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ARTICLE

Comparative study of general with Spinal Anesthesia on maternal outcomes for caesarean delivery among preeclamptic women at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

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Tsehay Terefe, Yohannes Tekalegn and Abraham Irena

Full Length Research Paper

Comparative study of general with Spinal Anesthesia on maternal outcomes for caesarean delivery among preeclamptic women at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

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Anesthetic management of preeclamptic patients remains a challenge. Although general anesthesia can be used safely in pre-eclamptic women, it is fraught with greater maternal morbidity and mortality. The added risks associated with general anesthesia include airway difficulties due to edema (often aggravated by tracheal intubation) and the pressure response to laryngoscope and intubation. However, several studies support the use of spinal anesthesia as first choice reasoning less post-operative morbidity and mortality. To compare maternal outcome among preeclamptic women after caesarian delivery under general and spinal anesthesia in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. Hospital based retrospective comparative cross sectional study was used to compare maternal outcomes. All preeclamptic mothers that underwent Caesarian Section in Obstetrics and Gynecology Ward, Tikur Anbessa Specialized Hospital from October 2014 to October 2016 was included in the study. Data collection was carried out by using structured questionnaire. Data entry and analysis was done on SPSS version 20. Independent sample T-test and logistic regression was conducted to compare the outcome in both groups of spinal and general anesthesia, 95% confidence interval (CI) and p value < 0.05 is set as cut off point for statistical significance. The mean age of study subjects were 28.18 years and SD= ± 4.66 years, the median age is 28 years (IQR: 25-30 years). Majority 152 (91%) of the cesarean sections (C/S) was emergency C/S and the rest 15 (9%) were elective C/S. 78 (46.7%) of parturient operated under general anesthesia, and 89 (53.3%) were operated under spinal anesthesia. None of the mothers developed post-op complication, and none of the maternal death were documented until discharge from the hospital in both groups of parturient. The present finding shows that statistically significant higher intra operative blood pressure and pulse rate was observed among GA group when compared with SA group. In conclusion, SA is safer than GA in terms of stable intra operative vital signs among preeclamptic women.

Key words: Preeclampsia, caesarean section, general anesthesia, spinal anesthesia, Ethiopia.

INTRODUCTION

Preeclampsia is a multi-systemic disorder characterized by hypertension and new-onset of proteinuria which develops after the 20th week of pregnancy in previously

normo-tensive women. It is a common cause of maternal and perinatal morbidity and mortality in both developed and developing countries affecting 2 to 8% of

pregnancies (World Health Organization (WHO), 1988). WHO estimates that the incidence of preeclampsia is 7 times higher in low- and middle-income countries than in high-income countries, and From 10 to 25% of these cases will result in maternal death (Engender Health, 2007; Dolea and AbouZahr, 2003). Preeclampsia/Eclampsia is responsible for an estimated 16% of global maternal mortality (63,000 maternal deaths) annually (Khan et al., 2006).

Rates from African countries such as South Africa, Egypt, Tanzania, and Ethiopia vary from 1.8 to 7.1% (Kimball et al., 2007; Mahaba et al., 2001; Thiam et al., 2003; Teklu and Gaym, 2006). According to WHO report, an estimated 350 women per 100,000 live births were dying of pregnancy and related causes in Ethiopia. The Ethiopian National Emergency Obstetric and Newborn Care (EMONC) survey showed that preeclampsia contributed to the complication of approximately 1% of all deliveries and 5% of all pregnancies. Moreover, 16% of direct maternal mortality and 10% of all maternal mortality (direct and indirect) was due to preeclampsia/eclampsia (Gaym et al., 2011). A maternal mortality trend analysis showed an increasing trend of preeclampsia in Ethiopia (Abdella, 2010). Caesarean section is one of the lifesaving surgical interventions attributed to the decrease of maternal and perinatal mortality and morbidity. The frequency of cesarean section births continues to steadily rise worldwide (Gori et al., 2007). According to Demographic Health Survey (1990 to 2014), the global cesarean section rate is 18.6%. The average cesarean section rate in Africa is 7.3%, the highest Egypt (51.8%) and 0.6% for Ethiopia which is very low. But the national cesarean section rate in Ethiopia varies from 2 to 27% (Betrán et al., 2016).

Cesarean anesthesia has gained importance as the cesarean birth rates have increased. Even though the cesarean procedure has become very safe over the years, it is still associated with maternal and perinatal mortality and morbidity (Liu et al., 2007). The overall postoperative morbidity rate associated with cesarean births is 35.7%. The higher mortality and morbidity rates might be attributable not only to the surgical procedure but also to the anesthetic technique preferred (Saygil et al., 2015).

This study aimed to compare outcomes of preeclamptic parturient following caesarean delivery under either general or spinal anesthesia.

MATERIALS AND METHODS

Study area and setting

A hospital based retrospective cross sectional study was used to

compare maternal outcomes following caesarian delivery in preeclamptic women under general and spinal anesthesia in Tikur Anbessa Specialized Hospital Addis Ababa, Ethiopia; from November to December, 2016. Addis Ababa is the capital city of Ethiopia. It is the largest city with a population of 3,384,569 according to the 2007 population census. It lays at an altitude of 7,546 ft (2,300 m) above sea level in the southern periphery, the city rises to over 9,800 ft (3,000 m) in the north. It has 11 government hospitals and 86 health centers in the city. Tikur Anbessa Specialized Hospital is tertiary referral, teaching governmental hospital and the largest of all public hospitals in Ethiopia. The hospital has a total of 800 beds, 80 of which are currently being used in obstetrics and gynecology ward. About 3000 deliveries are attended each year and 60% of these are operative deliveries (Aya et al., 2003).

Inclusion and exclusion criteria

Inclusion criteria

All preeclamptic mothers admitted in obstetrics and gynecology ward of Tikur Anbessa Specialized Hospital from October 2014 to October 2016 and underwent CS was included in the study.

Exclusion criteria

Mothers who also do not have complete records on their charts like operation sheet, anesthesia sheet, and socio demographic characteristics data were excluded from the study.

Sample size determination

All preeclamptic mothers that underwent CS in obstetrics and gynecology ward, Tikur Anbessa Specialized Hospital from October 2014 to October 2016 were included in the study.

Sampling procedures

First, all mothers with preeclampsia undergone CS for delivery with either GA or SA were selected by the principal investigator from CS registration book by counting cases that were enrolled between October 2014 and October 2016. Then all eligible patients' card was collected from card room to conduct data collection.

Data collection procedures

Medical records were reviewed for all preeclamptic patients who had CS from October, 2014 to October, 2016. Data was collected from patients' medical records by using checklists. Five nurses and two anesthetic nurses with experience of data collection and supervision was involved as data collectors and supervisors, respectively, after taking training for one day on how to collect records and fill on the format prepared. Socio demographic, reproductive health characteristics, pre-operative, intra-operative and post-operative data were collected after taking the selected parturient card from card store.

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Data analysis procedures

The collected data were cleaned, coded, entered into SPSS version 20 statistical software for analysis. Data were checked for completeness and consistency. Frequency tables and graphs were used to describe the study variables. Independent sample T-test was applied to see whether there is significant difference between continuous independent variables and outcome variables. And logistic regression was applied for testing association between categorical independent variables and outcome variables. The significant level is declared at P-value < 0.05.

Data quality control

For data quality control, data collection tools were adopted from existing literatures and pretest of the questionnaire was carried out. Prior to data collection, one day training was provided for data collectors and supervisors on how to review records from the selected patient's card and fill on the prepared format after taking 5% of the sample size from card room for pretest. Supervisors were assigned to supervise the data collectors and monitor the data collection process. The principal investigator role was to coordinate over all activities of the data collection process. There was meeting and discussion between data collectors, supervisor and the principal investigator after the end of data collection daily to ensure completeness and consistency.

Operational definitions

Maternal outcomes

The incidence of pre and post-operative morbidity (elevated blood pressure, hypotension, intra operative aspiration, peri-operative maternal death, peri-operative infection, length of hospital stay, peri-operative maternal death and admission in ICU) was collected.

General anesthesia

After pre oxygenation, thiopental 4 to 5 mg/kg and succinylcholine 1 to 2 mg/kg were administered and they were intubated under sellick's maneuver. Maintenance of anesthesia was achieved with 100% oxygen and 0.5 to 1% halothane. Blood pressure and heart rate were monitored in the ward before induction after intubation and at 5 min interval till completion of the operation.

Spinal anesthesia

For spinal anesthesia (SA), isobaric bupivacaine (0.5%), 10 to 15 mg was given intrathecally at level of L3/L4 and 500 ml of normal saline given before induction and bilateral IV line secured to give crystalloid fluids and analgesics as required. Patients received 2 to 3 L/min oxygen from nasal prong throughout surgery. Blood pressure and heart rate were monitored at ward, before SA and after spinal anesthesia and at 5 min interval till completion of the operation.

Severe preeclampsia

Is the development of hypertension characterized by systolic blood pressure exceeding 160 mmHg and/or diastolic blood pressure exceeding 110 mmHg, together with proteinuria (>5 g/24 h) after 20 weeks of gestation (Leeman and Fontaine, 2008).

Ethical statement

Ethical clearance was obtained from Research Ethical Review Board of Addis Ababa University (AAU), permission to conduct the study was obtained from the clinical service director of Tikur Anbessa Specialized hospital prior to data collection. Participant records were treated anonymously and only accessed by research team; hence, confidentiality of participants' records and privacy of the health facility were secured.

RESULTS

Socio demographic characteristics of respondents

A total of 170 patients' document was reviewed based on the eligibility criteria and availability of the documents. The mean age of the study subjects were 28.18 years and SD= ± 4.66 years, the median age is 28 years (IQR: 25-30). Majority of the cases 129 (78.7%) were from urban and the rest 34 (20.7%) are from rural areas. Regarding marital status, 153 (96.8%) were married and 5 (3.2%) were unmarried (Tables 1 and 2).

Obstetric characteristics

Clinical characteristics

Majority 152 (91%) of the cesarean sections (C/S) were emergency C/S and the rest 15 (9%) were elective C/S. 78 (46.7%) of the parturient were operated under general anesthesia and 89 (53.3%) were under spinal anesthesia. 130 (83.9%) of operators were resident (GP) and the rest 25 (16.1%) were senior gynecology and obstetrics surgeons.

Comparison of the maternal outcomes under either spinal or general anesthesia

Out of the total study subjects, 78 (46.7%) were operated under general anesthesia and 89 (53.3%) were under spinal anesthesia. Mean age of mothers was 28.2 ± 4.5 vs. 28.1 ± 4.8 years in general and spinal anesthesia groups, respectively. None of the patients had post operative complication in both groups. Mean days of hospital stay after C/S in both groups is comparable. None of the mothers died after C/S in both groups. There is no significant difference between GA and SA groups in terms of post operative complication, days of hospital stay, and death (Tables 3 and 4).

Comparison of maternal vital signs under GA vs. SA

Comparison of pulse rate

The mean pulse rate of mothers at ward and before

Table 1. Socio demographic characteristics of preeclamptic women underwent C/S at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, from 2014 to 2016.

Variable		GA (%)	SA (%)	P-value
Marital status	Married	67 (44.7)	83 (55.3)	1
	Unmarried	4 (80)	1 (20)	0.1
Age	<20	1 (50)	1 (50)	1
	20-34	70 (47.3)	78 (52.7)	0.9
	≥35	7 (41.2)	10 (58.8)	0.8
Residence	Urban	55 (44)	70 (56)	1
	Rural	17 (50)	17 (50)	0.5

Table 2. Comparison of obstetric characteristics of preeclamptic women underwent C/S At Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, From 2014 To 2016.

Obstetric history		GA (%)	SA (%)	P-value
Parity	Nullipara	35 (46.7)	40 (53.3)	1
	1-4	38 (46.3)	44 (53.7)	0.93
	≥5	1 (50)	1 (50)	1
Gestational age	<37 weeks	10 (71.4)	4 (28.6)	1
	37-40 weeks	67 (44.7)	83 (55.3)	0.38
ANC follow up	Yes	59 (47.2)	66 (52.8)	1
	No	13 (41.9)	18 (58.1)	0.68
Referred from another health institution	Yes	22 (55)	18 (45)	1
	No	54 (44.6)	67 (55.4)	0.42
Had Previous history of C/S	Yes	8 (44.4)	10 (55.6)	1
	No	146	89	0.47

Table 3. Comparison of clinical characteristics of preeclamptic women underwent C/S at Tikur Anbessa Specialized hospital, Addis Ababa, Ethiopia, from 2014 to 2016.

Clinical characteristics		GA	SA	P-value
Type of C/S	Elective	4 (26.7)	11 (73.3)	0.098
	Emergency	74 (49)	77 (51)	1
Operator status	Senior	12 (50)	12 (50)	1
	Resident(GP)	58 (45.3)	70 (54.7)	0.67
Anti-hypertensive treatment used for preeclampsia	Hydralazine	44 (48.4)	47 (51.6)	0.94
	Labetalol	0 (0)	2 (100)	0.99
	Nifedipine	0 (0)	5 (100)	0.99
	Methyldopa	2 (50)	2 (50)	1
Anti convulsant treatment used for preeclampsia	Magnesium sulfate	25 (52.1)	23 (47.9)	0.53
	Diazepam	1 (33.3)	2 (66.7)	1

Table 4. Comparison of maternal outcome, among preeclamptic women underwent C/S, under GA and SA, at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, from 2014 to 2016.

Variable	Type of anesthesia		
	General (%), n=78	Spinal (%), n=89	P-value
Mean age	28.2+4.5	28.1+4.8	0.86
Post-operative complication	Yes	0 (0)	1
	No	78 (100)	89 (100)
Days of hospital stay	4-7 days	57 (75)	1
	≥7 days	1 (1.3)	0 (0)
Maternal outcome at discharge from hospital	Alive	78 (100)	1
	Dead	0 (0)	0 (0)

induction in GA vs. SA groups had no statistically significant difference. The mean pulse rate after induction and throughout intra operative period is significantly higher among GA group when compared with SA (Table 5).

Comparison of blood pressure

Despite the mean blood pressure of mothers at ward and before induction in GA vs. SA groups, there was no significant difference; the mean blood pressure after induction and throughout intra operative period is significantly higher among GA group than SA group (Table 5).

DISCUSSION

This study aimed to compare the outcome of preeclamptic women who gave birth through cesarean section, under either general or spinal anesthesia.

In the present study, 89 patients were administered spinal anesthesia and 78 patients received general anesthesia for cesarean section with a diagnosis of severe preeclampsia.

The present finding shows that both general and spinal anesthesia has no difference in terms of maternal survival status at discharge from the hospital. This finding is in line with previous studies study conducted in Jordan that there is no significant difference among both spinal and general anesthesia in terms of maternal outcome (Qublan et al., 2001). This finding is contrary to the retrospective study in Pakistan which found higher maternal mortality among GA group than SA group (Ahsan-UI-Haq, 2004). This variation could be explained by the fact that there is no reported death in both groups of patients in our the present retrospective study during the study period and pertaining to morbidity might be less

reported as they are not recorded on the patient documented and there may be trends of reporting less morbidity report.

The mean pulse rate, mean systolic blood pressure, and mean diastolic blood pressure of parturient before induction of anesthesia had no statistically significant difference ($p>0.05$). This result revealed homogeneity of hemodynamic status in both groups; this could be very favorable to compare the effect of both anesthesia types on the vital signs of patients.

The mean pulse rate, mean systolic blood pressure, and mean diastolic blood pressure after induction and throughout intra operative period is significantly higher for patients that underwent caesarean delivery under general anesthesia when compared with those operated under spinal anesthesia ($p<0.05$). This result shows GA groups had relatively elevated pulse rate and blood pressure when compared with SA group. This finding is in line with prospective study conducted in India, retrospective study conducted in Pakistan and randomized controlled study conducted in India which found prevalence of uncontrolled hypertension and tachycardia to be higher among GA group when compared with SA group (Ahsan-UI-Haq, 2004; Chattopadhyay et al., 2014; Denu et al., 2015). This result could be explained by the exaggerated response of patients' to laryngoscopy after intubation of endotracheal tube. Hypotension was treated with conventional treatment using IV fluid therapy and hypertension was controlled with hydralazin or nifedipine. It was observed that although intra operative haemodynamic changes during SA and GA had statistically significant difference but clinically these were acceptable and manageable and did not have any deleterious effect on the patients of both groups.

Conclusion

The present study revealed that maternal outcomes such

Table 5. Comparison of maternal vital signs, among preeclamptic women underwent C/S, under GA and SA, at Tikur Anbessa Specialized hospital, Addis Ababa, Ethiopia, from 2014 to 2016.

Variable	General	Spinal	95% CI of mean difference	p-value	
Pulse rate	Mean Base line pulse rate at ward	97.04±9.14	93.78±11.85	3.25 (-0.038-6.52)	0.053
	Mean Pulse rate before induction	98.97±7.45	95.66±8.85	3.32 (-0.64-7.28)	0.09
	Mean Pulse rate after induction/SA	103.19±10.55	92.83±12.32	10.36 (4.1-16.6)	0.002*
	Mean 10th minute pulse rate	99.66±9.63	88.93±9.69	10.73 (7.70-13.76)	<0.001*
	Mean 15th minute pulse rate	89.74±5.62	73.64±8.72	16.1 (10.89-21.3)	<0.001*
	Mean 20th minute pulse rate	96±8.5	84±9.2	11.53 (8.7-14.3)	<0.001*
	Mean 25th minute pulse rate	95.75±8.5	78.5±9.2	17.2 (12.2-22.2)	<0.001*
	Mean 60th minute pulse rate	90.05±5.7	82.67±6.9	7.38 (5.4-9.36)	<0.001*
	Mean 30th minute pulse rate	93.12±6.88	82.62±8.66	7.9 (5.9-10.04)	<0.001*
	Mean 60th minute pulse rate	90.05±5.78	82.67±6.98	7.38 (5.4-9.36)	<0.001*
Systolic blood pressure	Mean Baseline systolic BP at ward	153.68±12.26	149.76±13.85	3.92 (-0.12-7.9)	0.057
	Mean Systolic BP before induction	154.54±19.34	151.23±12.38	3.31 (-0.410.7)	0.37
	Mean Systolic BP after induction	162.27±12.34	144.93±12.76	17.33 (10.53-24.1)	<0.001*
	Mean systolic BP 5th minute	162.7±14	147.6±15.7	15.1 (5.92-24.29)	0.002*
	Mean systolic BP 10th minute	157.8±12.7	137.7±13.3	20 (16-24.17)	<0.001*
	Mean systolic BP 15th minute	150.5±16.8	131.1±17	19.36 (8.8-29.9)	<0.001*
	Mean systolic BP 20th minute	148.9±11.3	127.6±12.6	21.38 (17.6-25.12)	<0.001*
	Mean systolic BP 30th minute	141.5±11.9	119.6±13	21.88 (17.9-25.7)	<0.001*
Mean systolic BP 60th minute	134.7±9.6	122.7±10.5	12 (8.9-15.1)	<0.001*	
Diastolic blood pressure	Mean Baseline diastolic BP at ward	93.18±8.3	91.61±8.37	1.57 (-0.9-4.1)	0.22
	Mean Diastolic BP before induction	97.64±7.67	92.54±9.24	5.1 (1.33-8.86)	0.009*
	Mean Diastolic BP after induction	96.54±18.72	88.76±8.84	7.78 (-0.006-15.5)	0.05
	Mean 10th minute diastolic BP	92.77±12.74	81.4±8.9	11.37 (8.74-14.00)	<0.001*
	Mean 20th minute diastolic BP	86.5±6.3	73.07±8.6	13.49 (11.09-15.88)	<0.001*
	Mean 30th minute diastolic BP	82.18±9.71	67.63±8.43	14.55 (11.74-17.35)	<0.001*
	Mean 60th minute diastolic BP	78.24±11.2	71.64±11.28	6.60 (3.13-10.06)	<0.001*

*Significant at p<0.05.

as post operative complication, days of hospital stay, and maternal survival at discharge, have no statistically significant difference in both spinal and general anesthesia groups. General as well as spinal anesthetic techniques are acceptable for caesarean delivery in pregnancies complicated by severe preeclampsia if steps are taken to ensure a careful approach to either method. Spinal anesthesia could be considered as first choice for severe preeclamptic patients, associated with less intraoperative hypertension.

RECOMMENDATION

This study is recommended with strong design to be conducted in the area to come up with strong evidences.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

Abbreviations:

AAU, Addis Ababa University; **CI**, confidence interval; **CS**, caesarian section; **DBP**, diastolic blood pressure; **EDHS**, Ethiopia demographic and health survey; **EMONC**, Ethiopian emergency obstetric and newborn care; **GA**, general anesthesia; **HELLP**, hemolysis elevated liver enzymes and low platelet count; **ICU**, intensive care unit; **MCH**, maternal and child health; **SA**, spinal anesthesia; **SBP**, systolic blood pressure; **SNNPR**, South Nation Nationality People Region; **SPSS**, statistical package for social science; **WHO**, World Health Organization.

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