



ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES,
SCHOOL OF MEDICINE DEPARTMENT OF ANATOMY

Determinants of Placental Abruption among Pregnant Women who
attended Tikur Anbessa Specialized and Gandhi Memorial Hospitals:
Institution Based Unmatched Case Control Study

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Acronyms and Abbreviations

AMA:	Advanced maternal age
ANC:	Antenatal Care
AOR:	Adjusted odds ratio
APH:	Antepartum hemorrhage
ARDS:	Acute respiratory distress syndrome
CD:	Cesarean delivery
C/S:	Cesarean section
CI:	Confidence interval
DIC:	Disseminated intravascular coagulopathy
EDHS:	Ethiopian demographic health survey
ENND:	Early neonatal death
GA:	Gestational age
GMH:	Gandhi Memorial Hospital
HMIS:	Health Management Information System
IUGR:	Intrauterine growth restriction
LNMP:	Last normal menstrual period
MMR:	Maternal mortality rate
MRN:	Medical record number
MUAC:	Mid upper arm circumference
NRFHRP:	Non reassuring fetal heart rate pattern
PA:	Placental Abruption
PNM:	Perinatal mortality
PPH:	Post-partum hemorrhage

PROM:	Premature rupture of membranes
ROM:	Rupture of membrane
SIPI:	Short inter pregnancy interval
SIPE:	Super imposed preeclampsia
TASH:	Tikur Anbessa Specialized hospital
U.S:	United states
VBAC:	Vaginal birth after cesarean delivery
WHO:	World health organization

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ABSTRACT

Background: Placental abruption, also known as premature separation of placenta, is a significant cause of maternal morbidity and mortality, especially in low resource settings. Despite its negative maternal and fetal outcome, the determinant factors of placental abruption have not been sufficiently studied.

Objective: This study aimed to identify risk factors associated with placental abruption among pregnant women who attended Tikur Anbessa Specialized and Gandhi Memorial Hospitals Addis Ababa, Ethiopia 2021.

Methods: A Hospital-based retrospective unmatched case control study was employed at Tikur Anbessa Specialized and Gandhi Memorial Hospitals by reviewing medical chart of women admitted for 3 years from September 11, 2017 – September 10 2020. Among which 376 women (188 cases and 188 controls) were included in the study. After data was collected by using Kobo Collect version 1.27.3 it was exported and analyzed using SPSS version 25. To identify determinants of Placental abruption, Bivariable and Multivariable binary logistic regression analyses were done. Statistical significance was considered at a level of significance of 5%, and an adjusted odds ratio with 95% confidence interval was used.

Result: Prevalence of PA was found to be 0.25% and six identified independent determinants of Placental abruption with AOR [95% CI] were identified. These were advanced maternal age (Age ≥ 35) [AOR=2.44; 95% CI: 1.13, 5.25], previous history of stillbirth [AOR=4.55; 95% CI: 1.11, 18.59], previous history of abortion [AOR=2.28; 95% CI: 1.22, 4.26], previous history of cesarean section [AOR=3.21; 95% CI: 1.64, 6.29], premature rupture of membranes [AOR=8.88; 95% CI: 3.27, 23.65] and preeclampsia [AOR=3.95; 95% CI: 1.54, 10.11]. Perinatal death among cases was 22 (11.3%) whereas there was only one maternal death recorded (0.5%).

Conclusion and Recommendations: Prevalence of Placental abruption was low and advanced maternal age, premature rupture of membranes, and preeclampsia, as well as previous histories of stillbirth, abortion and cesarean section, were identified as independent determinants of placental abruption. Practitioners responsible for prenatal monitoring must pay attention to risk factors during prenatal care to prevent adverse maternal and fetal outcomes that may associate with placental abruption.

Key Words: Placental abruption, Determinants, Case-control, Pregnant women

1. Introduction

1.1 Background of the study

Placental abruption which is known as premature separation of placenta is defined as partial or complete separation of normally implanted placenta from the site of uterine implantation after 20 weeks of gestation, before birth(1). It refers to separation of a normally situated placenta after the 28th week of pregnancy in most developing countries(2).

Worldwide, approximately 830 women die every day from preventable causes related to pregnancy and childbirth; 99% of which are women from the developing countries (3). According to a systemic analysis by WHO hemorrhage is the leading cause of maternal mortality globally, accounting for approximately 27% of deaths worldwide; this includes Postpartum, Intra partum and Antepartum Hemorrhage (APH). APH, which is defined as bleeding from or into the genital tract occurring from 28 weeks of pregnancy and prior to the birth of the baby accounts for 6.5% of deaths in the developing regions. Its most important causes are placenta previa and placental abruption (4).

According to the Ethiopian Demographic and Health Survey (EDHS, 2016) report, the maternal mortality rate (MMR) in Ethiopia is 412/100,000 live births.(5) In the developed countries, hemorrhage prior to delivery accounts for 16.3% of maternal deaths, while in Sub-Saharan Africa it remains high at 24.5% (6) .

The etiology of placental abruption is not fully understood, but it appears that defective trophoblastic invasion of the spiral arteries and endothelial dysfunction may be leading to utero placental under perfusion. Incomplete remodeling of the spiral arteries with retained contractility leads to maintenance of high utero placental vascular resistance, which may predispose to vascular rupture of a spiral artery in the placental bed leading to abruption (7, 8).

It can be identified as: revealed- where bleeding is visible externally; concealed – where blood collects behind the separated placenta or between the membranes and decidua thus bleeding is not visible externally; and mixed – with features of both concealed and revealed(9).

The incidence of placental abruption varies according to locality and obstetric factors prevailing in that society. It occurs in 0.6% -1% of all pregnancies in the United States (1, 10).The incidence of placental abruption is increasing with occurrence of 5.4% and 0.3% at preterm and term gestations, respectively, complicating about 0.4–1.0% of pregnancies (11) A local study in Ethiopia showed a 3.3% prevalence of placental abruption.(12) The incidence is highest at 24–26 weeks of gestation and decreases with advancing gestation. Over 50% of the cases occur before 37 completed weeks of gestation(10).

Several studies have attempted to define risk factors for placental abruption and pointed out significant association with advanced maternal age (>35), multi parity, previous C/S, preeclampsia and chronic hypertension, prior abruption, preterm premature rupture of membrane, smoking, alcohol consumption, bleeding in early pregnancy, short inter pregnancy interval(13-17). Furthermore, several factors such as low socioeconomic status and antenatal visit inadequacy have been reported to be associated with placental abruption(12, 14).

Neonates born with placental abruption are more likely to suffer from preterm birth, congenital malformation, intrauterine Growth Restriction (IUGR), low birth weight, and apgar score less than 7 at 1 and 5 minutes (1, 8, 14, 18, 19). Perinatal morbidity has also been studied to increase; the majority of babies require resuscitation and Neonatal Intensive Care Unit (NICU) admission (1). Reported maternal complications associated with placental abruption include hemorrhage, postpartum hemorrhage (PPH), DIC, need for transfusion, C/S, prolonged stay, hysterectomy and maternal mortality. (10, 14, 20-22).

1.2 Statement of the problem

Placental abruption is a major cause of massive obstetric hemorrhage. It contributes significantly to perinatal morbidity and mortality. It is the most common cause of intra partum fetal death. Placental abruption also remains a significant cause of maternal mortality, especially in countries with low resource settings (23).

Placental abruption is the leading cause of vaginal bleeding in the latter half of pregnancy and obstetrics hemorrhage. Maternal/fetal death may occur due to massive hemorrhage or various associated pathologies including disseminated intravascular coagulopathy (DIC), adult respiratory distress syndrome (ARDS) and renal failure which may be interrelated(24).

According to the Centers for Disease Control and Prevention, placental abruption was the direct cause of maternal mortality in 1.1% of pregnancy-related deaths in the United States from 2006 to 2010(25). In Finland the perinatal death rate was approximately 12 percent (versus 0.6 percent in non-abruption births)(8). In study done in Ethiopia it was shown that the perinatal mortality in women with placental abruption together with placenta previa and others was about 50%, which was thought to be one of the highest in the world where perinatal mortality rate associated with placental abruption was found to be 564/1000 births (26).

Placental abruption is also a common cause of maternal morbidity in most African countries. The various delays in seeking health care in developing countries coupled with inadequate institutional preparedness and lack of blood and blood products result in a worse placental abruption outcome in developing countries. Studies have shown that it carries a greater risk of surgical complication including obstetric hysterectomy and massive hemorrhage requiring transfusion. Early diagnosis of placental abruption potentially can improve the outcome of the children involved in such pregnancies by closely monitoring women at risk(27).

There are few recent studies regarding the magnitude and associated risk factors of placental abruption in Ethiopia. Among which most are done on APH providing insufficient information specific to placental abruption. The knowledge of risk factors may have significant impact on the management options and outcome of placental abruption (28) further emphasizing the importance

of this study. Hence, this study aims to assess the determinant factors associated with placental abruption.

1.3 Significance of the study

Placental abruption is an important cause of maternal and neonatal morbidity and mortality. There have been many cases of placental abruption reported. However, there is less data on risk and outcome associated with abruption in Ethiopian community; hence the need to identify the characteristics associated with this condition is necessary. Owing to the lack of specific diagnostic markers early recognition of placental abruption is still a dilemma for obstetricians which increases rates of missed diagnosis and misdiagnosis. Therefore, to study the risk factors of placental abruption may point out direction for identification of the disease. Thus, the findings from this study could provide information which can help to improve maternal and neonatal outcomes in women with placental abruption, towards reducing maternal and neonatal mortality.

The finding from this study could be used as the baseline information for other investigators to conduct further studies.

2. Literature review

2.1 Placental abruption

Placental abruption, defined as complete or partial separation of the placenta prior to delivery of the fetus, is an infrequent but serious obstetric complication (29).

The reported incidence of placental abruption varies, but averages approximately 0.5% or one in 200 births. It is a common cause of perinatal mortality, and approximately 10% of third-trimester stillborn neonates are attributed to placental abruption (30).

The reported incidence of PA varies because of different criteria used for diagnosis. In a cohort study by Rutier and coworkers from a total of 1,570,635 singleton pregnancies, 3496 pregnancies (0.22%) were complicated by PA. The overall incidence was highest between 28 and 31 weeks of gestation, with 40.8 per 1000 deliveries (4.1%)(31).

In a longitudinal descriptive study in Gambia from January to December 2014 the incidence of PA was 24 in 1000 maternities (2.4%)(28). In a study done in Ethiopia between January 1 and December 31, 2013 the incidence of PA was 3.3% from a total of 3,854 women who gave birth in Jimma university specialized hospital (12).

2.2 Risk factor for development of placental abruption

2.2.1 Socio demographic and behavioural risk factors

2.2.1.1 Socio demographic factors

Advancing maternal age; Studies have indicated advancing maternal age increases the risk of placental abruption (32, 33). In an International Contrast of Rates of Placental Abruption done in 7 countries, there was a strong maternal age effect on PA with a concomitant increase in rates among women aged >35 years (34).

Low socio-economic status: Women with PA were also found to have low socio-economic status (8)

2.2.1.2 Behavioral factors

Cigarette smoking: Cigarette smoking is linked to an elevated risk for PA. Smoking increases homocysteine levels in the plasma, which may play a role. Hyper homocysteinemia can induce

endothelial cell injury and dysfunction, leading to local thromboembolism and defects within the placental vascular bed. Also, nicotine has a vaso constrictive effects on uterine and umbilical arteries, and carboxy-hemoglobin interferes with oxygenation. The hypoxic changes caused by nicotine and carbon monoxide can lead to placental infarcts, suggesting that increased capillary fragility might result in arterial rupture, leading to placental abruption.(10)

As a preventable risk factor, smoking cessation reduces many adverse pregnancy outcomes, including placental abruption. Based on a retrospective cohort study conducted between January 2003 and December 2012 in France , and more recent study in the U.S, it was shown that smoking has increased risk for placental abruption where the study in the U.S indicated almost 4 times increased risk (OR 4.25 (95% CI: 1.78-10.13,)(16, 19).

Alcohol consumption: Alcohol exposure disturbs the fetomaternal hormonal balance and also causes vasoconstriction in the placenta and umbilical cord, which might lead to PA(10). A study conducted in the U.S indicated alcohol consumption increased risk for PA. Similarly, another study in South Africa indicated that drinking alcoholic beverages during pregnancy carried a more than 3 times greater risk of developing placental abruption (35, 36).

Non-Attendance to Ante-natal Care (ANC): Nonattendance to ANC was also found to be associated with placental abruption. Women complicated by PA were more likely to have less than 4 antenatal care visits (14). In a study done in Ethiopia 15% of those with PA had no prenatal visits(12).

2.2.2 Factors related with past maternal obstetric history

Prior Abruption: The risk of placental abruption in a subsequent pregnancy was significantly higher in women with a previous placental abruption compared with women without (31). In a large retrospective population-based study, the recurrence rate was 8.6 per 1000 births (16). Another study by Godwin S. Macheke et al. also reported that women with previous placental abruption were twice at risk of developing PA in subsequent pregnancies (14). Similar finding was observed in a study conducted in Iran(37).

Previous Cesarean delivery: The risk of placental abruption was increased in women having previous cesarean delivery. Based on retrospective case control study data taken between September 2014 and October 2015 the incidence of PA was increased by 3.6 fold in patients who previously underwent cesarean delivery(15). Similar finding was also observed in different studies by Godwin S. Macheke and coworkers and by Awat Feizi and coworkers(14, 37).

Previous history of still birth and Abortion: in a study it was found that the women who had delivered a stillbirth in previous pregnancy compared to those who did not were associated with an increased risk of developing PA. (OR 3.1, 95% CI 1.1 to 9.1)(38). Furthermore, other studies in 2013 indicated previous abortion to be associated with increased risk of PA (37, 39)

2.2.3 Pregnancy associated factors

Male fetal sex: According to some researches, PA was more common and occurred earlier in male fetal sex compared to female fetal sex (40). In another similar finding by Tikkanen and coworker, it was found that male fetal sex was over-represented in the abruption group ($p < 0.001$)(8).

Short inter pregnancy interval: Closely spaced pregnancies may result in depletion of the mother's nutritional reservoir over time and may not permit the mother to get adequate time to sufficiently restore nutritional elements that may impact the ability of the internal lining of her uterus to fully recover(41). In a large population based cohort study in the United States by Amanuel T. Gebremedhin and coworkers, short inter-pregnancy interval of less than six months was associated with increased risk for PA(42).

In another study among women who experienced PA in the first pregnancy it was shown that those with an inter pregnancy interval of less than one year after a first abruption complicated pregnancy were 3 fold at risk for preterm birth and neo-fetal death in a subsequent pregnancy(41).

Hypertensive disorders: Both preexisting and pregnancy induced hypertension are linked with PA (11). Preeclampsia is also associated with increased risk for PA . Mehmet and coworkers in a recent study found that preeclampsia increased the risk for PA by about 14 fold (15). In a case

control study in South Africa, 34% of women in the study group had preeclampsia, in contrast to 7% in the control group with almost 3 fold increased risk.(36) In another study in Northern Tanzania preeclampsia and chronic hypertension were strongly associated (OR 2.1; 95 % CI 1.1–4.1) and (OR 4.1; 95 % CI 1.3–12.8), respectively (14).

Leiomyoma: Fibroids (leiomyomas’) are benign smooth muscle tumors of the uterus, and are common in women of reproductive age. The increased risk of abruption in women with fibroids appears to result from interference or distortion of the normal perfusion of the placental site. A number of studies have reported that antepartum bleeding is more common in pregnancies with fibroids. In case of abruption, the location of the fibroid in relation to the placenta appears to be an important determinant, especially if located near the mucosal surface behind the placental implantation site and can predispose to placental abruption. Pooled cumulative data suggest the risk of abruption is increased 3-fold in women with fibroids(43).

Multi parity: Macheke et al. and Rune Nathaniel et al. have reported that the occurrence of PA was higher in women with high parity and multi gravid as compared to nulliparous or primigravid women (14). Another study has also found that perinatal outcomes of PA were poor, and perinatal mortality was higher among multiparous women than among nulliparous women(16). Increased association was also found in a study done in Cameroon. (44) However, in another study the risk of PA was not correlated with increased parity ($p>0.05$)(15).

Preterm premature rupture of membranes (PPROM) and Chorioamnionitis : PPRM which is a complication in 1–4% of all pregnancies and occurs in 30–40% of all preterm deliveries was found to substantially increase the risk of PA (45) In a retrospective cohort study between January 2003 and December 2012 in France patients with PPRM were 9 times at risk for developing PA(46) and similar association was also found in study done in Iran(37). Chorioamnionitis was also found to be associated with mild abruption (AOR 1.50; 95 % CI 1.43 - 1.58) and severe abruption with twice as increased risk (AOR 2.42; 95 % CI 2.36 - 2.48) respectively (47).

Oligohydramnios and Polyhydramnios; Both oligohydramnios and polyhydramnios were found to be associated with increased risk of PA. A study by Boisrame and coworkers found

oligohydramnios to be associated with PA(46). Whereas study by and Hung and coworkers also found a stronger association between oligohydramnios and polyhydramnios with PA(48).

Prior bleeding: Study in Isreal by Yael Baumfeld and coworkers and similar study in the U.S by Hackney and coworkers found that vaginal bleeding prior to membrane rupture were significantly associated with PA(45, 49). Another study in Denmark also showed significant association where first trimester bleeding in the first pregnancy increased the risk of placental abruption from 1.0% to 1.4% (OR 1.48; 95% CI 1.30–1.68)(50)

Trauma: trauma was also listed as another risk factor in some studies where shearing effect is thought to disrupt the attachment of placenta to the decidua (10). The rate of fetal mortality after maternal blunt trauma was found to be 3.4 to 38.0 percent, mostly from placental abruption, maternal shock, and maternal death(51). In contrast to the above findings in another recent study , trauma with a fall or motor vehicle accident was not significantly associated with PA as the p-value was 0.25(19).

Multiple pregnancy: Study by Sahilu and coworkers found that incidence of abruption increased in dose dependent fashion from singleton to triplet gestation (52).

2.3 Conceptual framework

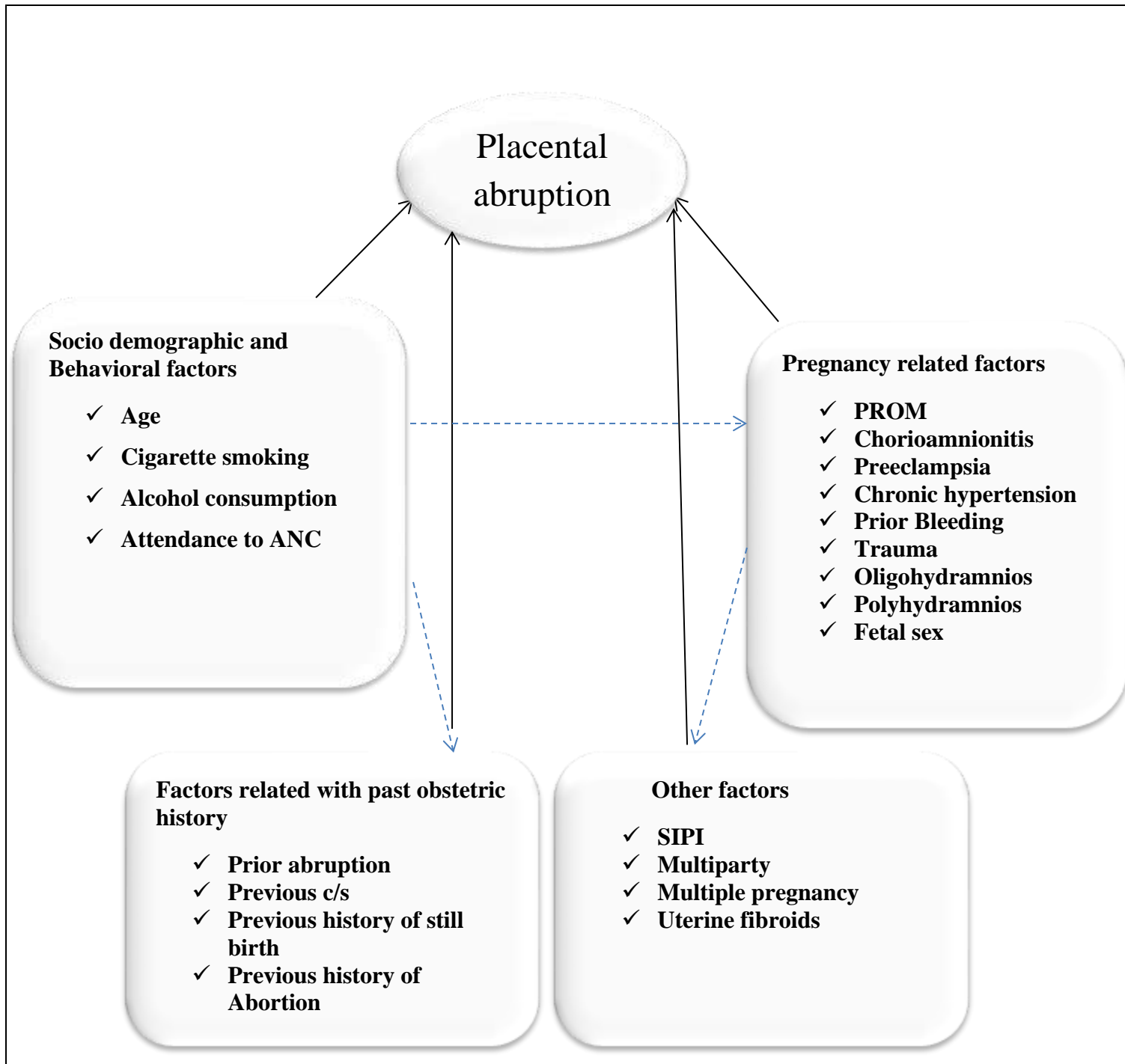


Figure 1: Conceptual frame work for determinants of placental abruption developed from review of different literature

Key SIPI; Short Inter Pregnancy Interval, C/S Cesarean section, ANC; Ante natal care, PROM; premature rupture of membrane

-----> The broken line indicates the association between the groups of explanatory variables

————> The solid line indicates the association between the outcome variable and explanatory variables

3. Objectives of the study

General objective:

- ✓ To identify risk factors associated with placental abruption among pregnant women who attended Tikur Anbessa Specialized and Gandhi memorial Hospitals from September 11, 2017 – September 10 2020 Addis Ababa, Ethiopia.

Specific objectives:

- ✓ To determine the prevalence of placental abruption
- ✓ To identify socio demographic and behavioral determinants of placental abruption
- ✓ To identify pregnancy related determinants of placental abruption
- ✓ To identify determinants of placental abruption related with past maternal obstetric history
- ✓ To describe neonatal outcomes and complications related with placental abruption
- ✓ To describe maternal outcomes and complications related with placental abruption

4. Methods and Materials

4.1 Study area and period

The study was conducted in Addis Ababa the capital city of Ethiopia. The study was conducted in Tikuer Anbessa specialized hospital (TASH), and Gandhi Memorial Hospital (GMH). TASH is the pioneer and high-level referral hospital of the whole Ethiopia. Tikur anbessa specialized hospital is the largest referral hospital in the country established in 1972 and with over 800 beds at different units. The TASH has 200 doctors, 379 nurses and 115 other health professionals dedicated to providing health care services. Similarly, GMH is one of the high-level government hospitals in Addis Ababa and the study was employed from February 13 – April 10, 2021.

4.2 Study design

Hospital based unmatched retrospective case control study was employed with a case to control ratio of 1:1.

4.3 Source population

All pregnant women who visited Tikuer Anbessa Specialized Hospital and Gandhi Memorial Hospital.

4.4 Study population

Pregnant women who visited Tikuer Anbessa Specialized Hospital and Gandhi Memorial Hospital from September 11, 2017 – September 10 2020.

4.5 Sample size

Sample size was calculated using Epi Info version 7.2.0.1 with the assumptions of 95% confidence level and 80 % power OR = 2.86 Case to control ratio of 1:1, and proportion of controls with exposure of 5.9 % the odds ratio and proportion for controls were taken from Hypertensive disorders in the study conducted in Israel.(11) The final sample size was found to be **188** cases and **188** controls respectively, which gave us a total sample of **376**.

Table 1: Sample size calculation for determinants of placental abruption among pregnant women who attended TASH and GMH, during September 11, 2017 – September 10 2020 Addis Ababa, Ethiopia

Alpha	Power	Controls exposed (%)	Cases exposed (%)	Odds ratio	N		
					Cases	Controls	Total
0.05	80	5.9 %	15.3%	2.88	188	188	376

4.6 Sampling technique and sampling procedure

4.6.1 Sampling procedure

The study hospitals Gandhi Memorial and Tikur Anbessa Specialized Hospitals were selected purposively and based on the number of their total obstetric admissions proportional number of study subjects were allocated for each study hospital. From all women admitted in obstetric wards and whose medical information was entered into the registry books of the study hospitals during the study period, 376 medical record charts were selected their medical record number (MRN) were taken to retrieve the medical record charts from the MRN archive office.

4.6.2 Sampling technique

Considering that the pattern in which the women visit the hospitals is random, consecutive sampling was used to select the cases until sample size was reached. And after each respective case consecutive 3 controls were selected as controls.

First cases were identified from Health Management Information System (HMIS) and their MRN was used to deeply investigate their information. Only complete registry records were considered

Controls were selected after proportional allocation to total number of deliveries in both hospitals both cases and controls were recruited during same time.

Table 2: Proportional allocation of controls attending delivery in TASH and GMH for three-years study period. (September 11 2017, - September 10 2020)

	Number of Deliveries	Number of controls allocated
TASH	18,738	74 controls
GMH	28,887	114 controls
Total	47,625	188

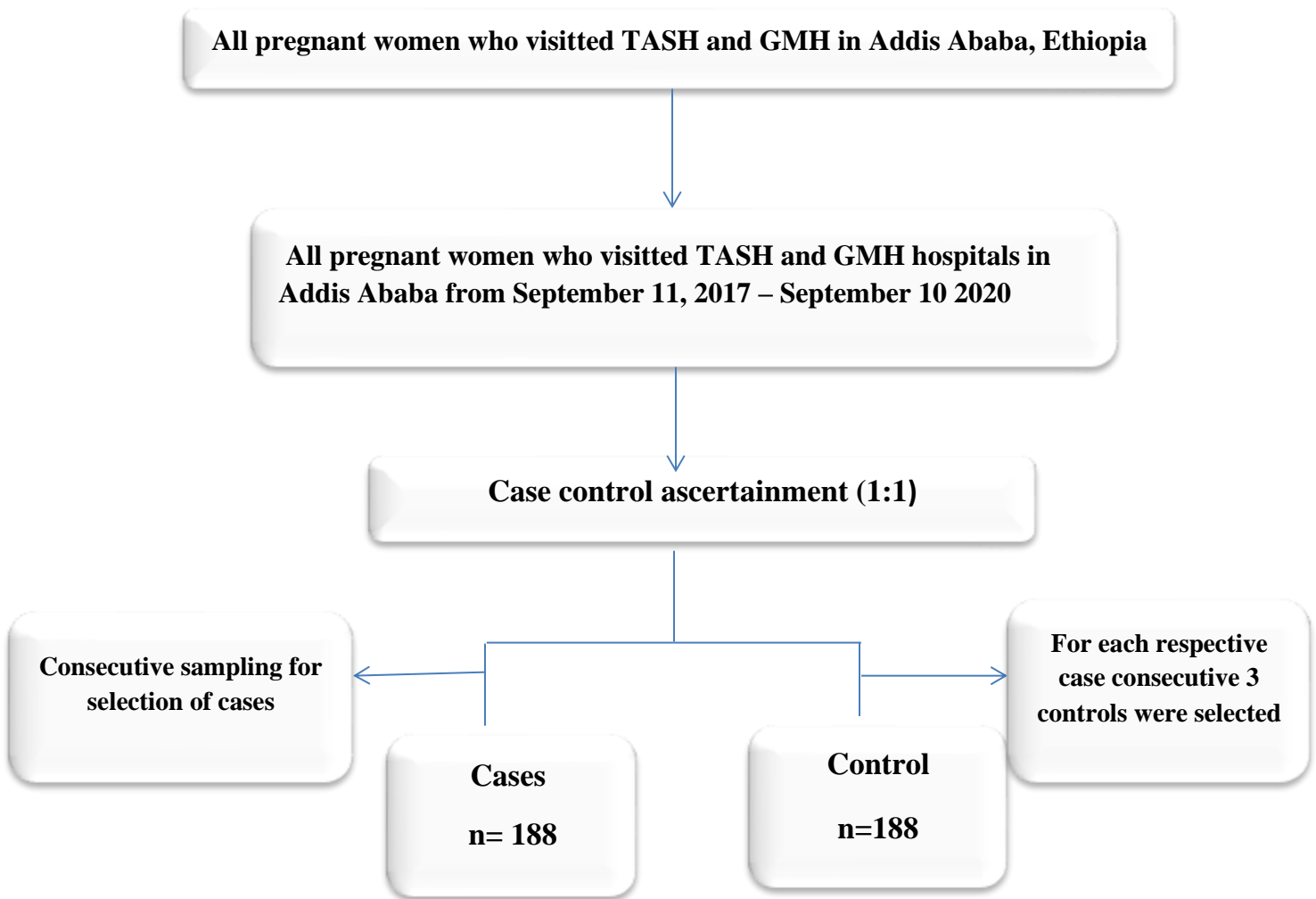


Figure 2: Schematic presentation of sampling procedure for determinants of placental abruption among pregnant women who attended TASH and GMH in Addis Ababa, Ethiopia 2021

4.7 Inclusion and Exclusion criteria

4.7.1 Inclusion criteria

For cases

All pregnancies with confirmed diagnosis of placental abruption

For controls

All pregnancies without diagnosis of placental abruption who delivered next to the cases

4.7.2 Exclusion criteria

Women with missing medical records and incomplete records with (>20% of variables) were excluded from the study

Case and control ascertainment

Those women with clinically and intraoperative confirmed diagnosis of placental abruption were selected as cases while any pregnant women who attended delivery without diagnosis of abruption were taken as controls

4.8 Study Variables

Dependent variable

- ✓ Placental abruption status (yes/no)

Explanatory variables

- ✓ Socio demographic (Age,)
- ✓ Behavioral factors (Smoking, alcohol consumption, attendance to antenatal care)
- ✓ Factors related with maternal past obstetric history (Prior abruption, Previous c/s, Previous history of still birth, Previous history of abortion)
- ✓ Pregnancy related and other factors: (PROM, Chorioamnionitis, Hypertensive disorder (Preeclampsia, Chronic hypertension), Oligo-hydramnios, Poly-hydramnios Prior Bleeding, Fetal sex , Trauma, Multi parity, multiple pregnancy, Inter pregnancy interval, Uterine fibroids)

4.9 Data collection technique

Data were obtained through review of digital records of the hospital using check list from medical records by using Kobo collect. Two BSc nurses were recruited for the data collection. Training on how to use the software and collect the data was given to the data collectors.

4.10 Data quality and management

Data was collected by two BSc nurses. To ensure quality of the data, pretest was done on 5% of sample size at Yekatit 12 memorial hospital before actual data collection. The collected data was checked for completeness and consistency on each day of the data collection.

4.11 Data processing and analysis

After data collection by Kobo Collect version 1.27.3, each completed form was checked for completeness and was exported to SPSS 25 for analysis. Mean, median, standard deviation, proportion was used to describe the data.

To identify determinants of placental abruption, first, Bivariable analysis was done to identify the variables associated with placental abruption among pregnant women. Then variables with a P-value < 0.25 in a Bivariable analysis were selected as candidate variables to be entered together in to a multivariable analysis in order to control for confounders. Lastly, variables with a p-value ≤ 0.05 in multivariable analysis were employed as statistically significant and AOR with 95% CI were identified to measure the strength of the associations. The result is presented by using text, tables and graphs, and finally interpreted in to valuable information

4.12 Operational definitions

Placental abruption: women with placental abruption were diagnosed when there was clinical diagnosis and intra operative (after the delivery and examination of the placenta) diagnosis of PA by the attending clinician.

Short Inter pregnancy interval: Short inter-pregnancy interval is when the interval between the delivery date of the preceding live birth and the conception of date of the next pregnancy is less than 24 months (53).

Clinical classifications of PA

Mild

- No sign of vaginal bleeding or a small amount of vaginal bleeding, Slight uterine tenderness, Maternal blood pressure and heart rate within normal level, No signs of fetal distress

Moderate

- No sign of vaginal bleeding to a moderate amount of vaginal bleeding, Significant uterine tenderness with tetanic contractions, Change in vital signs: maternal tachycardia, orthostatic changes in blood pressure, Evidence of fetal distress, Clotting profile alteration: hypofibrinogenemia

Severe

- No sign of vaginal bleeding to heavy vaginal bleeding, Tetanic uterus/ board-like consistency on palpation, Maternal shock, Clotting profile alteration: hypofibrinogenemia and coagulopathy, Fetal death

Advanced maternal age (AMA): Maternal age greater than or equal to thirty-five (≥ 35).

Preterm birth: Delivery after 28 weeks of gestation and before 37 complete weeks of gestation.

Premature rupture of membrane: Rupture of membrane occurring before the onset of labor

Neonatal death: Death occurring during the first four weeks after birth

Early neonatal death: Death occurring during the first week after birth

Prenatal death: Neonatal deaths of less than seven days of age and fetal deaths after 28 weeks of gestation, includes both deaths in the first week of life and fetal deaths (stillbirths)(54)

4.13 Ethical consideration

Ethical clearance for the study was obtained from Institutional review board of Addis Ababa University, Addis Ababa Health bureau, TASH and GMH. Data was collected from the patient's medical record and confidentiality of the information was maintained throughout by excluding names as identification in the study.

4.14 Dissemination of result

The finding of this study will be submitted as a thesis and presented to Addis Ababa University, College of Medicine and Health Sciences, Department of Anatomy. Finally, it will be published on peer reviewed journal.

5. Result

5.1 Socio demographic characteristics of Cases and Controls

In this study a total of 188 pregnant women with diagnosis of placental abruption (Cases) and 188 pregnant women with no diagnosis of placental abruption (Controls) were included. The median reported age (Q1, Q3) of cases and controls was found to be 28(25,35) and 27(24.25,30) respectively. Most of the women were at the age of 25-29 years residing in Addis Ababa and having regular ANC visit (Table 3).

Table 3. Socio demographic characteristics of Cases and Controls in Tikur Anbessa specialized Hospital and Gandhi Memorial Hospital, during September 11, 2017 – September 10 2020 Addis Ababa, Ethiopia

Study characteristics		Control (%) n=188	Case (%) n=188	Total (%) n=376
Age	≤ 24	47(25.0%)	34(18.1%)	81(21.5%)
	25-29	82(43.6%)	75(39.9%)	157(41.8%)
	30-34	35(18.6%)	31(16.5%)	66(17.6%)
	≥ 35	24(12.8%)	48(25.5%)	72 (19.1%)
Residence	Addis Ababa	178(94.7%)	176(93.6%)	354(94.1%)
	Oromia	7(3.7%)	6(3.2%)	13(3.5%)
	Amhara	2(1.1%)	4(2.1%)	6(1.6%)
	Tigray	0(0.0%)	1(0.5%)	1(0.3%)
	Diredawa	1(0.5%)	0(0.0%)	1(0.3%)
	SNNPR	0(0.0%)	1(0.5%)	1(0.3%)
ANC follow up	Yes	173(92.0%)	170 (90.4 %)	343 (91.2%)
	No	15(8.0%)	18 (9.6%)	33(8.8%)

5.2 Type of placental abruption based on clinical classifications

Mild abruption was the commonly occurring type of placental abruption (62.2%) followed by moderate (24.5%) and severe (13.3%). From the total cases (48.9%) of them had no retro placental clot while (11.2%) of them have retro placental clot \geq 50% (Figure 3).

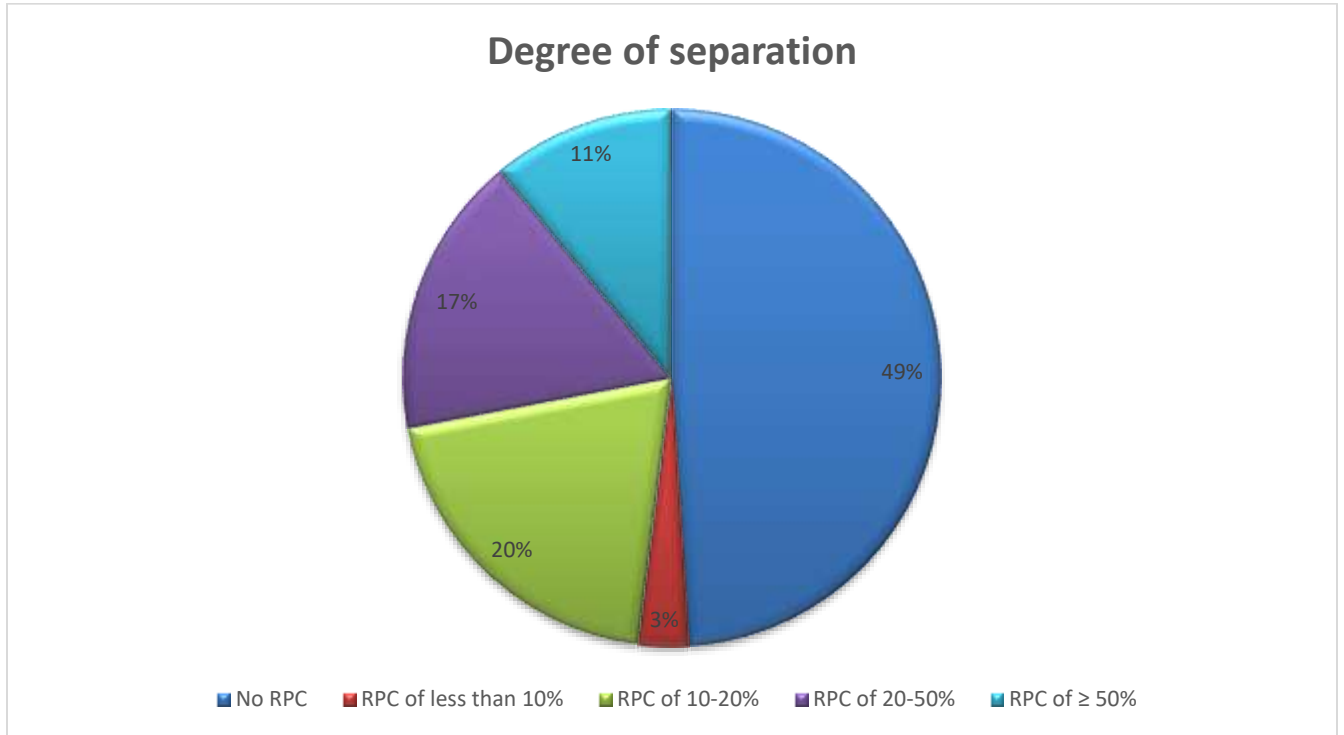


Figure 3. Frequencies and percentage of Retro placental clot among cases in Tikur Anbessa Specialized Hospital and Gandhi Memorial Hospital Addis Ababa, Ethiopia, 2021

5.3 Antenatal characteristics of cases and controls

With regard to parity, (42.6%) of cases and (45.7%) of controls were nulliparous. Preterm delivery was reported in (45.2%) of cases and (5.9%) of controls (Figure 4).

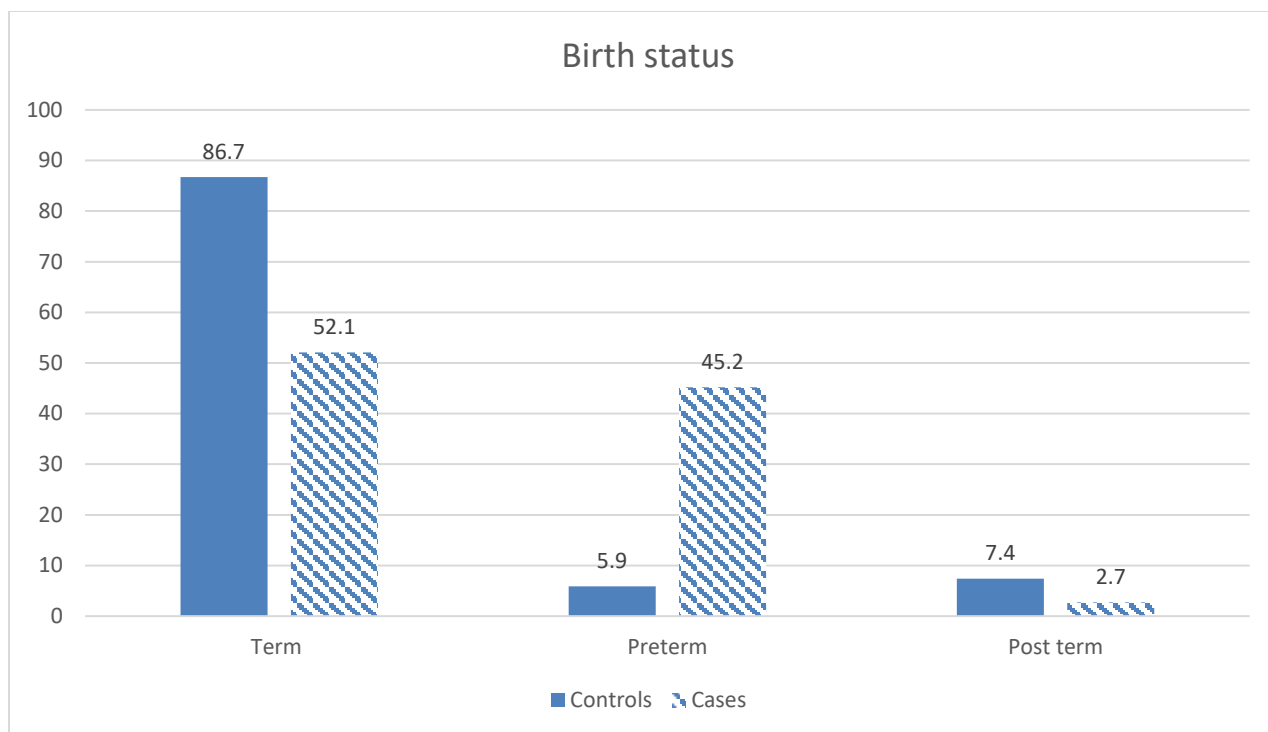


Figure 4 Percentage of gestational age among Cases and Controls in Tikur Anbessa Specialized Hospital and Gandhi Memorial Hospital Addis Ababa, Ethiopia 2021

The most common presentation among the cases was bleeding which accounted for (86.2%), Abnormal/ absent fetal heart tone was seen in (8.55%) of the cases. About half of cases and one third of controls had cesarean delivery (Table 4).

Table 4 Antenatal characteristics of cases and controls in Tikur Anbessa Specialized Hospital and Gandhi Memorial Hospital during September 11, 2017 – September 10 2020, Addis Ababa, Ethiopia.

Antenatal characteristics		Controls (%)	Cases (%)	Total (%) (n=376)
Mode of delivery	Caesarean section	57(30.3%)	103(54.8%)	160(42.6%)
	Vaginal delivery	131(69.7%)	85(45.2%)	216(57.4%)

Parity	Nulliparous	86(45.7%)	80(42.6%)	166(44.1%)
	Primiparous	58(30.9%)	56(29.8%)	114(30.3%)
	Multiparous	44(23.4%)	52(27.7%)	96(25.5%)
Order of Pregnancy	Single	180(95.7%)	182(96.8%)	362(96.3%)
	Multiple	8(4.3%)	6(3.2%)	14(3.7%)

5.4 Previous Obstetric history of Cases and Controls

Previous obstetric history including prior APH, and Previous history of caesarean section, was calculated from a total of 210 samples excluding nulliparous among which about 38.0% of cases have previous history of cesarean section which is slightly higher than controls 19.6% (Table 5).

Table 5. Previous obstetric history of Cases and Controls in Tikur Anbessa Specialized Hospital and Gandhi Memorial Hospital during September 11, 2017 – September 10 2020 Addis Ababa, Ethiopia

		Controls (%)	Cases (%)	Total (%)
Prior APH (n=210)	Yes	1(1.00%)	12(11.1%)	13(6.2%)
	No	101(99%)	96(88.9%)	197(93.8%)
Type of APH (n=13)	AP	0(0.0%)	8(66.7%)	8(61.5%)
	PP	1(100%)	3(25%)	4(30.8%)
	Not mentioned	0(0.0%)	1(8.3%)	1(7.7%)
Previous c/s (n=210)	Yes	20(19.6%)	41(38.0%)	61(29.0%)
	No	82(80.4%)	67(62.0%)	149(71.0%)
Frequencies of caesarean delivery	1x	18(90.0%)	38(92.7%)	56(91.8%)
	2x	2(10%)	3(7.3%)	5(8.2%)
Previous history of abortion	Yes	20(10.6%)	42(22.3%)	62(16.5%)
	No	168(89.4%)	146(77.7%)	314(83.5%)
Previous history of still birth	Yes	3(1.6%)	12(6.4%)	15(4.0%)
	No	185(98.4%)	176(93.6%)	361(96.0%)

5.5 Co-occurring Medical and Obstetric conditions

Pregnancy induced hypertension was present in (22.3%) of cases and (5.9%) of controls, among the cases with PIH, (59.5%) had gestational hypertension and (54.8%) of them had preeclampsia (Figure 5).

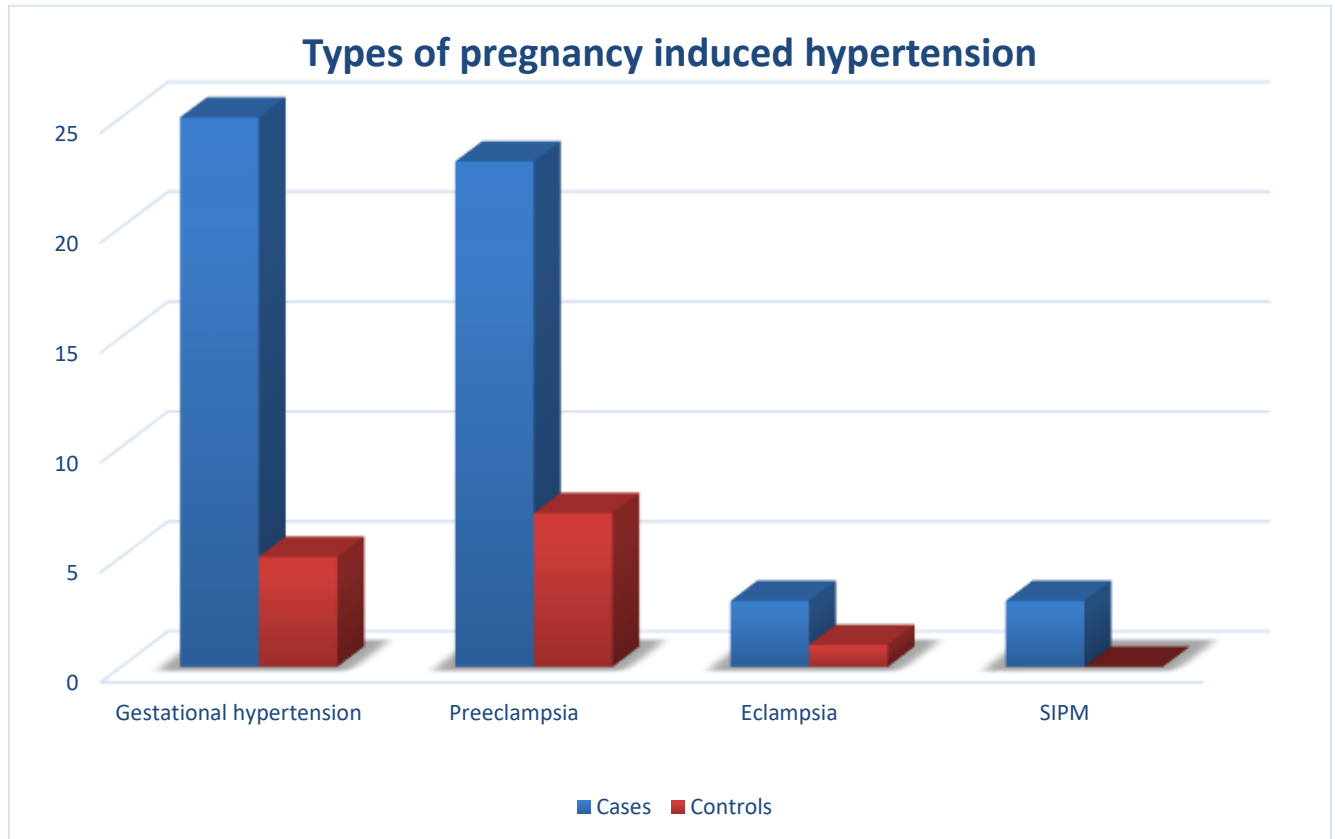


Figure 5 Frequency of Types of PIH among Cases and Controls in Tikur Anbessa Specialized Hospital and Gandhi Memorial Hospital Addis Ababa, Ethiopia 2021

Bleeding before 27 weeks of gestation were noted in (10.1%) of cases. From the total 376 participants 10.4% had preterm premature rupture of membrane (Table 6).

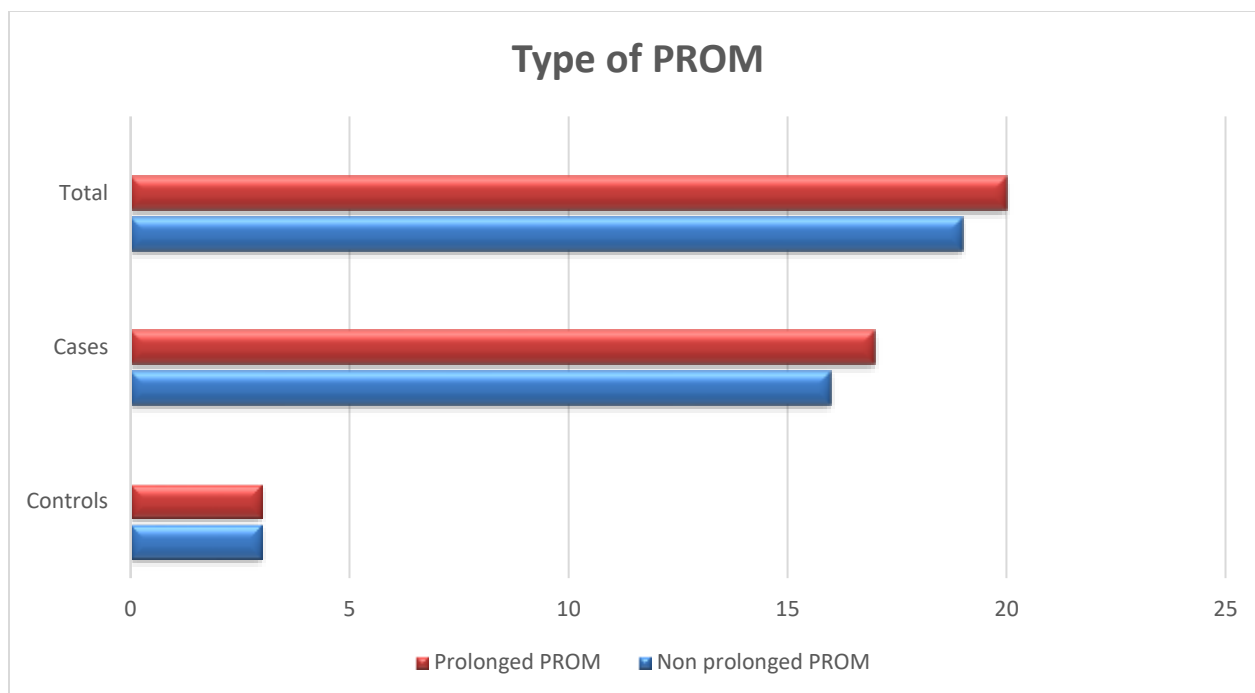


Figure 6 Frequency of type of PROM among Cases and Controls in Tikur Anbessa Specialized Hospital and Gandhi Memorial Hospital Addis Ababa, Ethiopia 2021

Table 6. Co-occurring Obstetric conditions among cases and controls in Tikur Anbessa Specialized Hospital and Gandhi Memorial Hospital during September 11, 2017 – September 10 2020 Addis Ababa, Ethiopia

		Controls (%)	Cases (%)	Total (%) n=376
Presence of PROM	Yes	6(3.2%)	33(17.6%)	39(10.4%)
	No	182(96.8%)	155(82.4%)	337(89.6%)
Chorioamnionitis	Yes	1(0.5%)	1(0.5%)	2(0.5%)
	No	187(99.5%)	187(99.5%)	374(99.5%)
Prior bleeding	Yes	2(1.1%)	19(10.1%)	21(5.6%)
	No	186(98.9%)	169(89.9%)	355(94.9%)
Oligo hydramnios	Yes	10(2.7%)	22(5.9%)	32(8.5%)
	No	178(94.7%)	166(88.3%)	344(91.5%)
Poly hydramnios	Yes	1(0.5%)	1(0.5%)	2(0.5%)

	No	187(99.5%)	187(99.5%)	374(99.5%)
HEELP	Yes	2(1.1%)	8(4.3%)	10(2.7%)
	No	186(98.9%)	180(95.7%)	366(97.3%)
PIH	Yes	11(5.9%)	42(22.3%)	53(14.1%)
	No	177(94.1%)	146(77.7%)	323(85.9%)

Table 7. Co-occurring medical conditions among cases and controls in Tikur Anbessa Specialized Hospital and Gandhi Memorial Hospital during September 11, 2017 – September 10 2020 Addis Ababa, Ethiopia

		Controls (%)	Cases (%)	Total (%) n=376
Past Medical history(n=376)	Yes	10(5.3%)	15(8.0%)	25(6.6%)
	No	178(94.7%)	173(92.0%)	351(93.4%)
Chronic hypertension	Yes	0(0%)	4(2.1%)	4(1.1%)
	No	188(100%)	184(97.9%)	372(98.9%)
Diabetes mellitus	Yes	1(0.5%)	3(1.6%)	4(1.1%)
	No	187(99.5%)	185(98.4%)	372(98.9%)
RVI	Yes	6(3.2%)	3(1.6%)	9(2.4%)
	No	182(96.8%)	185(98.4%)	367(97.6%)
Hepatitis B	Yes	3(1.6%)	2(1.1%)	5(1.3%)
	No	185(98.4%)	186(98.9%)	371(98.7%)
Myoma	Yes	3(1.6%)	4(2.1%)	7(1.9%)
	No	185(98.4%)	184(97.9%)	369(98.1%)
Trauma	Yes	1(0.5%)	3(1.6%)	4(1.1%)
	No	187(99.5%)	185(98.4%)	372(98.9%)

5.6 Neonatal outcome and complications

Regarding fetal sex, 52.5% of neonates born to PA mothers and 44% of neonates born to mothers without PA were male (Table 8). From total of 391 nearly a quarter of them had deliveries with low-birth-weight neonate (Figure 7).

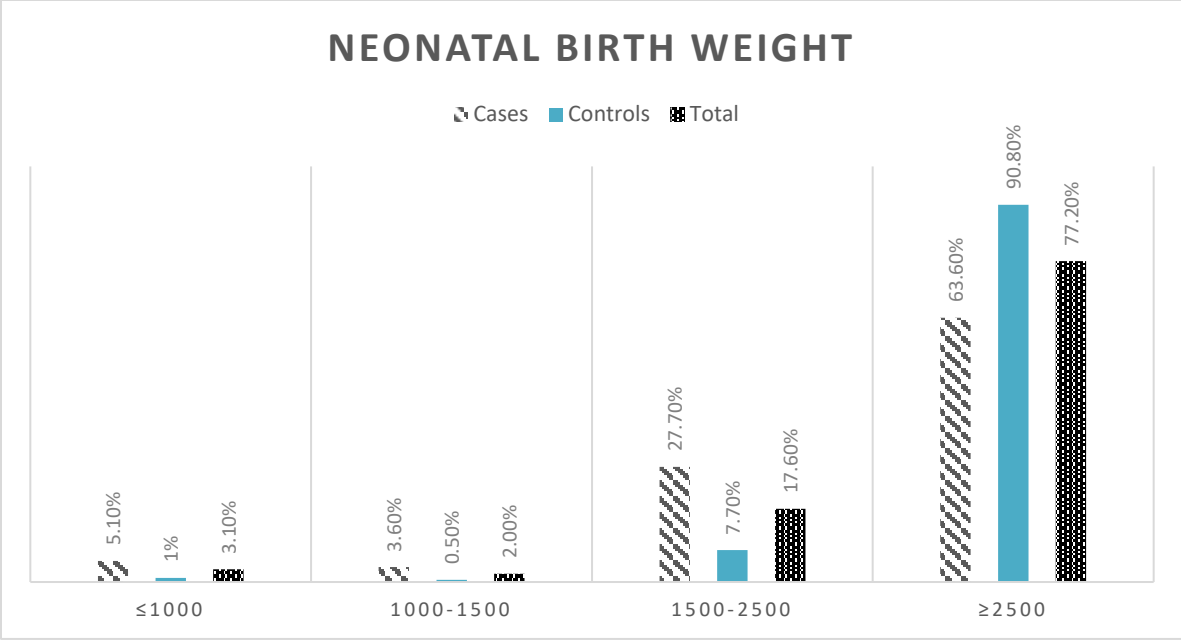


Figure 7. Frequency of Birth weight of neonates of pregnant women who attended Tikur Anbessa Specialized Hospital and Gandhi memorial hospital during September 11, 2017 – September 10 2020 Addis Ababa, Ethiopia

Perinatal death among cases was 11.3% as compared to 2.6% recorded among the controls (Figure 8). Among neonates born to PA mothers 15.9% and 28.2 % had Apgar score <7 in 1 minute and 5 minutes respectively whereas 2.6% and 8.2 % of neonates of the controls had Apgar <7 in 1 and 5 minutes respectively. (Table 8)

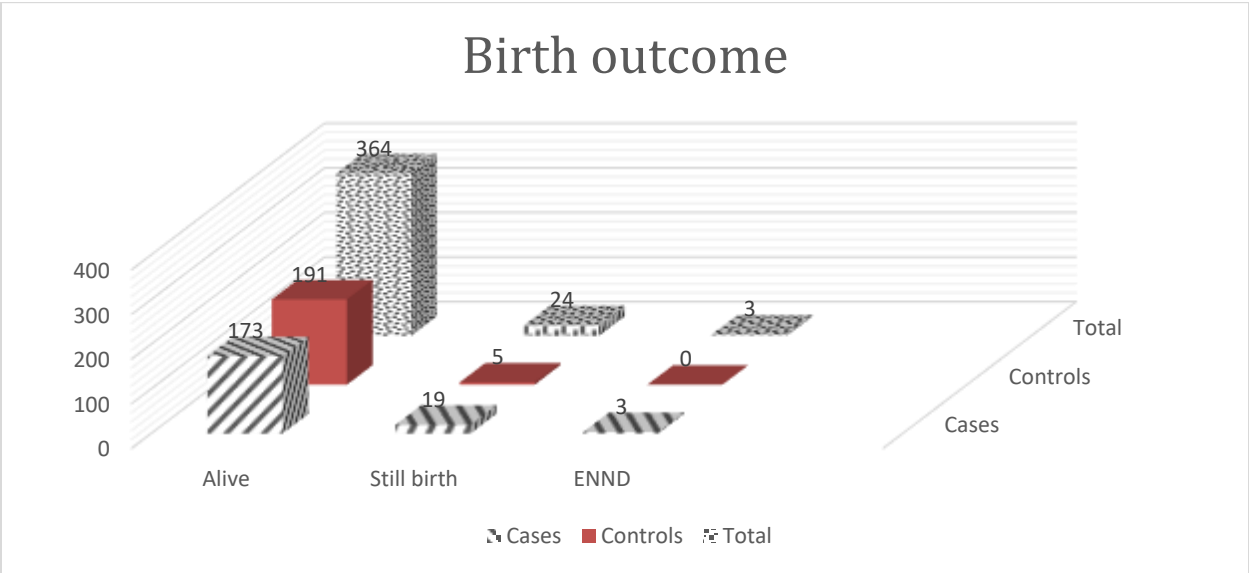


Figure 8 Distribution of delivery status among Cases and controls in Tikur Anbessa Specialized Hospital and Gandhi memorial hospital Addis Ababa Ethiopia, 2021

From the total still births/ IUFD delivered among the cases 73.7% of them had retroplacental clot $\geq 50\%$ (Figure 9). Nearly one fourth of neonates had admission to the NICU (Table 8).

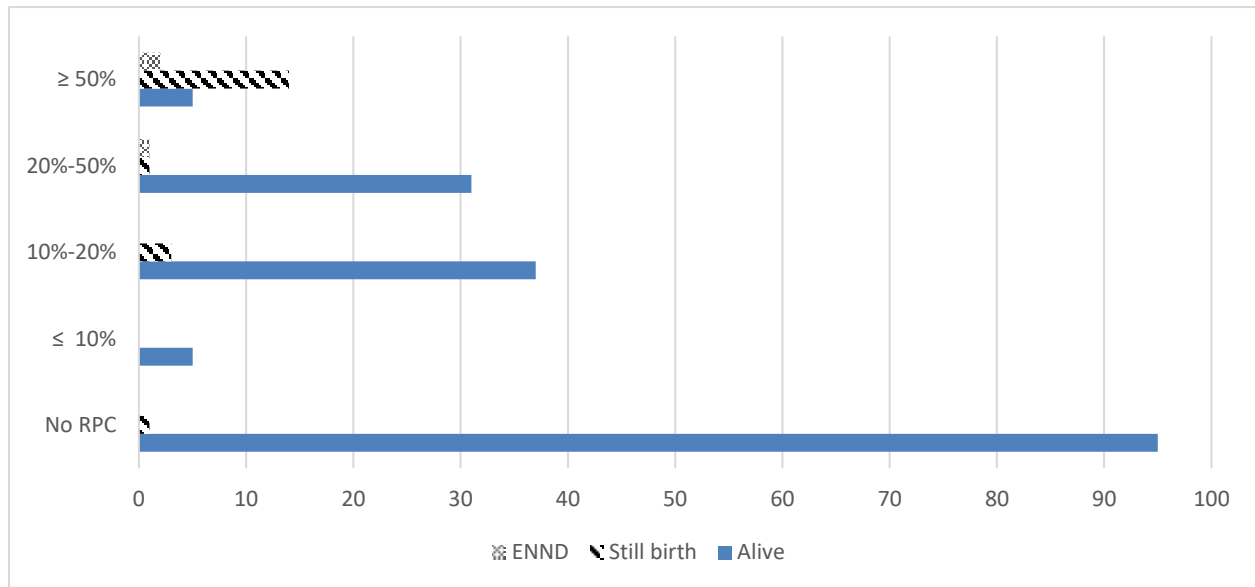


Figure 9 Retroplacental clot distribution among the birth outcome in cases in Tikur Anbessa Specialized Hospital and Gandhi memorial hospital Addis Ababa Ethiopia, 2021

With regard to patients with placental abruption the mean gestational age at delivery was found to be 36.1 ± 3.3 as compared to 39.6 ± 2 of controls. Whereas mean gestational age at diagnosis was found to be 35.2 ± 4.2 for cases as compared to 39.5 ± 2.2 of controls. The median birth weight (Q1, Q3) was also lower for cases with median birth weight of 2600gm (2100gm, 3000gm) as compared to 3000gm (2700gm, 3300gm) of the counterpart controls.

Table 8: Neonatal outcome and complications of cases and controls in Tikur Anbessa specialized Hospital and Gandhi Memorial Hospital during September 11, 2017 – September 10 2020 Addis Ababa, Ethiopia

		Controls (%)	Cases (%)	Total (%) (n=391) *
Birth status	Term	169(86.2%)	99(50.8%)	268(68.5%)
	Preterm	13(6.6%)	91(46.7%)	104(26.6%)
	Post term	14(7.1%)	5(2.6%)	19(4.9%)
Apgar score in 1 min	< 7	5(2.6%)	31(15.9%)	36(9.2%)
	≥ 7	191(97.4%)	164(84.1%)	355(90.8%)

Apgar score in 5 min	< 7	16(8.2%)	55(28.2%)	71(18.2%)
	≥ 7	180(91.8%)	140(71.8%)	320(81.8%)
Total (n=368) **				
Fetal Sex	Male	84(44.0%)	93(52.5%)	177(48.1%)
	Female	107(56.0%)	84(47.5%)	191(51.9%)
Presentation of the fetus	Vertex	179(93.7%)	151(85.3%)	330(89.7%)
	Non vertex	12(6.3%)	26(14.7%)	38(10.3%)
Presence of IUGR	Yes	4(2.1%)	19(10.7%)	23(6.3%)
	No	187(97.9%)	158(89.3%)	345(93.8%)
Presence of NRFHRP	Yes	21(11.1%)	50(28.2%)	71(19.3%)
	No	169(88.9%)	127(71.8)	296(80.7%)
Presence of MASAF	Yes	14(7.3%)	13(7.4%)	27(7.4%)
	No	177(92.7%)	163(92.6%)	340(92.6%)
Admission into NICU	Yes	19(9.3%)	69(37.4%)	88(22.9%)
	No	172(90.1%)	108(61.0%)	280(76.1%)
Reason for admission	VLBW/LBW	7(43.8%)	41(62.1%)	48(58.5%)
	Pre term	7(43.8%)	38(57.6%)	45(54.9%)
	Neonatal infection	1(6.3%)	6(9.1%)	7(8.5%)
	RDS	2(12.5%)	14(21.2%)	16(19.5%)
	Others	8(50.0%)	29(43.9%)	37(45.1%)

*Total of 391 samples were included by adding multiple pregnancy,

**Total of 368 samples were used by decreasing perinatal death

5.7 Maternal complications

Among pregnant women with placental abruption (2.6%) and (1.6%) developed PPH and DIC respectively. Among the maternal complications anaemia occurred in almost quarter of the cases, among which 24.5% required transfusion. Pregnant mothers with PA have more longer hospital stay than the controls where 22.9% of cases had hospital stay more than or equal to 14 days as compared to 0.5% of controls. One maternal death was recorded among the cases (Table 9).

Table 9. Maternal outcomes and complications of cases and controls in Tikur Anbessa Specialized Hospital and Gandhi Memorial Hospital during September 11, 2017 – September 10 2020 Addis Ababa, Ethiopia

		Controls (%)	Cases (%)	Total (%) (n=376)	
Maternal complications	Yes	11(5.95)	63(33.5%)	74(19.7%)	
	No	177(94.1%)	125(66.5%)	302(80.3%)	
Type of maternal complications	Infection	Yes	0(0.0%)	7(3.7%)	7(1.9%)
		No	100(100%)	181(96.3%)	369(98.1%)
	PPH	Yes	1(0.5%)	5(2.7%)	6(1.6%)
		No	187(99.5%)	183(97.3%)	370(98.4%)
	DIC	Yes	0(0%)	3(1.6%)	3(0.8%)
		No	188(100%)	185(98.4%)	373(99.2%)
	Anemia	Yes	10(5.3%)	49(26.1%)	59(15.7%)
		No	178(94.7%)	139(73.9%)	317(84.3%)
Was there Need for transfusion	Yes	0(0.0%)	12(24.5%)	12(20.3%)	
	No	10(100%)	37(75.5%)	47(79.7%)	
Maternal death		0	1(0.5%)	1(0.3%)	
Hospital stays	< 14	187(99.5)	145(77.1%)	332(88.3%)	
	≥ 14	1(0.5%)	43(22.9%)	44(11.7%)	
Mode of delivery	Caesarean section	57(30.3%)	103(54.8%)	160(42.6%)	
	Vaginal delivery	131(69.7%)	85(45.2%)	216(57.4%)	

5.8 Prevalence and Risk factors associated with Placental abruption

Prevalence of placental abruption was found to be 0.25% and Based on the p-value of the bivariable analysis and the potential to confound the association of factors with placental abruption, seven variables were identified as candidates for the multivariable analysis. These are advanced maternal age (age ≥ 35), previous history of still birth, previous history of abortion, Oligo- hydramnios, previous history of cesarean section, PROM, and preeclampsia. The result of the multivariable analysis however identified, history of previous cesarean section, previous history of still birth, PROM, age ≥ 35 , preeclampsia, previous history of abortion as independent determinants of placental abruption as shown in (Table 10).

The odds of advanced maternal age (≥ 35) among cases were 2 times higher than that of controls. [AOR=2.44; 95% CI: 1.13, 5.25].

Likewise, the odds of previous cesarean section were 3 times higher among cases than controls [AOR=3.21; 95% CI: 1.64, 6.29]. The odds of PROM were higher in cases as compared to controls. [AOR=8.88; 95% CI: 3.27, 23.65]. The odds of preeclampsia were almost 4 times higher in cases than controls [AOR=3.95; 95% CI: 1.54, 10.11]. Lastly the odds of previous history of still birth and previous history of abortion were also higher in cases with [AOR=4.55; 95% CI: 1.11, 18.59] and [AOR=2.28; 95% CI: 1.22, 4.26] respectively.

Table 10. Binary and multivariate logistic regression of Risk factors associated with placental abruption in Tikur Anbessa Specialized Hospital and Gandhi Memorial Hospital during September 11, 2017 – September 10 2020Addis Ababa, Ethiopia

Explanatory variables		Cases	Controls	COR 95%CI	AOR 95% CI	P value
Maternal age	≤ 24	34(18.1)	47(25.0)	1	1	-
	25-29	75(39.9)	82(43.6)	1.26(0.74, 2.18)	1.34(0.73, 2.5)	0.39
	30-34	31(16.1)	35(18.6)	1.22(0.64, 2.37)	1.27(0.6,2.65)	0.52
	≥ 35	48(25.5)	24(12.8)	2.77(1.43,5.35)	2.44(1.13,5.25)*	0.02*
Previous history of Still birth	Yes	12(6.4)	3(1.6)	4.25(1.17, 15.15)	4.55 (1.11,18.59)*	0.04*
	No	176(93.6)	185(98.4)	1	1	-
Previous history of Abortion	Yes	42(22.3)	20(10.6)	2.42 (1.36,4.3)	2.28(1.23,4.3)*	0.01*
	No	146(77.7)	168(89.4)	1	1	-
Previous caesarean section	Yes	41(21.8)	20(10.6)	2.51(1.34 , 4.69)	3.21(1.64, 6.3)*	0.001*
	No	67(35.6)	82(43.6)	1	1	-
Preeclampsia	Yes	23(12.2)	7(3.7)	3.6(1.51,8.62)	3.95(1.54,10.10)*	0.004*
	No	165(87.8)	181(96.3)	1	1	-
Oligo hydramnios	Yes	22(5.9)	10(2.7)	2.36(1.09, 5.13)	0.86 (0.33, 2.25)	0.86
	No	166(88.3)	178(94.7)	1	1	-
PROM	Yes	33(17.6%)	6(3.2%)	6.45(2.63, 15.81)	8.8(3.23,23.65)	<0.001*
	No	155(82.4%)	182(96.8%)	1	1	-

* Statistically significant at p value ≤ 0.05

6. Discussion

The findings of this study showed that prevalence of PA was found to be 0.25% and advanced maternal age, previous history of caesarean section, preeclampsia, PROM, previous history of still birth and abortion were independent determinants of placental abruption. Preterm birth, low birth weight, NRFHRP, admission to NICU and perinatal death were among the fetal complications which were more common among neonates born to PA mothers compared to non-PA mothers. Whereas Anemia, infections, postpartum hemorrhage, DIC and longer hospital stay were among the maternal complications that occurred more common among cases than counterpart controls. Where one maternal death was recorded among cases.

Prevalence of PA was found to be 0.25% which is lower than findings from local study in Ethiopia and Gambia this difference can be due to difference in sample size or difference in recording system at the level of triage to address the cases. (12, 28)

Advanced maternal age (≥ 35) was identified as one of the significant determinants of placental abruption the odds of being ≥ 35 was about 2.2 times higher in cases than controls. This is in line with different studies in Gambia(28), Iran(37), Brazil (33), Turkey (15), and Norway (13). With advanced age due to physiological changes of aging uterine blood flow decreases and utero placental under perfusion increases (55). Consequently, the strong association between increased maternal age and placental abruption is due to placental under perfusion and utero placental ischemia (34). Multi parity however was not found to be an independent risk factor for placental abruption while advanced maternal age did. This probably can be explained by difference in study area due to increasing rates of family planning services or due to higher rates of delaying pregnancies seen in women residing in the city.

Previous caesarean delivery was identified as independent determinant of placental abruption. The odds of having previous cesarean section were 3 times higher in women with placental abruption than those with no abruption. This association is supported by studies in Tanzania (14), Iran (37) and Turkey(15), The risk of placental abruption in women with a history of cesarean section has been argued to result from the dehiscence of the scar line and again from thinning of the scar area (15). This study also found preterm PROM to be strong independent determinant of PA where the

odds of PROM is 8 times higher in cases than the counterpart controls. Similar associations were also noted in cohort study done in France (46) and in Finland (39).

There appears to be several plausible biologic mechanisms that may be responsible for the increased risk for placental abruption in relation to PROM. These possible justifications lie in different mechanisms which may account for this link. Some of the speculations indicate that an acute reduction in the uterine volume and intra uterine surface area as a consequence of PROM could ultimately lead to disruption in site of placental attachment there by resulting in abruption(56). Another possible justification could be premature rupture of the membranes is often associated with ascending intrauterine infection and direct bacterial colonization of decidua with tissue inflammation may initiate a process that ultimately results in placental abruption(10).

Hypertensive disorders in pregnancies has been found to be significant risk factors in several studies like Gambia (28), Uganda (38). Similar associations were observed in this study where the odds of preeclampsia were 4 times higher in pregnant women with PA than without PA. This finding is in line with researches done in South Africa,(36), Tanzania(14), Finland (39) and Turkey(15).

Vascular disease plays a predisposing role in the disruption of the placental bed in some abruptions. Because hypertension has been shown to cause arteriolar degeneration, the compromised afferent blood supply to the placenta has been emphasized. In addition, superimposed arteriolar spasm would tend to aggravate the ischemia. Perhaps the entire entity may be a progressive stress or accelerated degeneration of an already defective vasculature of the placental bed(56).

Lastly, the odd of previous history of still birth and abortion was 4 and 2 times higher in pregnant women with PA respectively. Similar findings of association were observed in studies done in Uganda (38), and Peru (57). The mechanism how previous abortions pre-dispose to placental abruption development could be explained with possible endometrial damage during repeated abortions, which impedes successful implantations of placenta(37).

Unlike the finding from this study in some researches nonattendance to ANC was found as an independent risk factor for PA(14). In study done in South west Ethiopia at Jimma University Specialized Hospital 15% of women with PA have no history of attendance of ANC while in this

study 9.6% of women with PA have no history of attendance of ANC (12). This is probably due to difference in study population since almost all of our study participants reside in urban area where health seeking behavior and knowledge about importance of ANC is thought to be higher.

In this study perinatal death was reported in 11.3% of cases where 9.7% had still birth and 1.5% had early neonatal death., these rate of still birth can be due to delay in taking the decision to go to the hospital after experiencing some unusual symptoms or symptoms as vaginal bleeding indicate the possibility of placental abruption this leads to early diagnosis and intervention however some type of placental abruption cases may not have prompting symptom to seek out medical care this in turn can lead to late detection and larger placental separation leading to fetal distress and eventually fetal death.

However, higher rate of perinatal death was seen in different studies like study done in southwest Ethiopia where perinatal mortality rate associated with placental abruption was found to be 564/1000 births(26) higher rate was also observed in India (58) , Nigeria and Gambia where more than 50% of still births were reported among the cases(21, 28). Higher still birth rate seen in other studies as compared to this study can be explained by difference in sample size or difference in predominant type of class of placental abruption where in this study majority presented with mild type of placental abruption.

Alongside with the above finding another significant finding of this study was that most of placental abruption cases with still birth (73.7%) had more than 50% of retroplacental clot/ degree of separation which is similar to the findings reported in studies done in South Africa and USA(59, 60)

In case of patients with placental abruption both the mean gestational age at delivery and mean gestational age at diagnosis were pre-term neonates where mean gestational age was found to be 36.1 ± 3.3 weeks and 35.2 ± 4.2 among cases as compared to 39.6 ± 2 weeks and 39.5 ± 2.2 among controls respectively. This finding is in agreement with studies done in USA and Japan (19, 61). Preterm birth due to placental abruption can be either medically indicated preterm birth which can be necessary in the setting of placental abruption to reduce the risk of maternal and perinatal morbidity and mortality or spontaneous preterm birth (preterm labor or membrane rupture) which

is thought to be the result of bleeding from the separation of the placenta which irritates the uterine lining and stimulates contractions which progress into preterm labor.(1, 62)

In this study among the cases 36.4% of them had delivered low birth weight neonate this is in line with different studies(14, 19, 38). Low birth weight is frequently exhibited in placental abruption cases which can be primarily related to the corresponding incidence of preterm birth (63)

Almost quarter of cases had anemia and PPH, DIC and longer hospital stay were among maternal complications that were common among placental abruption cases, which is in line with other studies(14, 21).

Maternal death was found only in 1(0.5%) of the cases. This finding is in line with several other studies (21, 28). The report of lower maternal death in this study may be due the study settings where both TASH and GMH are referral centers and there is higher level of care given in these hospitals. Furthermore, it may be due to early detection of the condition due to higher reported implementation of ante natal care service and wide implementation of facility-based deliveries.

7. Strength and limitation of the study

Use of Kobo collect for data collection to improve data quality and reduce time required for data entry was one of the strengths of this study.

The major limitation of the study was use of secondary data which led to missing of some important variables. Another limitation was possibility of selection bias, since this was a hospital-based study and both Study settings used are referral centers women with complicated pregnancies are more likely to be referred for delivery in the study settings.

The other major limitation of study was inadequate recording system at the study hospitals specifically at Gandhi Memorial Hospital which made it hard to find the cases.

Thirdly, diagnosis of PA was based on an assessment made by the attending clinician. Thus, some form of misclassification may have resulted from subjective assessment of the clinician especially for moderate and milder forms of placental abruption.

From medical registry at both TASH and GMH the information obtained from the mother and neonate is only until delivery and immediate to delivery. The neonate's status after delivery is

captured if there is a maternal condition that prompted the mother to stay longer therefore, early neonatal deaths that might have occurred outside the hospital may not have been recorded in the registry. This may have led to underreporting of the true perinatal death.

Moreover, our data lack specific information on a few important behavioral factors for abruption such as smoking status, alcohol consumption and use of illicit drugs which might be associated with development of PA. These variables were not recorded in the patient's chart therefore was not presented in the study.

8. Conclusion

In this study prevalence of placental abruption was found to be low, advanced maternal age, previous history of caesarean section, preeclampsia, PROM, previous history of still birth and abortion were identified as independent determinants of placental abruption. Overall, Placental abruption is more likely to be affected by factors from previous obstetric history and factors occurring during pregnancy, on the basis of the findings from this study one can assume which groups of women are at high risk and which group of women can have benefit from thorough surveillance during pregnancy. So that the attending health personnel can pay attention to signs suggesting to placental abruption that a woman may present during antenatal care.

Preterm birth, low birth weight, NRFHRP, admission to NICU and perinatal death were among fetal complications that commonly occurred among neonates born to PA mothers. Whereas, Anemia, infections, postpartum hemorrhage, DIC and longer hospital stay were maternal complications that occurred in relation to placental abruption where there was one maternal death recorded.

9. Recommendation

Based on the findings of our study, the following recommendations are forwarded for the respective organs

Clinicians: Although the technological advancement of medicine contributes in the diagnosis of placental abruption, clinical diagnosis is still very important. Hence, it is important for medical practitioners responsible for prenatal monitoring to be able to diagnose such complications in a timely manner and monitor maternal condition in the search for the best prognosis, and detect women who are more likely to develop placental abruption and develop individual follow up plan with specific intervention. Improved attendance to antenatal care and timely management of these factors may reduce the risk of placental abruption and associated adverse fetomaternal outcomes.

Pregnant women: Pregnant women with bad obstetric history and previous history of cesarean section should have proper ANC follow up and knowledge that PA is more common in older women could help to inform clinical decision making in pregnancy

Health facilities: Health care providers at health facilities need to maintain proper recording system of their cases.

Researchers: Researchers are recommended to conduct more researches on maternal and fetal outcomes that associate with PA, since this study's findings indicate descriptive statistics of fetal and maternal outcomes researchers are recommended to do further analytical studies to identify relations between PA and maternal and fetal outcomes associated with it. And prospective studies are more recommended to assess behavioral factors associated with placental abruption such as cigarette smoking and alcohol consumption.

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Annex I Questioner

No	Questions	
	Section 1 Socio demographic factors	
101	Type of data	1. Case 0. Control
102	MRN	
103	Age	
104	Place of residence	1.Addis Ababa 2. Diredawa 3. Amhara region 4. Oromia Region 5.Tigray region 6. Benshalgumguz 7. Afar region 8. SNNPR 9. Gambella 10. other -----
	Behavioral factors	
105	History of smoking?	1. Yes 2. No
106	History of Alcohol consumption?	1. Yes 2. .No
107	Total duration of stay	----- days
	Pregnancy related	
111	Gravidity	
112	Parity	
113	Abortion status	
114	Still birth status	
115	NND status	
116	GA at diagnosis	
117	GA at delivery	
118	ANC follow up	1.Yes 2. No
119	Mode of delivery	1.Vaginal delivery 2. Caesarean section 3. Medical termination
120	Presenting symptom upon admission?	1. Painful/Painless Bleeding(dark blood/ light colored) (clotting/ non clotting) 2. Abdominal pain 3. Blood stained amniotic fluid

		4. Abnormal or absent fetal heart tones 5. Pushing down pain 6. Passage of liquor 7. Other specify-----	
121	Admission diagnosis	1. Abruption 2. ROM 3. Labor 4. Anemia 5. PIH 6. Other	1.Mild/Moderate/Severe 2.Preterm/Term/Prolonged 3. Preterm/Term 4. Type specify----- 5.Gestational htn/ Preeclampsia/ Eclampsia / superimposed eclampsia on chronic htn 6. Specify
122	Any additional manifesting symptom?	1.Yes 2. No	If yes specify
123	Any additional disease condition developed after admission	1.Yes 2. No	Specify -----
124	Presence of any bad obstetric history	1. Yes 2. No	
125	Type of Bad obstetric history	1. Pregnancy loss 2. Neonatal death	Frequency of NND-----
126	Type of pregnancy loss	1. Abortion 2. Still birth	
127	Frequency of Abortion Frequency of still birth GA at which it occurred		
128	Family history of the following disease conditions	1. Preterm birth 2. IUGR 3. None	
129	Any history of medical illness	1. Yes 2. No	If yes Specify
	Current obstetric history		
130	Bleeding before current admission?	1.Yes 2.No	Frequency-----
131	Any history of accident during current pregnancy	1.Yes 2. No	If yes specify type of accident
132	Presence of uterine anomaly?	1.Yes 2. No	If yes type-----
133	HEELP syndrome	1.Yes 2.No	
134	Chorioamnionitis	1. Yes 2. No	
135	Oligohydramnios	1.Yes 2.No	

136	Polyhydramnios	1. Yes 2. No	
Post-delivery maternal status			
200	Any maternal complications	1. Yes 2. No	
201	Maternal complications	1. Hysterectomy 2. Pelvic organ injury 3. Infection 4. Maternal death 5. Anemia 6. PPH 7. DIC 8. other specify	If Anemia Type of Anemia----- Was there need for transfusion? If yes how many units of blood? -- --
202	Presence of Placental abnormality	1. Yes 2. No	Specify ---
203	% Of Retro placental clot	-----%	
204	Post-natal blood work status	1. Known 2. Unknown	
205	Post-natal HGB HCT		
206	Order of pregnancy?	1. Single 2. Multiple	
Fetal status			
207	Birth status	1. Term 2. Pre term 3. Post term	
208	Birth outcome	1. Alive 2. Still birth/IUFD 3. Early neonatal death	
209	Birth weight		
210	Apgar score in 1 minute		
211	Apgar score in 5 minutes		
212	Sex of the baby	1. Male 2. Female	
213	Presentation of the fetus	1. Vertex 2. Non vertex	
214	Presence of cord prolapse?	1. Yes 2. No	
215	Presence of IUGR?	1. Yes 2. No	
216	Presence of NRFHRP	1. Yes 2. No	If yes type -----

217	Need for resuscitation	1. Yes 2. No	
218	Admission to NICU	1. Yes 2. No	
219	Reason for admission to NICU	1. LBW/VLBW 2. Pre term 3. Neonatal infections 4. Respiratory distress syndrome 5. Other	
220	Presence of MSAF	1. Yes 2. No	
221	Presence of congenital anomaly?	1. Yes 2. No	
	For cases Only		
222	Type of PA based on the clinical classification	1. Mild 2. Moderate 3. Severe 4. Not specified	

Annex II: Declaration Form

DECLARATION

ASSURANCE OF PRINCIPAL INVESTIGATORS

I, the undersigned, declare that this postgraduate degree thesis is my original work, has not been presented for a degree in any other university and that all sources of materials used for the thesis have been duly acknowledged.

1. Name of the student: _____ Signature _____ Date _____

APPROVAL OF THE ADVISORS

This Thesis has been submitted with my approval as university advisor.

APPROVAL OF ADVISOR

Name of the first advisor: Professor Mekbeb Afework

Signature _____ Date _____

Name of the second advisor: Dr. Abdu Mengesha

Signature _____ Date _____

APPROVAL OF EXAMINER

Name of the examiner: Dr. Eyasu Mesfin

Signature _____ Date. _____