



**MEKELLE UNIVERSITY,  
COLLEGE OF HEALTH SCIENCES,  
SCHOOL OF MEDICINE**

**DEPARTMENT OF OBSTETRICS AND GYNECOLOGY**

**MATERNAL AND NEONATAL OUTCOME OF ADVANCED  
MATERNAL AGE ADMITTED FOR LABOUR AND DELIVERY  
IN ACSH AND MGH, TIGRAY ETHIOPIA**

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## List of Abbreviations and Acronyms

<b>Abbreviations</b>	<b>Extended form</b>
ACSH	Ayder comprehensive Specialized Hospital
ANC	Antenatal Care
APGAR	Appearance, Pulse, Grimace, Activity, and Respiration
APH	Antepartum Hemorrhage
CD	Cesarean Delivery
EDHS	Ethiopia Demographic and Health Survey
ETB	Ethiopian Birr
IUFD	Intra Uterine Fetal Death
IUGR	Intra Uterine Growth Restriction
LBW	Low Birth Weight
MGH	Mekelle General Hospital
NICU	Neonatal Intensive Care Unit
PIH	Pregnancy Induced Hypertension
PNA	Perinatal Asphyxia
PPH	Postpartum Hemorrhage
RDS	Respiratory Distress Syndrome
SPSS	Statistical Package for Social Science
USA	United States of America
WHO	World Health Organization

## Declaration

I hereby declare that this specialty thesis paper is my original work and has not been presented for a degree in any other university and all sources of material used for this thesis paper have duly acknowledged.

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Date \_\_\_\_\_

## Abstract

### Background

Advanced maternal age is usually defined as being 35 years or older during pregnancy. AMA, planned or unplanned, are usually regarded as high risk, because they have been associated with an increased risk of adverse pregnancy outcomes.

### Objective

To examine maternal and neonatal outcomes in AMA admitted for labor and delivery at AMA and adult age pregnancy in ACSH and MGH, from July 2024 to October 2024

### Methodology

Hospital based prospective case-control study on 256 pregnancy at AMA(cases) and 256 pregnancy at 20-34yrs(controls) admitted for labor and delivery in Mekelle Public Hospitals was employed. Data was collected by using pretested structured questionnaire. The collected data was entered into EpiData 4024 and exported to SPSS 27 for analysis. The dependent variables were AMA pregnancy, maternal and neonatal outcomes. Statistical significance declared at  $p < 0.05$ .

### Result

Participants who attended secondary school or above accounted for 144 (56.3%) of cases and 185 (72.3%) of controls. The difference in distribution of educational status between cases and control were statistically significant ( $p = 0.001$ ). Among those who had ANC contacts, 4 plus ANC contact was recorded in 188 (76.1%) of cases and 220 (87.6%) of controls and the difference was statistically significant ( $p < 0.001$ ). Pregnancy was planned in 218 (85.2%) of cases and 248 (96.9%) of controls. The difference in pregnancy plan was statistically significant ( $p < 0.001$ ). Obstetric complications happened in 104 (40.6%) of cases and 70 (27.3%) of controls. The magnitude of obstetric complication was significantly higher in cases group ( $p = 0.002$ ). Caesarean delivery rate was higher in cases (87, 34.0%) than controls (53, 20.7%) and the discrepancy was highly remarkable ( $p < 0.001$ ). The magnitude of low first minute APGAR score ( $< 7$ ) was observed in 27 (10.6%) of cases and 10 (3.9%) of controls. This difference was statistically significant ( $p = 0.011$ ).

### Conclusion

This study has revealed that obstetric complications like antepartum haemorrhage, pre-eclampsia, prolonged labor, and gestational diabetes are higher among older mothers compared to younger mothers. Low First minute APGAR scores were more frequent in older mothers. Caesarean delivery and post-partum haemorrhage (PPH) were significantly higher in mothers aged 35 or above.

**Keywords:** AMA pregnancy, mode of delivery, maternal outcome, neonatal outcome

## **1. Introduction**

### **1.1. Background**

Advanced maternal age is usually defined as being 35 years or older which is believed to predispose mothers to enormous adverse outcomes during pregnancy . A study done in 29 countries (Africa, Asia, Middle East, and Latin America) revealed that the magnitude of pregnant women with advanced maternal age was 12.3% (1–5).

Study conducted in the United States of America showed that the average age of women at first birth has consistently increased over the last four decades, with the birth rate for women aged 40–44 more than doubling from 1990 to 2012. A retrospective comparative study done in a South Africa tertiary hospital revealed that the prevalence of advanced maternal age was 17.5%(3,4,6)

Postponing marriage until later, the availability of better contraceptive options, social and cultural shifts, wider opportunities for further education and career advancement have impacted AMA prevalence.(7,8)

AMA, planned or unplanned, are usually regarded as high risk, because they have been associated with an increased risk of adverse pregnancy outcomes.

AMA is reported to be associated with a range of pregnancy complications including: fetal growth restriction (FGR), preeclampsia (PE), placental abruption, pre-term birth (PTB) and stillbirth by a series of epidemiological studies and importantly these increased risks appeared to be independent of maternal co-morbidities.(1,2,4,7,9)

Furthermore, systematic reviews and meta-analyses have demonstrated that AMA is associated with an increased risk of Caesarean birth [12] and that AMA is a risk factor for stillbirth(1)

## **1.2. Statement of the problem**

Advanced maternal age is associated with various economic, social and health complications to the mother and to the fetus or neonate as well .(7,10)

Even though reduction of neonatal mortality is needed to achieve Sustainable Development Goals 2030, advanced maternal age is still an independent and a substantial risk factor for different adverse perinatal outcomes, in turn causes neonatal morbidity and mortality(7)

Various studies conducted on the topic elucidated that the aftermath of advanced maternal age (AMA) is highly linked with the occurrence of pregnancy-induced hypertension, DM, maternal near-miss, increased cesarean delivery, malpresentations, and maternal death. Alongside with this, AMA also results in neonatal complications, such as Low Apgar score, NICU admission, preterm delivery, low birth weight, birth defects.(1,2,8,11,12)

Globally, the academic community has extensively explored the association of AMA with adverse obstetrical and perinatal outcomes. However, few researches have been conducted to identify the association of AMA with these outcomes in Ethiopia and none in the study setting. Hence, this research will be used determine the magnitude of obstetrical and neonatal outcomes associated with AMA.(13)

## **1.3. Significance of the study**

Ethiopia has done a tremendous job in preventing teenage pregnancy; however, the pregnancy in older-aged women is given less concern even though postponing pregnancy due to the educational and socioeconomic condition improvement is increasing. Pregnancy in AMA is studied and approached poorly in Ethiopia.(3,13)

A significant number of mothers included in the Ethiopian Demographic Health Survey (EDHS) were having AMA although their birth outcomes were not assessed. Therefore, this study aims at assessing the effect of advanced maternal age pregnancy on maternal and neonatal outcomes.

This study is aimed to compare adverse neonatal outcomes and its associated factors among women with adult and advanced maternal age pregnancy in ACSH and MGH.

Identifying the outcomes of AMA pregnancy will be useful in designing effective sensitization programs for couples and empowering them about informed choices for pregnancies during advanced maternal age.

Furthermore, the result of this study can be utilized by concerned bodies to optimize care given for advanced aged mothers.

## **2. Literature Review**

### **2.1. Overview and Prevalence of AMA pregnancy**

Advanced maternal age (AMA) is defined as pregnancy at a maternal age of 35 years or older. During the last two decades, the worldwide trend in childbearing age is changing towards an older maternal age. The proportion of pregnancy at AMA in three different continents, Latin America, Middle East Asia, and Africa, is 12.3% . In United States of America the average age of women at first birth has consistently increased over the last four decades, with the birth rate for women aged 40–44 more than doubling from 1990 to 2012 .(6,8,15,16)

The prevalence of advanced maternal age is different in different countries 17.5% in South Africa. 33.4% in Norway, 11.4% in Taiwan , 45.7% in Israel and 14.8% in the report from Malaysia .(1–3,13,15)

Different reasons for postponing pregnancy were described by different studies. Occupational and socio economic, personal and marriage problems, child bearing desire and conception issues, and infertility were among the reasons for late-age pregnancy.

Advanced maternal age is associated with various economic, social and health complications to the mother and to the fetus or neonate as well. Various studies conducted on the topic elucidated that the aftermath of advanced maternal age (AMA) is highly linked with the occurrence of pregnancy-induced hypertension, DM, maternal near-miss, increased cesarean delivery, malpresentation, and maternal death. Alongside with this, AMA also results in neonatal complications, such as Low Apgar score, NICU admission, preterm delivery, low birth weight, birth defects, chromosomal abnormalities and perinatal death.

### **2.2. Immediate maternal outcomes of AMA pregnancy**

Advanced maternal age is associated with various economic, social and health complications to the mother.

According to cross-sectional study conducted at Awi zone, Amhara region, Nearly 35% of AMA women had previous bad obstetrical history, compared with 10.1% adult aged women. More than one-third 35.4% of AMA women had unplanned pregnancy compared with 8.7% of adult aged women. 97.7% AMA and 98.3% adult aged women had ANC follow up. Around 21% of AMA women had complication during pregnancy, compared with 14.5% of adult aged women.

Complications during labor-delivery were significantly more common among AMA women 23.4% than adult aged women 15.9%(7)

cross-sectional study was conducted from March 2020 to July 2020 at Dessie specialized hospital on 796 mothers shows , induced hypertension and antepartum hemorrhage among advanced age mothers were 18.6% and 16%, respectively among AMA . However, these were 6.9% and 5.3% in adult age mothers. Slightly higher advanced mothers had GDM (1.6% Vs 2.4%) compared to adult pregnant mothers. Almost one-third of 34.7% advanced age mothers and 21.8% adult mothers underwent cesarean section. Roughly higher 5.4% of advanced age mothers had postpartum hemorrhage than adult mothers 1.3%.(13)

cross-sectional analytical study done in Tanzania shows Women with cesarean sections were 3.86 times more likely to be in the advanced age group than those under 35 years of age (OR 3.86; 95%CI 1.30–1.49; P < 0.001). Women with gestational diabetes were 10.29 times more likely to have AMA than those aged <35 years (OR 10.29; 95%CI 2.57–41.18; P <0.001). Women with AMA were 1.67 times more likely to have pre-eclampsia than the reference group.(16)

Retrospective cohort study done in china shows the risk of preeclampsia was revealed to be 1.5 fold, 3 fold risk of GDM, 2.1 fold risk of CD on AMA over adult age pregnancy .(17)

### **2.3. Immediate neonatal outcomes of AMA pregnancy**

AMA is also associated with adverse perinatal outcomes. According to cross sectional study conducted at Awi zone, from February 25/2020 to April 25/2020, Prevalence of adverse perinatal outcome was 29.1% and 14.5% among advanced and adult aged maternal respectively. The proportion of preterm birth among AMA women (12%) was significantly higher compared to (4.1%) adult aged women (p < 0.001). similarly, significant percentage of babies born from AMA women were LBW compared to adult aged newborn babies (14.3% vs 6.7% respectively with p < 0.001).(7)

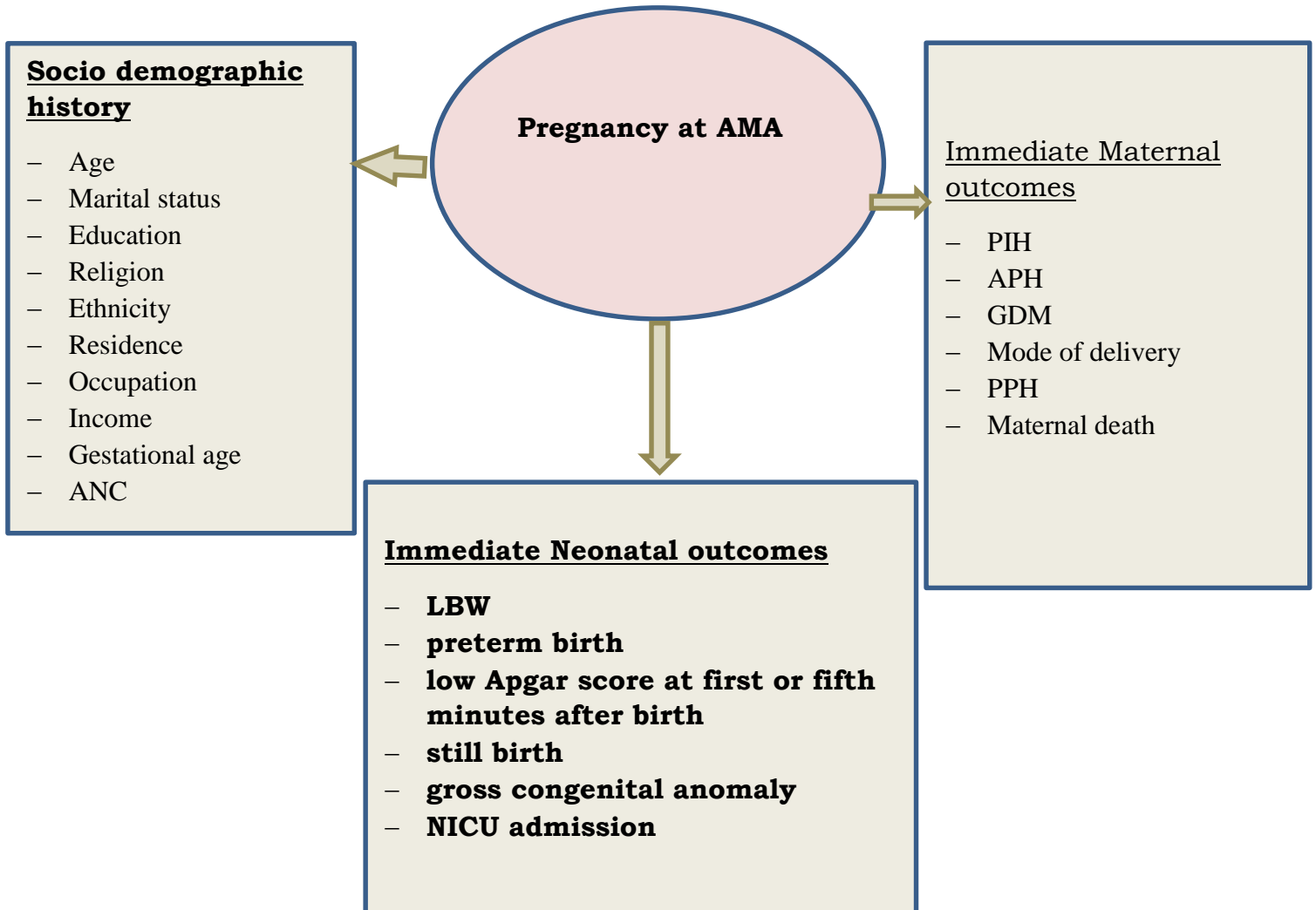
From the above mentioned study in dessie shows, Perinatal death was 2.46 times more likely to happen upon in babies born from advanced age mothers than adult pregnancy, babies born from advanced age mothers were 3.01 times more likely to be born prematurely, likewise, babies born from advanced age mothers were 3.08 times more likely to be low birth weight and 3.99 times more likely to have low fifth minute Apgar score than babies born from the reference aged mothers.(13)

From the study done in Tanzania , women with AMA were 1.18 times more likely to have a low-birth-weight baby; they were also 23 % more likely to have babies transferred to the NICU and 1.47 times more likely to have a stillbirth .(16)

Study done on Cameron, AMA to adult age pregnancy shows : fetal death -3.5% vs 1.6%; preterm delivery - 12% vs 9.2%; low birth weight -11% vs 7.7% ; admission to special care neonatology unit-14.1% vs 10.2%; low Apgar scores at 1min and 5min -3.5% vs 1.6 .(18)

According to study done on Israel , from 2003 – 2021, NICU admission rates rose from 2.7% in the comparison group to 6% in AMA group.(19)

### 3. Conceptual framework



## **4. Objectives of the study**

### **4.1. General Objective**

To examine maternal and neonatal outcomes in AMA admitted for labor and delivery at AMA and adult age pregnancy in ACSH and MGH , from July 2024 to October2024.

### **4.2. Specific Objectives**

1. To compare adverse maternal complications between mothers admitted for labor and delivery at AMA and adult age pregnancy in ACSH and MGH, from July2024 to October 2024.
2. To compare adverse neonatal complications between mothers admitted for labor and delivery at AMA and adult age pregnancy in ACSH and MGH, from July2024 to October 2024 .

## **5. Method and Materials**

### **5.1. Study Area**

Tigray is one of the northern most of the ten regional state of the Federal Democratic Republic of Ethiopia. Mekelle is the capital city of Tigray and is located 780 km away from the capital city of Ethiopia, Addis Ababa.

Ayder comprehensive Specialized Hospital is found in Mekelle, and one of the largest public hospitals in Ethiopia. It started as a referral and specialized medical center in 2008 G.C. It serves for 9 million populations in its catchment areas of Tigray, Northern Afar, and North-eastern part of Amhara regional states. It is the second largest hospital in the nation and has more than 500 inpatient beds in the four major departments (pediatric and child health, Internal medicine, Surgery and Obstetrics/ Gynecology) and other specialty units. The hospital also served as teaching hospital and research center for the College of Health Sciences, Mekelle University.

Mekelle general hospital is one of the oldest regional hospitals that gives service currently mainly for residents' of the city and neighboring districts. The hospital gives delivery services to 400 mothers per month on average. In the hospital there are 30 midwives and 6 delivery couches. Residents and seniors from ACSH rotate monthly to deliver Obstetrics and Gynecology services. It similarly hosts an average of 5484 deliveries per annum

This study is to be conducted at Ayder Comprehensive Specialized Hospital and Mekelle General Hospital, found in Mekelle town, North Ethiopia.

### **5.2. Study Period**

Data collection for this study will be undertaken from July1, 2024 to October30, 2025 G.C

### **5.3. Study Design**

Hospital based prospective case control study was done

### **5.4. Source Population**

All pregnant mothers admitted for labor and delivery in ACSH and MGH during the study period

#### **5.4.1. Study Population**

All pregnant mothers aging more than 20yrs and above admitted for labor and delivery in ACSH and MGH during the study period.

## 5.5. Eligibility Criteria

### 5.5.1. Inclusion criteria

Pregnancy carrying Singleton babies

### 5.5.2. Exclusion criteria

Mothers who decline to participate in the study

Age less than 20 years

Mothers with chronic medical illness

## 5.6. Study Variables

### 5.6.1. Independent Variables

- Age
- Residence
- Religion
- Marital status
- Education
- Occupation
- Income
- Gestational age
- ANC
- Referral Status
- Mode of delivery

### 5.6.2. Dependent Variables

- Maternal outcome
- Neonatal outcome

## 5.7. Sample size Determination

Sample size formula for comparing two population proportions was used to compute the minimum sample size required for this study considering an assumption of 95% confidence level, power 80%, the proportion of low birth weight in pregnancy at AMA is 14.3%, and adult pregnancy is 6.7% taken from a study conducted in Awi zone, Amara region Ethiopia(7) and the formula is written below:

$$n = \left[ \frac{z_{\alpha/2} \sqrt{(p1 + p2)(q1 + q2)/2} + z_{\beta} \sqrt{p1q1 + p2q2}}{p1 - p2} \right]^2$$

EpiInfo 7 was used for computing the required sample size and the description of formula for comparing two population proportions is presented below:

- ✓  $p_1$  = prevalence of low birth weight in AMA was 14.3%
- ✓  $P_2$  = prevalence of low birth weight in adults was 6.7%
- ✓  $q_1 = 1 - p_1$ ,
- ✓  $q_2 = 1 - p_2$ ,
- ✓  $z_{\alpha/2}$  = critical Z value for 95% confidence level = 1.96,
- ✓  $z_{\beta}$  = critical Z value for power of 80% = 0.84
- ✓  $n$  = sample size for cases assuming ratio of case to control was 1:1.

Based on the above parameters, the minimum sample size required for cases and controls was 256 and 256, yielding a total sample size of 512.

### 5.8. Sampling procedure

Women with AMA pregnancy formed the case group, while adult mothers aged 20-34 years formed the control group. The control group was selected since this age-group is generally regarded as safe for childbirth. one consecutively admitted for labor and delivery control was taken for each case who was admitted for labor and delivery.

### 5.9. Data collection methods and quality assurance

Data was collected by using pretested structured questionnaire. Before the data collection, data collectors (2 midwives) were trained in order to have a common understanding on each question. Data collection was supervised by the principal investigator daily to assure the quality of data. After checking for completeness and cleaned, data were entered into EpiData 7.2.6.0 and exported to SPSS 27 for analysis.

### 5.10. Data Processing and Analysis

The collected data was clear and checked by the principal investigator for completeness and consistency. Then the data was computed and analyzed using SPSS version 27 statistical software. Finally, the data is presented in tables and graphs.

### 5.11. Operational Definition

- AMA: according to the International Federation of Gynecology and Obstetrics, it is defined as age of 35 years or older at the time of delivery.
- Adult maternal age: is considered when maternal age is 20–34 years-inclusive
- Maternal outcome: stands for mode of delivery, and antepartum, intrapartum and/or postpartum morbidities/mortality until discharge from the hospitals
- Perinatal outcome: stands for 1<sup>st</sup> and 5<sup>th</sup> minute APGARs, prematurity and its morbidities, admission to N-ICU and status at birth and until discharge from the hospitals.

### **5.12. Ethical Consideration**

Ethical clearance was obtained from Institutional Review Board of Mekelle University, College of Health Science, and permission to collect data was obtained from Clinical Directors of the two hospitals. Names and other identifiers were not used in collecting the data, and confidentiality was maintained throughout the study period. Verbal informed consent was obtained from the mothers.

Add

## 6. Results

For this study, 256 cases (mothers aged 35 or above) and 256 controls who met the eligibility criteria were recruited.

### 6.1 Socio-demographic Information of cases and controls

Orthodox followers accounted for 242 (94.5%) of cases and 246 (96.1%) of controls. Almost all cases and controls were Tigrayan by ethnicity. Concerning residence, 227 (88.7%) cases and 239 (93.4%) of controls were from urban area. Except one participant from control group, the remaining all participants were married in both cases and control group. Illiterate participants accounted for 25 (9.8%) of cases and 8 (3.1%) of controls. Participants who attended secondary school or above accounted for 144 (56.3%) of cases and 185 (72.3%) of controls. The difference in distribution of educational status between cases and control were statistically significant ( $p=0.001$ ). Among cases, 210 (82.0%) were housewives, 23 (9.0%) were government employee, and 19 (7.4%) were private employee. Among controls, 195 (76.2%) were housewives, 22 (8.6%) were government employee, and 35 (13.7%) were private employee.

*Table 1: Sociodemographic information of the cases and controls in Mekelle public hospitals, Tigray region, Ethiopia, June 1 to October 30, 2024 (n= 512)*

Characteristics		Case-Control				p-value
		Control (n=256)		Case (n=256)		
		n	%	n	%	
Place of admission	ACSH	130	50.8	130	50.8	1.000
	MGH	126	49.2	126	49.2	
Religion	Orthodox	246	96.1	242	94.5	0.403
	Muslim	10	3.9	14	5.5	
Ethnicity	Tigray	252	98.4	255	99.6	0.221
	Amhara	1	0.4	1	0.4	
	Afar	3	1.2	0	0.0	
Residence	Urban	239	93.4	227	88.7	0.064
	Rural	17	6.6	29	11.3	
Marital	Married	255	99.6	256	100.0	0.317
	Single	1	0.4	0	0.0	
Education	Illiterate	8	3.1	25	9.8	0.001
	Grade 1-4	11	4.3	19	7.4	
	Grade 5-8	52	20.3	68	26.6	
	Grade 9-12	128	50.0	101	39.5	

	College or University graduate	57	22.3	43	16.8	
Occupation	House Wife	195	76.2	210	82.0	0.072
	Governmental Employee	22	8.6	23	9.0	
	Private Employee	35	13.7	19	7.4	
	Student	1	0.4	0	0.0	
	Daily Labourer	1	0.4	4	1.6	
	Others	2	0.8	0	0.0	

## 6.2 Obstetrics profiles of the cases and controls

Only 9 (3.5%) cases were primigravida. The remaining cases were multigravida (124, 48.4%) and grand multigravida (123, 48.0%). Among controls, 86 (33.6%) of them were primigravida, 151 (59.0%) were multigravida, and only 19 (7.4%) of them were grand multipara. About 95% and 60% of cases and controls have 2 alive kids or more, respectively. Stillbirth history was recorded in 19 (7.5%) of cases and 8 (3.1%) of controls. END is reported by 8 (3.2%) of cases and 3 (1.2%) of controls. History of infant death is noted in 2 cases but there was no report from controls. Recurrent abortion history was found in 11 (4.3%) of cases and 10 (3.9%) of controls.

*Table 2: Obstetrics profiles of the cases and controls in Mekelle public hospitals, Tigray region, Ethiopia, June 1 to October 30, 2024 (n= 512)*

Characteristics		Case-Control				p-value
		Control (n=256)		Case (n=256)		
		N	%	n	%	
Gravidity	1	86	33.6	9	3.5	<0.001
	2-4	151	59.0	124	48.4	
	5 or above	19	7.4	123	48.0	
Parity	1	101	39.5	11	4.3	<0.001
	2-4	147	57.4	132	51.8	
	5 or above	8	3.1	112	43.9	
Alive kids	0	2	0.8	1	0.4	<0.001
	1	101	39.5	13	5.1	
	2 or above	153	59.8	242	94.5	
Stillbirths	0	248	96.9	237	92.6	0.072
	1	7	2.7	14	5.5	
	2 or above	1	0.4	5	2.0	
END	0	253	98.8	248	96.9	0.284
	1	2	0.8	4	1.6	
	2 or above	1	0.4	4	1.6	
Infant death	0	256	100.0	254	99.2	0.156

	1	0	0.0	2	0.8	
Abortion	0	217	84.8	213	83.2	0.890
	1	29	11.3	32	12.5	
	2 or above	10	3.9	11	4.3	
Ectopic	0	255	99.6	255	99.6	1.000
	1	1	0.4	1	0.4	

### 6.3 Antenatal care and obstetric complications

Except for 41 (16.0%) of cases and 31 (12.1%) of controls, GA was known either by reliable LNMP or early ultrasound in both cases and controls. ANC was booked for 247 (96.5%) and 251 (98.0%) of cases and controls, one-to-one. Among those who had ANC contacts, 4 plus ANC contact was recorded in 188 (76.1%) of cases and 220 (87.6%) of controls and the difference was statistically significant ( $p < 0.001$ ). The most common site for ANC in both cases and controls was Health Center. Pregnancy was planned in 218 (85.2%) of cases and 248 (96.9%) of controls. The difference in pregnancy plan was statistically significant ( $p < 0.001$ ). Obstetric complications happened in 104 (40.6%) of cases and 70 (27.3%) of controls. The magnitude of obstetric complication was significantly higher in cases group ( $p = 0.002$ ).

*Table 3: Antenatal care and obstetric complications of the cases and controls in Mekelle public hospitals, Tigray region, Ethiopia, June 1 to October 30, 2024 (n= 512)*

Characteristics		Case-Control				p-value
		Control (n=256)		Case (n=256)		
		N	%	n	%	
Method of GA estimation	Reliable LNMP	206	80.5	183	71.5	0.048
	Early Ultrasound	19	7.4	32	12.5	
	Unknown	31	12.1	41	16.0	
ANC	Booked	251	98.0	247	96.5	0.278
	Not booked	5	2.0	9	3.5	
Frequency of ANC contact	1 to 3	31	12.4	59	23.9	<0.001
	4 or above	220	87.6	188	76.1	
	Total	251	100.0	247	100.0	
Place of ANC contact	Health center	94	37.5	116	47.0	0.005
	Public general/primary hospital	56	22.3	53	21.5	
	Private clinic/hospital	81	32.3	48	19.4	
	Referral hospital	20	8.0	30	12.1	

	Total	251	100.0	247	100.0	
Referred	No	208	81.3	203	79.3	0.579
	Yes	48	18.8	53	20.7	
Planned	No	8	3.1	38	14.8	<0.001
	Yes	248	96.9	218	85.2	
Wanted	No	2	0.8	2	0.8	1.000
	Yes	254	99.2	254	99.2	
Supported	No	3	1.2	2	0.8	0.653
	Yes	253	98.8	254	99.2	
Obstetric complication	No	186	72.7	152	59.4	0.002
	Yes	70	27.3	104	40.6	
APH	No	251	98.0	237	92.6	0.037
	Yes	5	2.0	19	7.4	
	Total	256	100.0	256	100.0	
Preeclampsia	No	249	97.3	237	93.4	0.234
	Yes	7	2.7	17	6.6	
	Total	256	100.0	256	100.0	
Eclampsia	No	256	100.0	255	99.6	0.411
	Yes	0	0.0	1	0.4	
	Total	256	100.0	256	100.0	
Preterm labor	No	247	96.5	248	97.0	0.261
	Yes	9	3.5	8	3.0	
	Total	256	100.0	256	100.0	
GDM	No	256	100.0	247	97.0	0.011
	Yes	0	0.0	9	3.0	
	Total	256	100.0	256	100.0	
Prolonged labor	No	256	100.0	251	98.0	0.063
	Yes	0	0.0	5	2.0	
	Total	256	100.0	256	100.0	

## 6.4 Intra-partum and post-partum outcomes

Caesarean delivery rate was higher in cases (87, 34.0%) than controls (53, 20.7%) and the discrepancy was highly remarkable ( $p < 0.001$ ). The magnitude of low first minute APGAR score ( $< 7$ ) was observed in 27 (10.6%) of cases and 10 (3.9%) of controls. This difference was statistically significant ( $p = 0.011$ ). Twelve neonates of cases group and seven neonates of control group were admitted to neonatal intensive care unit (NICU). Four congenital anomalies were recorded in cases and controls each. The incidence of postpartum hemorrhage (PPH) was significantly ( $p = 0.030$ ) higher in cases (11, 4.3%) than controls (3, 1.2%).

*Table 4: Intra-partum and post-partum outcomes of the cases and controls in Mekelle public hospitals, Tigray region, Ethiopia, June 1 to October 30, 2024 (n= 512)*

Characteristics		Case-Control				p-value
		Control (n=256)		Case (n=256)		
		N	%	n	%	
Mode of delivery	SVD	203	79.3	169	66.0	<0.001
	CD	53	20.7	87	34.0	
Onset of labor	Spontaneous	211	82.4	186	72.7	0.002
	Induced	24	9.4	21	8.2	
	No labor	21	8.2	49	19.1	
Sex of the neonate	Male	128	50.0	151	59.0	0.041
	Female	128	50.0	105	41.0	
Status	Alive	252	98.4	245	95.7	0.067
	Dead	4	1.6	11	4.3	
APGAR 1st minute	0	6	2.3	12	4.7	0.011
	1-6	4	1.6	15	5.9	
	7-10	246	96.1	229	89.5	
APGAR 5th minute	0	5	2.0	11	4.3	0.076
	1-6	1	0.4	5	2.0	
	7-10	250	97.7	239	93.7	
APGAR 10th minute	0	5	2.0	11	4.3	0.261
	1-6	1	0.4	2	0.8	
	7-10	250	97.7	243	94.9	
Referred to ICU	No	249	97.3	244	95.3	0.252
	Yes	7	2.7	12	4.7	
Congenital anomaly	No	252	98.4	252	98.4	1.000
	Yes	4	1.6	4	1.6	
PPH	No	253	98.8	245	95.7	0.030
	Yes	3	1.2	11	4.3	
Puerperal sepsis	No	254	99.2	251	98.0	0.254
	Yes	2	0.8	5	2.0	

*Table 5: Multivariate Analyses of Association of Adverse maternal Outcomes with Maternal Age in Mekelle public hospitals, Tigray region, Ethiopia, June 1 to October 30, 2024 (n= 512)*

Variables	Frequency (%)		COR (95% CI)	AOR (95% CI)	p-value
	No	Yes			
APH					
Adult age	251(98)	5(2)	1	1	
AMA	237(92.6)	19(7.4)	3.380 (1.993–5.732)	2.215 (1.245–3.942)	0.045
<b>Preeclampsia</b>					
Adult age	249(97.3)	7(2.7)	1	1	
AMA	237(93.4)	17(6.6)	1.33 (0.96–1.83)	1.6 (0.84–3.6)	0.56
<b>GDM</b>					
Adult age	256(0.0)	0.0	1	1	
AMA	247(97)	9(3)	3.26(2.020–5.287)	3.13(1.931–5.089)	0.031
<b>Cesarean delivery</b>					
Adult age	203(79.3)	53(20.7)	1	1	
AMA	169(66)	87(34)	2.01(1.445–2.819)	2.59(1.775–3.790)	<0.001
<b>PPH</b>					
Adult age	252(98.4)	3(1.2)	1	1	
AMA	245(95.7)	11(4.3)	2.01(1.445–2.819)	4.16(1.548–11.227)	0.042

*Table 6: Multivariate Analyses of Adverse neonatal Outcomes with Maternal Age in Mekelle public hospitals, Tigray region, Ethiopia, June 1 to October 30, 2024 (n= 512)*

Variables	Frequency (%)		COR (95% CI)	AOR (95% CI)	p-value
	No	Yes			
Still birth					
Adult age	252(98.4)	4(1.6)	1	1	
AMA	245(95.7)	11(4.3)	2.77(1.576–4.878)	2.46(1.369–4.423)	0.039
<b>low 5th minute APGAR</b>					
Adult age	250(97.7)	6(2.3)	1	1	
AMA	240(93.8)	16(6.2)	5.32(2.855–9.939)	3.99(2.099–7.618)	0.045

## 7. Discussion

The purpose of this study was to compare adverse maternal pregnancy outcomes between cases (mother's aged 35 or above) and controls (mothers in the age range 20 to 34). The other aim of this study was to compare adverse neonatal outcomes between cases and controls. Bad obstetric histories like stillbirth, infant death, and recurrent abortion were more common in cases than controls. Planned pregnancy was significantly higher in controls than cases. Obstetric complications happened more frequently among cases than controls. Obstetric complications that happened more frequently in the cases group were APH, GDM, Pre-eclampsia, and prolonged labor. Caesarean delivery rate was higher in cases than controls. Low first minute APGAR score and NICU admission was observed more frequently in cases group than controls. The incidence of postpartum haemorrhage (PPH) was significantly higher in cases than controls.

Our study has found that adverse maternal pregnancy outcomes are more frequent in mothers aged 35 or above compared to those aged 20 to 34. This finding agrees with existing studies which revealed that advanced maternal age is related with increased risks of obstetric complications such as pre-eclampsia, gestational diabetes mellitus (GDM), and prolonged labor.(1-4,6,7,10,11,13)

Our study has revealed that advanced maternal age increases the risk of antepartum haemorrhage (APH), GDM, pre-eclampsia, and prolonged labor. In line with our finding, studies have consistently exposed that advanced maternal age is related with a higher chance of these complications.(8,10)

The caesarean delivery rate was higher in mothers aged 35 or above compared mothers in the age range 20 to 34. This finding consistent with studies indicating that older mothers undergo caesarean deliveries more frequently than younger mothers due to complications such as prolonged labor, non-reassuring fetal heartbeat, and chronic medical illnesses. For examples, a study conducted in Oman found a higher rate of caesarean delivery among older mothers. According to the study, the caesarean delivery rate was 38.4% and 21.9% in older and younger mothers, respectively.(8)

The incidence of postpartum hemorrhage (PPH) was significantly higher in cases than controls. Scientific evidences have exhibited that advanced maternal age rises the risk of PPH due to factors such as prolonged/obstructed labor, uterine atony following repeated pregnancies, lack of antenatal care, and chronic illnesses(9,12).

Low first minute APGAR scores and NICU admissions were more common in due to advanced maternal age. This is in line with findings from other studies that have exposed advanced maternal age to be significantly related with higher rates of adverse neonatal outcomes(2,3). A study in Northern Ethiopia has found that adverse neonatal outcomes were remarkably higher among mothers aged 35 and above (3). Advanced maternal age leads to adverse neonatal outcomes due to placental insufficiency, increased risk of pre-existing medical conditions like hypertension and diabetes, increased risk of obstetric complications (such as pre-eclampsia/eclampsia, gestational diabetes mellitus (GDM), and placental abruption), and diminished uterine blood flow (3,4,8,10,12)

## 8. Strength and limitation

This study has two main strengths. First, data was collected prospectively which prevents against missing data on essential variables like neonatal and maternal outcomes. The second main strength of this study is being a comparative or analytic study than being cross-sectional. As a result, temporal and causative relationship can be ascertained in a better way.

This study was not without limitations. In some mothers there was no delivery summary, so that the true cause of APH(placental abruption Vs heavy show ) was difficult to ascertain.

## 9: Conclusion

Our study findings strongly agree with existing studies on advanced maternal age. This study has revealed that obstetric complications like antepartum haemorrhage, pre-eclampsia, prolonged labor, and gestational diabetes are higher among older mothers compared to younger mothers. Low First minute APGAR scores were more frequent in older mothers. Caesarean delivery and post-partum haemorrhage (PPH) were significantly higher in mothers aged 35 or above compared to adult mothers (mothers in the age range 20 to 34).

## 10. Recommendation

Health professionals

- Should meticulously screen older mothers for pregnancy and labor related complications
- Should give emphasis to neonates born from older mothers since they at risk for adverse neonatal outcomes
- Should be ready for immediate management of PPH in older mothers if it happened

Health facilities

- Should continuously train midwives, doctors, and nurses on the management of maternal and neonatal complications related with advanced maternal age

Health Bureaus/Protocols

- Should develop guidelines, protocols, and policies that focus on the management of pregnancies that occur at advanced age
- Should financially and technically help trainings on complications of pregnancy in advanced maternal age and its management

## **12: Dissemination of findings**

The findings of the study will be presented and submitted to the department of obstetrics and gynecology. It will also be presented in annual scientific meeting and conferences. The copy of the finding will be kept at Ayder Comprehensive Specialized hospital OBGYN department and given to Tigray Regional Health Bureau. The findings of this study will be published in reputable journals.

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## 14. Annexes

### 14.1. Data extraction English form

This questionnaire is developed to collect data for the study on the prevalence and maternal and neonatal outcome of AMA pregnant mothers admitted in labor, in ACSH and MGH . This will be filled by data collector who is trained to collect data in this study.

Name of data collector \_\_\_\_\_

Place of admission:

A. ACSH

B.MGH

Part I Socio demography characteristics		
1. Identification	A. Age: _____	C. Date of admission _____
	B. Code: _____	D. Date of discharge _____
	E. Religion:	I. Orthodox II. Catholic III. Prothestant IV. Muslim V. Other specify _____
	F. Ethnicity	I. Tigray II. Amara III. Afar IV. Other specify _____
	G. Residence	I. Urban II. Rural
	H. Marital status	I. Married II. Single III. Divorced IV. Widowed
	I. Educational status	I. Illiterate II. Grade 1-4 III. Grade 5-8 IV. Grade 9-12 V. College or University graduate
J. Occupation	I. House Wife II. Governmental Employee III. Private Employee IV. Student V. Daily Laborer VI. Others _____	

Part 2 Reproductive, obstetric, medical history		
2. Reproductive history	A. Gravidity:____ B. Parity:____ C. Alive kids:____ D. Stillbirth:____ E. END:____	F. Infantile death:____ G. No. of Abortion:____ H. No. of Ectopic Pregnancy:____ I. No. of GTD:____
3. Gestational age at delivery (in weeks): _____	A. Reliable LNMP B. Early Ultrasound C. Unknown	
4. ANC	a) Booked	If booked, number of visits _____ Place of ANC 1. Health center 2. Public general hospital 3. Private clinic/hospital 4. Referral hospital
	b) Unbooked	
5. Referral Status	I. Yes II. No	If yes Place of referral _____
6. Is pregnancy planned	I. Yes II. No	
7. Is pregnancy wanted	I. Yes II. No	
8. Is pregnancy supported	I. Yes II. No	
9. Obstetric complication	I. Yes A. APH B. Preeclampsia C. Eclampsia D. Preterm labor E. GDM F. Prolonged labor G. If others specify _____	
	II. No	
10. Alcohol intake or smoking _____		
11. Mode of delivery	I. SVD II. Operative Vaginal delivery III. CD if CD, indication _____	
12. Onset of labor	I. Spontaneous II. Induced if induced, indication _____	

**Part 3 Outcome and Postpartum Maternal and Neonatal Status**

MRN of Neonate _____	
13. Outcome	Weight: _____ Sex: _____ Status, alive or dead _____
14. APGAR score	1 <sup>st</sup> min: _____ 5 <sup>th</sup> min _____ 10 <sup>th</sup> min _____
15. Neonate referred to NICU?	I. Yes If yes, admission diagnosis _____ II. No
16. Congenital anomaly	I. Yes II. No
17. Complications before discharge	I. PPH II. puerperal sepsis III. If other specify _____

