



**ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES
DEPARTMENT OF ANESTHESIA**

**COMPARATIVE STUDY OF MATERNAL OUTCOME FOLLOWING
CAESARIAN DELIVERY IN PREECLAMPTIC WOMEN UNDER
GENERAL AND SPINAL ANESTHESIA IN BLACK LION SPECIALIZED
HOSPITAL, ADDIS ABABA**

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**A THESIS SUBMITTED TO SCHOOL OF GRADUATE STUDIES OF
ADDIS ABABA UNIVERSITY, IN PARTIAL FULFILMENT OF THE
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JUNE, 2017

ADDIS ABABA, ETHIOPIA

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University in partial fulfillment of the requirements for the degree
of masters of Science in Anesthesia in department of anesthesia.**

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Acronyms

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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Abstract

INTRODUCTION: Opinions are controversial regarding the use of General and spinal anesthesia in preeclamptic or eclamptic patients undergoing caesarean section. Several studies recommended avoiding Spinal anesthesia in preeclamptic patients because of concern for sudden severe hypotension. However, other studies also support the use of spinal anesthesia as first choice reasoning less post-operative morbidity and mortality.

OBJECTIVE: To determine and compare maternal outcome among preeclamptic women after caesarian delivery under general and spinal anesthesia in Black lion Specialized Hospital, Addis Ababa, Ethiopia.

METHODS: Hospital based retrospective comparative cross sectional study was used to compare maternal outcome. All preeclamptic mothers that underwent Caesarian Section in Obstetrics and gynecology ward, Black Lion Referral 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 cleaning was done on SPSS version 20. Result is explained using frequency tables, graphs and descriptive summaries. Independent sample T-test 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.

RESULT: A total of 170 patients' document was reviewed depending on the eligibility criteria and availability of the documents. The mean age of study subjects were 28.18 years and $SD = \pm 4.66$ years, the median age is 28 years (IQR: 25-30). Present finding shows that both general and spinal anesthesia has no difference in terms of maternal survival status, days of hospital stay, post-operative admission to ICU, and post-operative complications. But this study found statistically significant higher post operative blood pressure and pulse rate among GA group when compared with SA group.

Conclusion: In conclusion SA is safer than GA in terms of stable vital signs among preeclamptic women.

1. INTRODUCTION

1.1 Background

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%–8% of pregnancies (1). World Health Organization (WHO) estimates that the incidence of preeclampsia is 7 times higher in low- and middle-income countries than in high-income countries, and the risk of a woman in a low-income country dying of pre-eclampsia/eclampsia is 300 times that of a woman in a high-income country (2,3). Pre-eclampsia/eclampsia is responsible for an estimated 16% of global maternal mortality (or 63 000 maternal deaths) annually (4).

According to World Health Organization (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) showed that preeclampsia contributed for 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 (6). A maternal mortality trend analysis showed an increasing trend of preeclampsia in Ethiopia (7).

Cesarean Section is one of the lifesaving surgical intervention attribute to the decrease of maternal and perinatal mortality and morbidity. The frequency of cesarean section births continues to steadily rise worldwide (8). According to Demographic Health Survey, 1990-2014, 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%-27% (9).

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 high rates of maternal and perinatal mortality and morbidity (10). 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 (11).

1.2 Statement of the problem

In Ethiopia, the national population based cesarean delivery rate is 0.6% with variation between the regions from 0.2% to 9 % (12). The CS rate in some specified hospitals of the areas such as Mizan Aman and Attat Hospital in South Nation Nationality People Region (SNNPR) is 21.1% and 27.6% respectively (13,14). Study conducted in Eastern part of Ethiopia also determines 34.3% prevalence of CS in Harrar Hospitals of which 26.6% accounts Public Hospitals (16). The prevalence of CS in Addis Ababa determined to be 31.1% as compared with 58.7% in Private/Non-Governmental Hospitals (12).

Women with preeclampsia have an increased rate of cesarean section consequent upon the high incidence of intrauterine growth restriction, fetal distress, and prematurity (16). Cesarean section on the other hand increases the risk of cardiopulmonary morbidity associated with preeclampsia (17). This is due to the altered hemodynamic in women with preeclampsia, particularly in an emergent situation. This risk is present with both spinal and general anesthesia (GA) and continues to challenge anesthetists worldwide (18).

Anesthetic management of pre-eclampsia patients remains a challenge. GA as well as spinal anesthesia (SA), has been shown to be acceptable and safe methods for conducting cesarean deliveries in preeclampsia, if steps are taken to ensure a careful approach to either technique (16). Although general anesthesia can be used safely in preeclampsia women, it is associated 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 pressor response to laryngoscopy and intubation (19).

Opinions are controversial regarding the use of spinal anesthesia in pre-eclamptic or eclamptic patients undergoing caesarean section. Several studies recommended avoiding Spinal anesthesia in preeclamptic patients because of concern for sudden severe hypotension (21, 22). A report from India suggests that ideal anesthesia for eclampsia remains unknown but that General anesthesia can produce favorable outcomes with lower perinatal mortality. In emergency cesarean section, general anesthesia is the better choice because of the lowest incidence of hypotension (22). Spinal anesthesia is controversial only in terms of hemodynamic compromise that it is believed to cause in preeclampsia (21)

Fifteen years (1996-2010) obstetric anesthesia trend analysis at Gondar University Hospital determined that GA is still a predominant anesthetic technique (65.6%) as compared with SA that accounts 34.4%(23).Considering the anesthetic dilemma of using GA versus SA for pre-eclamptic patients, predominance of GA technique and its associated maternal morbidity, mortality and limited studied on the pascals for comparison of maternal outcome among pre-eclamptic patients that underwent caesarian section under general and spinal anesthesia in Ethiopia. It is very important to know the types of Anesthesia with better maternal outcomes despite the risks and benefits of each type of Anesthesia.

1.3 Significance of the study

The study aim to benefit the following;

1. This study will provide information on the magnitude of maternal complications among pre-eclamptic mothers that underwent cesarean section under GA and SA
2. It also compare maternal outcome among pre-eclamptic patients that underwent cesarean section under GA and SA
3. The finding of this study will benefit service providers and Hospital Administrators by providing important information for decision making on preferred anesthesia choice and utilization.
4. It promote further knowledge or research about this particular area

2. LITERATURE REVIEW

2.1 What is preeclampsia?

Preeclampsia is a multi-systemic disorder characterized by hypertension and new-onset of proteinuria which develops after the 20th week of pregnancy (24). It is clearly defined as gestational hypertension [systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg] after 20 weeks of gestation plus the presence of proteinuria in previously normotensive women (5).

Major maternal risks of severe preeclampsia includes: eclampsia, abruption, progression to HELLP(hemolysis, elevated liver enzymes, and low platelet count) syndrome and its complication, disseminated intravascular coagulation, pulmonary edema, acute renal failure, hepatic rupture, post-partum hemorrhage and anesthesia complication. The etiology of pre-eclamptic disease is unknown, and no disease specific therapy or preventive approach is available (25).

Institutional care with close maternal monitoring; prevention and control of seizures through the use of anticonvulsants; treatment of severe hypertension; and timely termination of pregnancy reduce maternal mortality and serious morbidity. Until the cause of pre-eclampsia is identified and specific therapy made available, these symptomatic management approaches offer the only option for reducing maternal and perinatal mortality ascribed to the syndrome (24).

Caesarean section (CS) is the procedure where a baby is delivered through an incision on the abdominal wall and uterus of the mother under general or spinal Anesthesia (26). It is one of the lifesaving surgical interventions attributed to the decrease of maternal and perinatal mortality and morbidity. The safety of CS operation has improved with time, largely due to improved surgical and anesthetic techniques as well as the availability of blood transfusion services and broader choices of antibiotics. As any surgical procedure, it is associated with a variety of short and long term complications relating to anesthesia (27).

2.2 Trends of General versus Spinal anesthesia

The choice of anesthesia for any caesarean section depends on multiple factors like the indication of surgery, the urgency of the operation, and patient's as well as surgeon's desire. Anesthetist always choose the method that is believed to be safest and most comfortable for the mother, least depressant to the newborn and provides the optimal working conditions for the obstetrician(28).

For many years, general anesthesia was the preferred type for use in cesarean procedures (29). Although it has many advantages, such as faster induction, better cardiovascular stability with lower incidence of hypotension, and good control over ventilation, use of anesthetic drugs that cross the placental barrier can nevertheless produce neonatal depression (29). Moreover, complications such as maternal aspiration syndrome and intubation failure, which may occur during general anesthesia and contribute towards maternal mortality, have been reported (30).

Spinal anesthesia for caesarean section is an old and well established method. It was first used in obstetrics in 1901 for pain relief during vaginal delivery and also became popular for caesarean delivery because of its rapid onset and a high frequency of successful blockade. The development of thinner spinal needles and better local anesthetic agents like bupivacaine for subarachnoid use, and more knowledge of the path physiology of hypotension may have contributed to a rising popularity of spinal anesthesia (31). Recently, the rates of cesarean section using regional anesthesia have been increasing and regional anesthesia has now become the preferred anesthetic technique for avoiding both maternal and fetal complications (11).

There are several reasons for preferring spinal anesthesia for cesarean sections. Babies born to mothers having spinal anesthesia may be more alert and less sedated as they have not received any general anesthetic agents through the placental circulation (32). As the mother's airway is not compromised, there is a reduced risk of aspiration of gastric contents causing chemical pneumonitis. The onset of block is faster and quality of anesthesia is generally superior with spinal anesthesia and requires less equipment and training and more importantly less time to perform compared to epidural and combined spinal epidural anesthesia, particularly in an emergency setting. Regional anesthesia is usually considered safer, although cases must be assessed on an individual basis. The small doses of local anesthetics required to perform spinal anesthesia also reduce the risks of systemic toxicity compared to general anesthesia (20).

Anesthesiologists are more likely to encounter a difficult airway in a severely preeclamptic patient. Furthermore the hazards related to the hemodynamic consequences of laryngoscope and tracheal intubations in a severely preeclamptic patient are very much obvious (33). So, general anesthesia in such patients may be resorted to only when regional anesthesia is contraindicated. Although spinal anesthesia has been usually avoided in these patients because of the risk of precipitous fall in BP and severe hypotension, and epidural anesthesia preferred, several studies are now available that show that the hemodynamic effects of spinal and epidural anesthesia are almost similar (20, 33). Recent studies have indicated that SA may be an appropriate anesthetic choice for women with severe preeclampsia having a cesarean delivery. Furthermore, owing to its simplicity, reliability and rapidity, SA may be considered as an alternative to GA for emergency cesarean delivery in preeclamptic women (34).

2.3 General situation about the study

Previous data showed that use of spinal anesthesia was controversial in preeclamptic patients - the anticipated potential risks of pulmonary edema, profound cardiovascular instability, possibly from a fall in cardiac output, and the consequent recourse to Intravenous fluids and vasoconstrictors, suggested that it was not a technique to be recommended in preeclampsia. However during the last decade, after the advent of pencil point spinal needles and newer local anesthetic agents, it has been tried with favorable results. In most of the obstetrical centers it is now being used as anesthesia of first choice for pre-eclamptic patients (35).

A prospective observational study conducted in India compared the effects of general and spinal anesthesia in 173 severe preeclamptic women undergoing emergency CS. Subgroup analysis shows that 22.2% of patients given GA developed pulmonary edema and 14.8% in this group had uncontrolled hypertension as compared with (5.2% each) in patients receiving SA. Overall 44.4% of patients in GA group required critical care at any point of time compared to 7.5% in SA group, $P < 0.001$). Patients receiving GA had a higher mortality (25.9% versus 1.4%; $P < 0.001$). The length of hospital stay was comparable. The study concludes that, Spinal anesthesia is a safer alternative to general anesthesia in severe preeclampsia with less postoperative morbidity and mortality (18).

A retrospective comparative study conducted in Pakistan among 60 preeclamptic women who underwent caesarian delivery stated the incidence of intra-operative and postoperative hypotension was high in SA group(33.3% and 13.2% respectively) as compared with GA with significant level of P Value<0.05. In contrast intra-operative and postoperative hypertension observed to be high in GA group(66.6% and 16.6 % respectively) as compared to 6.6% and 3.3% in SA group (P<0.05).Significant difference was reported in Heart rates in both groups. Postoperative complications were significantly ($p<0.05$) more common in GA group (66.7% versus 16.6%) as compared to SA group. Admission ratio in ICU and total hospital stay, GA versus SA group was 4:1 and 2:1 respectively. Maternal mortality was more in GA group 6.6% as compared to 0% in SA group (20).

A randomized study conducted in India among 60 parturient with severe pre-eclampsia who underwent CS also support the use of spinal anesthesia as first choice reasoning less post-operative morbidity and mortality. In the study significant difference observed in Intraoperative hypertension which was 73.3% in GA group as compared with 6.6% in SA group (P value<0.05). The incidence of tachycardia was higher in GA group (73.3%) as compared with 33.3%in SA group (P value <0.05). Post-operative complication and admission to ICU was higher (50%) among GA group versus 16.6% in SA group (P Value<0.05). Significant difference was observed in days in Hospital stay among the two groups ranges 7-15 days among GA groups as compared with 4-10 days in SA groups with P Value< 0.05(35).In addition to better maternal out comes, regional anesthesia is associated with less cost to the hospital, less charge to the patient and better client satisfaction to the service due to good post-operative analgesia without additional analgesics (23).

3. OBJECTIVE OF THE STUDY

3.1 General objective

To determine and compare maternal outcome among preeclamptic women following caesarian delivery under general and spinal anesthesia in Black lion Specialized Hospital, Addis Ababa, Ethiopia.

3.2 Specific objectives

- To determine maternal outcome among preeclamptic women following caesarian delivery under general anesthesia in Black lion Specialized Hospital, Addis Ababa, Ethiopia
- To determine maternal outcome among preeclamptic women following caesarian delivery under spinal anesthesia in Black lion Specialized Hospital, Addis Ababa, Ethiopia
- To compare maternal outcome among preeclamptic women following caesarian delivery under general and spinal anesthesia in Black lion Specialized Hospital, Addis Ababa, Ethiopia.

4. MATERIAL AND METHODS

4.1 Study design

A hospital based comparative cross sectional study was used to compare maternal outcome following caesarian delivery in preeclamptic women under general and spinal anesthesia in Black Lion Referral Specialized Hospital.

4.2 Study area and period

This study is carried out in Addis Ababa from November to December; 2016G.C. Addis Ababa is the capital city of Ethiopia. It is the largest city in Ethiopia, with a population of 3,384,569 according to the 2007 population census. It lays at an altitude of 7,546 feet (2,300 meters) above sea level in the southern periphery, the city rises to over 9,800 feet (3,000 meters) in the north. It has 11 government hospitals and 86 health centers in the city. The study is conducted in Tikur Anbessa Specialized Hospital, which is tertiary referral, teaching hospital and the largest of all public hospitals in Addis Ababa. 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 (33).

4.3 Description of population

4.3.1. Source population

The source population comprises all preeclamptic women that underwent CS in Obstetrics and gynecology ward of Black Lion referral specialized Hospital from October 2014 to October 2016.

4.3.2. Study population

Study population comprises all preeclamptic mothers that underwent CS with GA & SA in Obstetrics and gynecology ward of Black Lion referral specialized Hospital from October 2014 to October 2016.

4.3.3 Inclusion and exclusion criteria

Inclusion criteria: All preeclamptic mothers admitted in Obstetrics and gynecology ward, Black Lion Referral Specialized Hospital from October 2014 to October 2016 was included in the study.

Exclusion criteria: To restrict the study to address only the outcome of GA and SA and avoid coexistence of other health conditions those may influence the outcome, the followings were excluded from the study. The excluded were, Preeclamptic mothers who have known history of

cardio vascular and pulmonary disease, Diabetes, HELLP syndrome, Gestational age <34weeks, Fetal bradycardia and any contraindications of regional anesthesia including patients refusal, severe hemorrhage, coagulopathy and sepsis and who have other cause of edema. Mothers also who does not have complete records on their charts like operation sheet, anesthesia sheet, socio demographic characteristics data's was excluded from the study for better interpretation of the results.

4.4 Sample size determination

All pre-eclamptic mothers that underwent CS in Obstetrics and gynecology ward, Tikur Anbessa Specialized Hospital from October 2014 to October 2016 was included in the study.

4.5 Sampling procedures

First all mother with pre-eclampsia under gone CS for intervention with GA and SA was selected by the principal investigator from CS registration book by counting cases that were enrolled between October 2014 and October 2016. Then the severe preeclamptic mothers who underwent CS were selected from CS registration book and then patient card was collected. The registration book was cross checked with the collected patient's card from card room using card number and cases which are eligible was included in the sample. The necessary information was recorded by using checklist format.

4.6 . 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 was collected after taking the selected patient card from card store.

4.7 Data Analysis procedures

The Collected data was cleaned, coded, entered in to SPSS version 20 statistical software for analysis. Data checked for completeness and consistency. Frequency tables, graphs were used to describe the study variables. Independent sample T-test was applied to see whether there is significant difference in outcome between spinal and general anesthesia. The significant level is declared at $P \text{ value} < 0.05$.

4.8 Data Quality

For data quality control data collection tool was adopted from relevant 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 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.

4.9 Definition of variables

4.9.1 Dependent variable:

- Intra and post operation complication
- Hypotension, hypertension, tachycardia,
- bradycardia, Admission in ICU,
- Length of stay in Hospital and death

4.9.2 Independent variables:

- Demographic characteristics
- Type of anesthesia administered
- Age, marital status, address, weight,
- height, Body Mass Index
- Reproductive Health characteristics
- Gravidity, Parity, Gestational age,
- ANC follow up

4.9 Operational definition

Maternal outcome – The incidence of pre and post-operative morbidity, mortality and admission in ICU.

Maternal Morbidity- The incidence of pre and post-operative hypotension, hypertension Change in Heart rate and post-operative complication.

Hypotension: - Twenty five percent fall in blood pressure (BP) from the baseline

Hypertension: - Twenty five percent rise in blood pressure (BP) from the baseline

Bradycardia: - 25% fall in heart rate (HR) from the base line

Tachycardia: - 25% raise in heart rate (HR) from the base line

4.11 Ethical consideration

Ethical clearance was obtained from ethical Review Board of Addis Ababa University (AAU), permission and letter of cooperation for the Black lion Referral Specialized Hospital obtained from school of anesthesia. Objective of the study was explained and permission was obtained from the clinical service coordinator of the hospital. Participant records were coded and only accessed by research team; hence confidentiality of participant records and privacy of the health facility was secured.

4.12 Dissemination of the result

The finding of the study will be submitted in a form of a thesis to AAU College of Health Science, Department of anesthesiology. The result will be publicly defended following submission. Copies will be provided to relevant stakeholders. Efforts will be made to present the results in scientific conferences and to publish in reputable journals.

5. RESULT

1. SOCIO DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

A total of 170 patients' document was reviewed depending on the eligibility criteria and availability of the documents. The mean age of study subjects were 28.18 years and $SD = \pm 4.66$ 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 (**table 1**).

Table 1: socio demographic characteristics of preeclamptic women underwent C/S at TikurAnbessa Specialized hospital, Addis Ababa, Ethiopia, from 2014 to 2016.

Variables		GA	SA
Marital status	Married	67(44.7%)	83(55.3%)
	Unmarried	4(80%)	1(20%)
Age	<20	1(50%)	1(50%)
	20-34	70(47.3%)	78(52.7%)
	>=35	7(41.2%)	10(58.8%)
Residence	Urban	55(44%)	70(56%)
	Rural	17(50%)	17(50%)

OBSTETRIC CHARACTERISTICS

Obstetric characteristics of the preeclamptic mothers underwent C/S listed in Table 2 below.
(Table 2).

Table 2: Obstetric characteristics of preeclamptic women underwent C/S at TikurAnbessa Specialized hospital, Addis Ababa, Ethiopia, from 2014 to 2016

Obstetric history		GA	SA
Parity	Nullipara	35(46.7%)	40(53.3%)
	1-4	38(46.3%)	44(53.7%)
	>=5	1(50%)	1(50%)
Gestational age	<37 weeks	10(71.4%)	4(28.6%)
	37-40 weeks	67(44.7%)	83(55.3%)
ANC follow up	Yes	59(47.2%)	66(52.8%)
	No	13(41.9%)	18(58.1%)
Referral status on arrival	Yes	22(55%)	18(45%)
	No	54(44.6%)	67(55.4%)
Previous history of C/S	Yes	8(44.4%)	10(55.6%)
	No	146	89

CLINICAL CHARACTERISTICS

Majority 152(91%) of the Cesarean sections(C/S) was emergency C/S and the rest 15(9%) were elective C/S. Regarding type of anesthesia; 78(46.7%) underwent General Anesthesia, and 89(53.3%) underwent spinal anesthesia. Majority 130(83.9%) of operators were resident (GP), the rest 25(16.1%) were senior gynecology and obstetrics surgeons. None of the mothers developed post complication, and none of the maternal death were documented until discharge from the hospital.

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

Clinical characteristics		GA	SA
Type of C/S	Elective	4(26.7%)	11(73.3%)
	Emergency	74(49%)	77(51%)
Operator status	Senior	12(50%)	12(50%)
	Resident(GP)	58(45.3%)	70(54.7%)
Antihypertensive treatment used for preeclampsia	Hydralazine	44(48.4%)	47(51.6%)
	Labetalol	0(0%)	2(100%)
Anticonvulsant/sedative used	Nifedipine	0(0%)	5(100%)
	Methyldopa	2(50%)	2(50%)
	Magnesium sulfate	25(52.1%)	23(47.9%)
	Diazepam	1(33.3%)	2(66.7%)

Comparison of the maternal outcomes under either spinal or general anesthesia

Out of the total study subjects 78(46.7%) operated under general anesthesia and 89(53.3%) operated under spinal anesthesia. Mean age of mothers was 28.2 ± 4.5 years 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 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 (table4).

Table 4: comparison of maternal outcome, among preeclamptic women underwent C/S, under GA and SA, at TikurAnbessa Specialized hospital, Addis Ababa, Ethiopia, from 2014 to 2016.

Variables		Type of anesthesia	
		General n=78	Spinal n=89
Mean age		28.2±4.5	28.1±4.8
Post-operative complication	Yes	0(0%)	0(0%)
	No	78(100%)	89(100%)
Days of hospital stay	48-72 hours	18(23.7%)	23(26.4%)
	4-7 days	57(75%)	64(73.6%)
	≥7 days	1(1.3%)	0(0%)
Maternal outcome at discharge from hospital	Alive	78(100%)	89(100%)
	Dead	0(0%)	0(0%)

Comparison of maternal vital signs under GA vs. SA

Comparison of pulse rate

The mean pulse rate of mothers at ward and before induction in GA vs. SA group had no statistically significant difference. The mean pulse rate after induction and throughout intra operative period is significantly higher among GA group when compared to SA (table 5, fig1).

Comparison of blood pressure

The mean blood pressure of mothers at ward, and before induction in GA vs.SA group had no significant difference. Although the mean blood pressure after induction, and throughout intra operative period is significantly higher among GA group than SA group (table 5, Fig2, Fig3)

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.

Variables		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 10 th minute pulse rate	99.66±9.63	88.93±9.69	10.73(7.70-13.76)	<0.001
	Mean 15 th minute pulse rate	89.74±5.62	73.64±8.72	16.1(10.89-21.3)	<0.001
	Mean 20 th minute pulse rate	96±8.5	84±9.2	11.53(8.7-14.3)	<0.001
	Mean 25 th minute pulse rate	95.75±8.5	78.5±9.2	17.2(12.2-22.2)	<0.001
	Mean 60 th minute pulse rate	90.05±5.7	82.67±6.9	7.38(5.4-9.36)	<0.001
	Mean 30 th minute pulse rate	93.12±6.88	82.62±8.66	7.9(5.9-10.04)	<0.001
	Mean 60 th 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 5 th minute	162.7±14	147.6±15.7	15.1(5.92-24.29)	0.002
	Mean systolic BP 10 th minute	157.8±12.7	137.7±13.3	20(16-24.17)	<0.001

	Mean systolic BP 15 th minute	150.5±16.8	131.1±17	19.36(8.8-29.9)	<0.001
	Mean systolic BP 20 th minute	148.9±11.3	127.6±12.6	21.38(17.6-25.12)	<0.001
	Mean systolic BP 30 th minute	141.5±11.9	119.6±13	21.88(17.9-25.7)	<0.001
	Mean systolic BP 60 th 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 10 th minute diastolic BP	92.77±12.74	81.4±8.9	11.37(8.74-14.00)	<0.001
	Mean 20 th minute diastolic BP	86.5±6.3	73.07±8.6	13.49(11.09-15.88)	<0.001
	Mean 30 th minute diastolic BP	82.18±9.71	67.63±8.43	14.55(11.74-17.35)	<0.001
	Mean 60 th minute diastolic BP	78.24±11.2	71.64±11.28	6.60(3.13-10.06)	<0.001

Comparison of pulse rate in both groups (GA vs. SA)

Mean pulse rates of mothers in general (GA) anesthesia is relatively higher than Spinal (SA) anesthesia group (fig1, fig2).

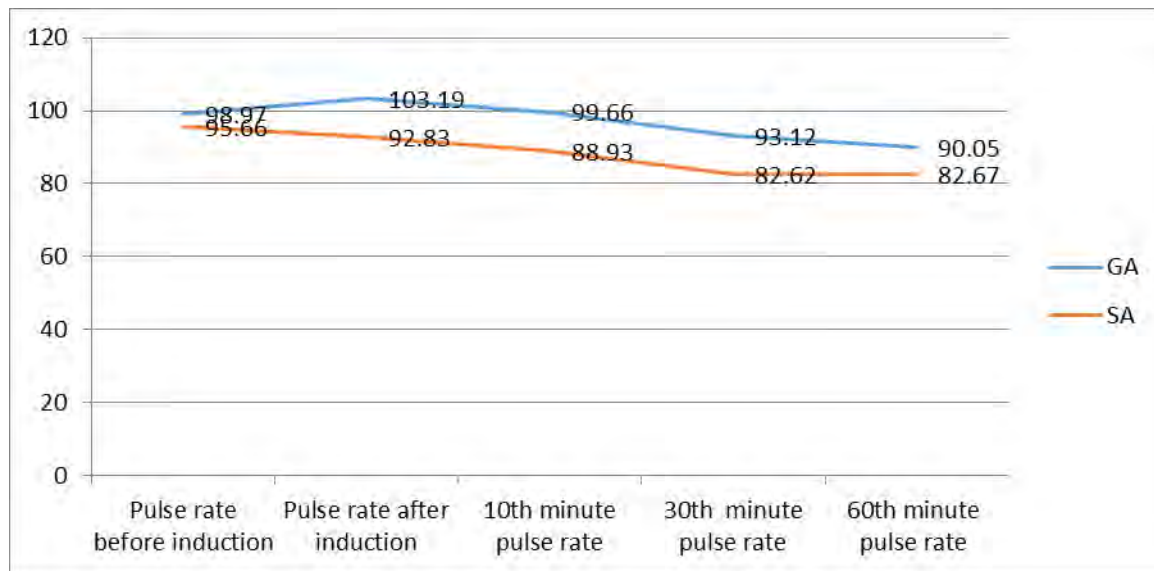


Fig 3: comparison of pulse rate of preeclamptic women underwent C/S, TikurAnbessa Specialized Hospital, Addis Ababa, Ethiopia, from 2014 to 2016.

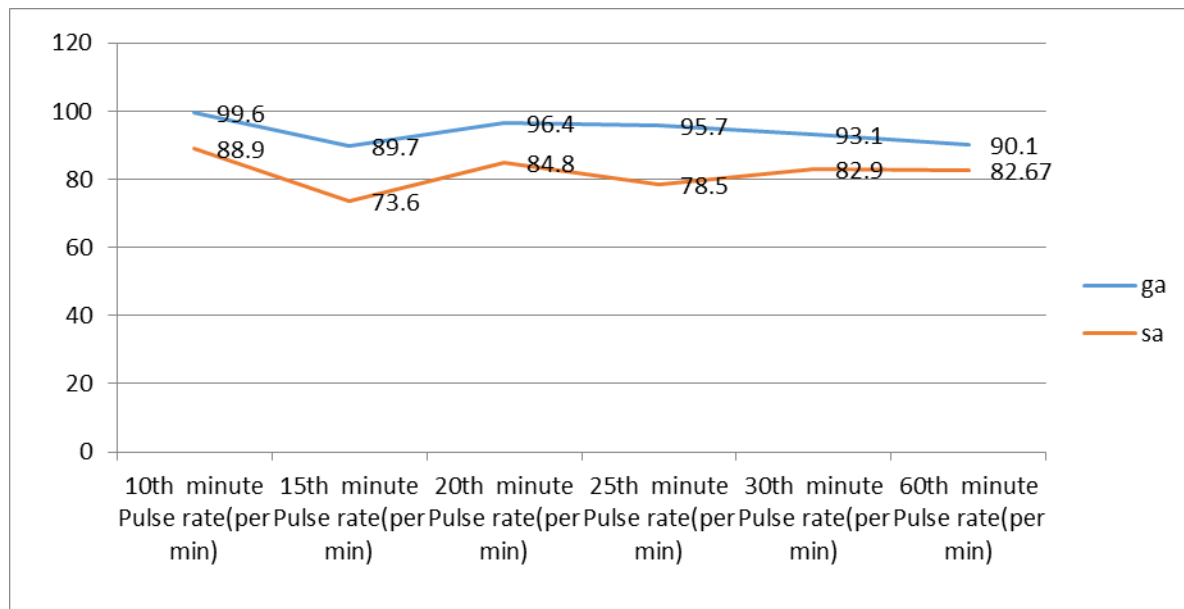


Fig 4: comparison of mean pulse among preeclamptic women underwent C/S, TikurAnbessa Specialized Hospital, Addis Ababa, Ethiopia, from 2014 to 2016.

Comparison of intra operative mean systolic blood pressure in both groups (GA vs. SA)

Intra operative mean systolic blood pressure is higher among GA groups than SA groups (fig3, fig4).

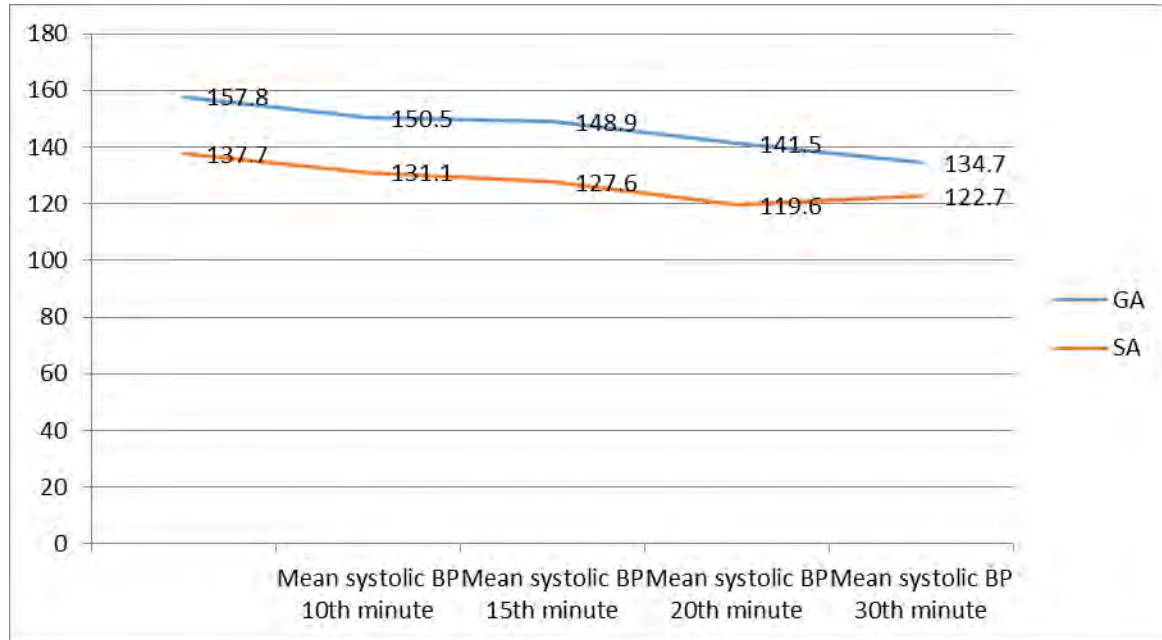


Fig 5: comparison of mean systolic blood pressure among preeclamptic women underwent C/S, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, from 2014 to 2016.

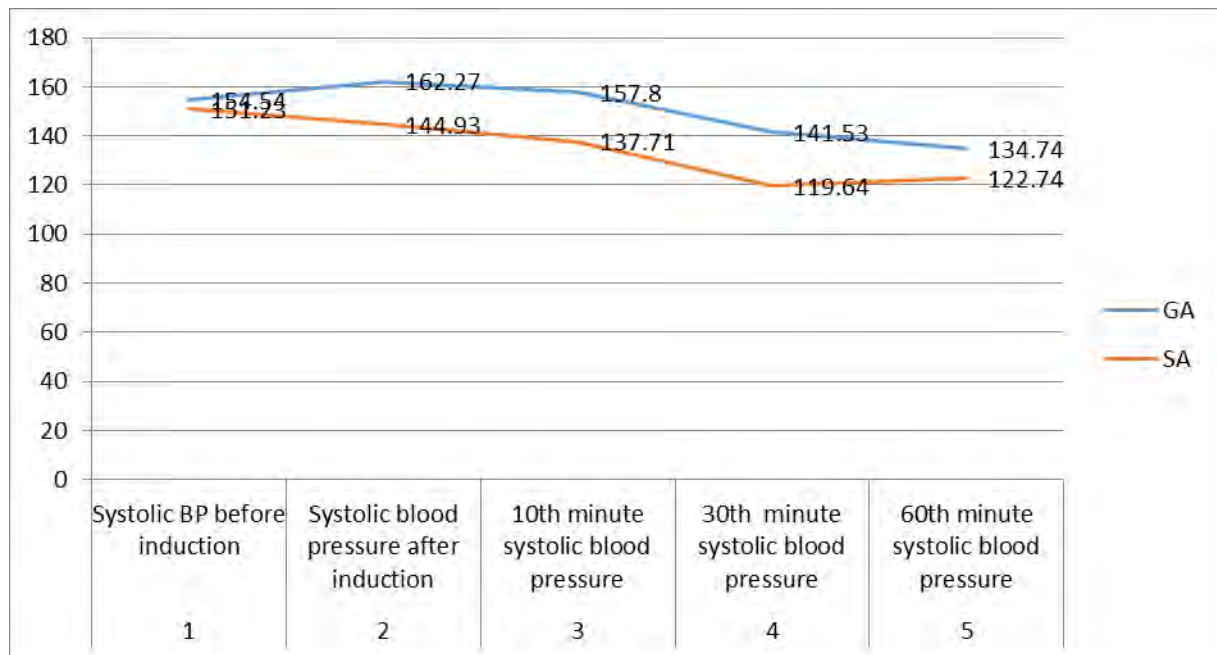


Fig 6: comparison of mean systolic blood pressure among preeclamptic women underwent C/S, TikurAnbessa Specialized Hospital, Addis Ababa, Ethiopia, from 2014 to 2016.

The trend of intra operative mean diastolic blood pressure is also higher among GA than SA groups (fig5).

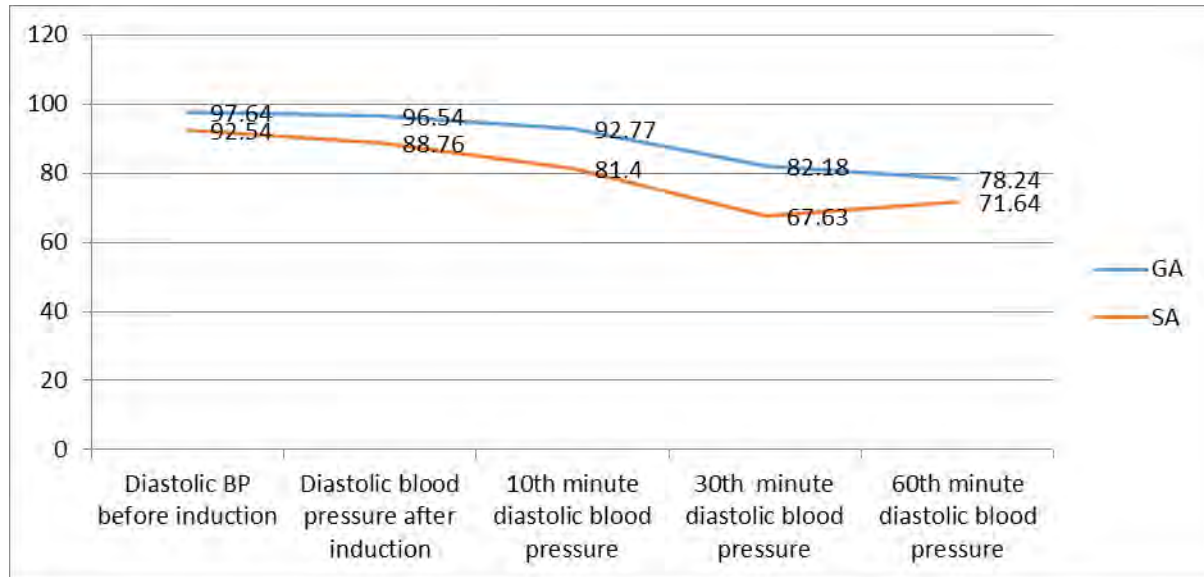


Fig 7: comparison of mean diastolic blood pressure among preeclamptic women underwent C/S, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, from 2014 to 2016.

6. Discussion

This study aimed to compare the outcome of preeclamptic women gave birth through cesarean section, under either general or spinal anesthesia. A total of 170 clients card were reviewed to collect data for the study.

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. This study tried to compare the outcomes of preeclamptic women both under general and spinal anesthesia.

The study found that the outcome under both types of anesthesia is comparable, the mean ages of respondents are comparable in both groups (28.2 vs 28.1) in general and spinal anesthesia group respectively.

Present finding shows that both general and spinal anesthesia has no difference in terms of maternal survival status. This finding is in line with study conducted in Jordan that there is no significant difference among both spinal and general anesthesia in terms of maternal outcome (37).

Present study shows that no significant difference in both groups in terms types of c/s, operator status, post op complications, ANC follow up, and previous history of C/S. This finding is in line with study conducted in Jordan (37).

The mean pulse rate, mean systolic blood pressure, and mean diastolic blood pressure before induction had **no** statistically significant difference($p>0.05$). This result revealed that homogeneity of hemodynamic status in both groups; this could be very favorable to compare 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 among GA group when compared to SA ($p<0.05$). This result shows GA groups had relatively elevated pulse rate and blood pressure when compared to SA group. This finding is in line with prospective study conducted in India, which found prevalence of uncontrolled hypertension is higher among GA group than SA group (18). Another randomized study among preeclamptic women at India found

that incidence of intra operative hypertension, tachycardia, and post-operative admission to ICU is higher among GA group than SA group (23).

Strength of the study

- This study included all eligible cases during study period
- This study can be used as baseline information for future researchers

Limitation of the study

This study used secondary data from medical records of the patients. The information stated in this document is limited to data that is only available in the individual medical records. Therefore, it is hardly possible to find further information than that is recorded in the individual medical record.

7. Conclusion

Present study revealed that maternal outcomes such as post operative complication, days of hospital stay, maternal survival at discharge, has no difference in both spinal and general anesthesia groups.

In this study significantly higher intra operative blood pressure, and higher pulse rate was observed among GA group than SA. In conclusion SA is safer than GA in terms of stable vital signs among preeclamptic women.

8. Recommendation

As long as spinal anesthesia is not contra indicated, it is safer to choose spinal anesthesia over general anesthesia for C/S delivery of preeclamptic women, because SA associated with stable intra operative blood pressure and pulse rate.

Further prospective studies are recommended to have detailed variables outcome.

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APPENDICES

Appendix 1 Data collection instrument English Version

Demographic characteristics

Instruction: - Circle your answer on the number and write on the blank space

Question code	Question	Response	Skip pattern
Q101	Age	1. 19 and less than 2. 20-34 4. 35 and above 5. Not documented	
Q102	Marital Status	1. Married 2. Unmarried 3. Not Documented	
Q103	Residence	1. Addis Ababa 2. Outside Addis Ababa 3. Not documented	
Q104	Weight	_____ KG	
Q105	Height	_____ Meter	

Q106	Body Mass index(Wt./M2)	1.<18.5 2.18.5-24.9 3.25-29 4.30-35 5.above 35	
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Reproductive Health Characteristics

Q201	Parity	1. Nulliparous 2. 1-4 3. 5 and above	
Q202	Gravidity	_____	
Q203	Gestational age	1.<37 week 2. 37-42Week 3. above 42 weeks	
Q204	ANC follow up	1.Yes 2.No	

History of Caesarian section and anesthetic technique

Q301	Referral Status	1. Referred 2. Not referred	
Q302	History of previous Caesarian Section	1. Yes 2. No 3. Not documented	
Q303	Type of current surgery	1. Elective 2. Emergency 3. Not documented	
Q304	Type of anesthesia	1. General 2. Spinal 3. Others Specify _____	
Q305	Operator status	1. General practitioner/Resident 2. Senior	

Intraoperative and postoperative maternal Blood Pressure and Heart rate change

Q.	Time	Blood pressure(mmHg)	Pulse rate(per min)
Q401	Baseline at ward		
Q402	Before induction		
Q403	After intubation/spinal anesthesia		
Q404	5 th min		
Q405	10 th min		
Q406	15 th min		
Q407	20 th min		
Q408	25 th min		
Q409	30 th min		
Q410	Post anesthetic care unit entry		
Q411	10 th min		
Q412	20 th min		
Q413	30 th min		
Q414	40 th min		
Q415	50 th min		
Q416	60 th min		

V. Post-operative characteristics

S.NO	Question	Response	Skip
Q501	Post-operative complication	1.Yes 2.No	Go to Q504
Q502	Post-operative admission to ICU	1.Yes 2.No	
Q503	Post-operative complication indication for ICU	1.Post-operative Hypertension 2.Postoperative Hypotension 3.Plumonary edema 4.Aspiration Pneumonitis 5.Acute renal failure 6.Convulsion 7.Delayed recovery 8.Others,Specify_____	
Q504	Days of Hospital stay	1. 24hrs 2.48-72 hrs. 3.4-7 days 4. above 7days	
Q505	Maternal outcome	1.Alive 2.Dead	

ASSURANCE OF PRINCIPAL INVESTIGATOR

The undersigned agrees to accept responsibility for the scientific ethical and technical Conduct of the research(**comparative study of maternal outcome following caesarian delivery in preeclamptic women under general and spinal anesthesia in black lion specialized hospital, Addis Ababa, 2017**) project and for provision of required progress reports as Per terms and conditions of the Research Publications Office in effect at the time of Grant is forwarded as the result of this application.

Author

Name _____, Signature _____, Date _____

Approval of the board of examiners :

Advisor

Name _____, Signature _____, Date _____

Internal examiner

Name _____, Signature _____, Date _____

External examiner

Name _____, Signature _____, Date _____