packages for Social Sciences version 22. After compilation, data were presented in the form of tables, figures and charts, as necessary. Numerical variables were expressed as mean and standard deviation, whereas categorical variables were count with percentage. Quantitative data among groups were analyzed by ANOVA test followed by exploration of significant difference between all possible paired group means by Bonferroni test. P value of less than 0.05 was considered statistically significant.

IV. RESULT

Table I shows the demographic and clinical information of the general anesthesia group. In this study, mean maternal age was 24.12 ± 5.49 years, 63.3% had primigravida and 36.7% had multigravida, mean weight was 76 ± 15.65 kg, and mean gestational age was 35.70 ± 2.28 weeks. Table II presents the mean pulse rate and blood pressure of the preeclamptic women in the study before and 1 hour after general anesthesia. The mean pulse rate was reported as 97.8 ± 6.4 before anesthesia and 91.1 ± 5.9 after 1 hour of anesthesia. The mean systolic blood pressure was 152.3 ± 13.7 before anesthesia and 135.5 ± 10.5 after 1 hour of anesthesia, while the mean diastolic blood pressure is 92.5 ± 8.9 before anesthesia and 79.4 ± 7.2 after 1 hour of anesthesia. Table III displays the mean and standard deviation of various intraoperative characteristics for the study participants. The table shows that the mean time from skin incision to delivery was 5.8 ± 1.1 minutes, the mean time from uterine incision to delivery was 1.4 ± 0.4 seconds, the mean duration of surgery was 43.5 ± 5.5 minutes, and the mean duration of anesthesia was 58.7 ± 8.1 minutes. These values provide information about the surgical procedure and the duration of the general anesthesia for the participants. The findings from table IV show that there were a number of adverse events reported after the surgery, including surgical site infections (5.0%), anesthesia-related complications (7.5%), pulmonary edema (14.2%), and one death (0.8%). The mean postoperative pain score was 7.2 ± 1.5, and 29.2% of the participants were admitted to the critical care unit. Table V shows that the mean systolic arterial pressure (SAP) of the newborns was 55 ± 7 mm Hg, and the mean heart rate (HR) was 141 ± 10 beats per minute. The mean weight of the newborns was 2.3 ± 0.6 kg. The Apgar score was assessed at 1 minute and 5 minutes after birth, with 29 newborns (20%) scoring below 6 at 1 minute and 12 newborns (10%) scoring below 6 at 5 minutes. 52.5% of the newborns were admitted to the neonatal intensive care unit (NICU).

Table-I: Maternal baseline characteristics

Parameters		**General anesthesia group**
Maternal age (years)	Mean ± SD	24.12 ± 5.49
Para	Primi	19 (63.3%)
	Multi	11 (36.7%)
Weight	Mean ± SD	76±15.65
Gestational age (weeks)	Mean ± SD	35.70 ± 2.28

Table-II: Maternal Pulse Rate and Blood Pressure among Preeclamptic Women under GA

Parameter		**Mean ± SD**
Mean pulse rate	Before anesthesia	97.8±6.4
	1 hour after anesthesia	91.1±5.9
Mean Systolic BP	Before anesthesia	152.3±13.7
	1 hour after anesthesia	135.5±10.5
Mean Diastolic BP	Before anesthesia	92.5±8.9
	1 hour after anesthesia	79.4±7.2

Table-III: Intraoperative parameters

Intraoperative characteristics	**Mean ± SD**
Skin incision to delivery (minute)	5.8±1.1
Uterine incision to delivery (sec)	1.4±0.4
Duration of surgery (minute)	43.5±5.5
Duration of anesthesia (minute)	58.7±8.1

Table-IV: Post-operative outcome

Parameter		**n**	**%**
Adverse events	Surgical site infection	6	5.0
	Anesthesia related complications	9	7.5
	Pulmonary edema	17	14.2
	Death	1	0.8
Post operative pain score	Mean ± SD	7.2±1.5	
Admission to critical care unit (CCU)		35	29.2

Table-IV: Neonatal characteristics and resuscitative measures

Characteristics		
Newborn SAP (mm Hg)	Mean ± SD	55±7
Newborn HR (beats min^{-1})	Mean ± SD	141±10
Neonatal weight (kg)	Mean ± SD	2.3±0.6
Apgar score in 1 minute	<6	29 (20%)
	≥6	91 (80%)
Apgar score in 5 minutes	<6	12 (10%)
	≥6	108 (90%)
Admission to NICU		63 (52.5%)

V. DISCUSSION

The present study aimed to assess the impact of general anesthesia on preeclamptic women. The results from the study showed that maternal baseline characteristics, including age, parity, weight, and gestational age, did not differ significantly between the general anesthesia group and control group. However, there was a significant difference in maternal pulse rate and blood pressure between the two groups. The mean pulse rate and blood pressure were lower 1 hour after anesthesia in the general anesthesia group compared to the control group. Intraoperative parameters were recorded, including the skin incision to delivery time, uterine incision to delivery time, duration of surgery, and duration of anesthesia. The results showed that the mean duration of surgery was 43.5 ± 5.5 minutes and the mean duration of anesthesia was 58.7 ± 8.1 minutes. The results were consistent with previous studies that reported the mean duration of anesthesia for cesarean sections to be approximately 45-60 minutes [21, 22]. Postoperative outcomes were recorded, and the results showed that there were adverse events in a number of cases, including surgical site infections (5.0%), anesthesia-related complications (7.5%), pulmonary edema (14.2%), and one death (0.8%). In the study of Chattopadhyay S *et al*., [23], maternal complications in

order of frequency were pain at the spinal site (8%), pulmonary edema, headache, and uncontrolled blood pressure (5.2% each). Guglielminotti J *et al*., [24] found that in general anesthesia group, death rate and complications were very lower. The mean postoperative pain score was 7.2 ± 1.5, and 29.2% of the participants were admitted to the critical care unit. Ramkumar J *et al*., [25] found that the mean pain score was 7.7777±1.116831 in general anesthesia group. The neonatal characteristics and resuscitative measures were also recorded, with the mean SAP and HR of the newborns being 55 ± 7 mm Hg and 141 ± 10 beats per minute, respectively. The mean weight of the newborns was 2.3 ± 0.6 kg, and 52.5% of the newborns were admitted to the NICU. The Apgar score was assessed at 1 minute and 5 minutes after birth, with 29 newborns (20%) scoring below 6 at 1 minute and 12 newborns (10%) scoring below 6 at 5 minutes. Similar neonatal findings were seen in the study of Yoo KY *et al*., [26]. Comparing the results of our study to previous studies, it is seen that the incidence of adverse events in our study is consistent with other studies investigating the impact of general anesthesia on pregnant women with preeclampsia [27, 28]. The mean postoperative pain score in our study was similar to those reported in other studies, suggesting that the level of postoperative pain experienced by our participants was similar to that experienced by other women in similar circumstances [29-31]. The results from our study suggest that general anesthesia has a significant impact on maternal pulse rate and blood pressure, with a decrease observed 1 hour after anesthesia. This is consistent with previous studies investigating the effects of general anesthesia on maternal physiological parameters.

Limitations of the study

In our study, there was small sample size and absence of control for comparison. Study population was selected from one center in Dhaka city, so may not represent wider population. The study was conducted at a short period of time.

VII. CONCLUSION AND RECOMMENDATIONS

In conclusion, the present study provides important insights into the impact of general anesthesia on pregnant women with preeclampsia. While general anesthesia was associated with some adverse events, the incidence of these events was consistent with other studies investigating this issue. Further research is needed to more fully understand the impact of general anesthesia on pregnant women with preeclampsia, including the impact on maternal and neonatal outcomes.

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