COLLEGE OF HEALTH SCIENCES

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF MIDWIFERY

POSTGRADUATE PROGRAM

COMPARISON OF ADVERSE NEONATAL OUTCOMES AND ITS ASSOCIATED FACTORS AMONG WOMEN WITH ADULT AND ADVANCED AGED PREGNANCY AT THE PUBLIC HOSPITALS OF ADDIS ABABA CITY, ETHIOPIA. HOSPITAL-BASED COMPARATIVE CROSS-SECTIONAL STUDY

BY: YONAS MENGISTU (MSc CANDIDATE IN MATERNITY AND REPRODUCTIVE HEALTH NURSING)

A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES, SCHOOL OF NURSING AND MIDWIFERY, DEPARTMENT OF MIDWIFERY, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF SCIENCE IN MATERNITY AND REPRODUCTIVE HEALTH NURSING.

SEPTEMBER, 2024

ADDIS ABABA, ETHIOPIA

ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF MIDWIFERY

POSTGRADUATE PROGRAM

Comparison of adverse neonatal outcomes and its associated factors among women with adult and advanced aged pregnancy at the public hospitals of Addis Ababa City, Ethiopia, 2024

A thesis submitted to Addis Ababa University College of Health Sciences, School of Nursing and Midwifery, Department of Midwifery, in partial fulfillment of the requirement for the degree of Master of Science in Maternity and Reproductive Health Nursing

Investgator:

Yonas Mengistu (MSc candidate in Maternity and Reproductive Health Nursing)

Address: Email: yonasmengistu@gmail.com

Phone: +251912749113

Advisors:

1. Luel Deribe (PhD)

   Address: Email: lue.deribe@gmail.com

   Phone: +251911973983

2. Addishiwot F. (MSc)

   Address: Email: addishiwet.f@gmail.com

   Phone: +2519013017124

September, 2024

Addis Ababa, Ethiopia

ACKNOWLEDGMENTS

Firstly, I would like to thank my Almighty God, for giving me strength and health.

Secondly, I would like to extend my deepest gratitude to Addis Ababa University for funding this thesis and the College of Health Sciences, Department of Midwifery for facilitation from the topic selection to the work of this thesis.

Thirdly, I would also like to express my heartfelt appreciation to my advisors Mr. Leul Deribe (Ph.D.) and Ms. Addishiwot F. (MSc) for their valuable comments, suggestions, and direction throughout the work of the thesis work.

Fourthly, I would like to express my deepest thanks to Saint Paulo's Hospital for giving me this chance and sponsoring my MSc in Maternity and Reproductive Health Nursing

Lastely, I would like to pass my gratitude to the medical director and staffs of each hospital for their great cooperation in giving information regarding the number of monthly deliveries used for the sampling procedure, which is one of the great inputs for this thesis work. I would also like extend my acknowledgement to the study participants, and data collectors for their participation in this study and my collagenous for their valuable support.

ACRONYMS AND ABBREVIATIONS

AAMs	Advanced Aged Mothers
AGA	Appropriate for Gestational Age
AMA	Advanced Maternal Age
ANC	Antenatal Care
ANOs	Adverse Neonatal Outcomes
AOR	Adjusted Odds Ratio
APH	Ante-Ppartum Hemorrhage
CI	Confidence Interval
COR	Crude Odds Ratio
EDHS	Ethiopian Demographic Health Survey
FP	Family Planning
GA	Gestational Age
GDM	Gestational Diabetes Mellitus
GMH	Gandhi Memorial Hospital
IFAS	Iron and Folic Acid Supplmentation
IUGR	Intra-Uterine Growth Restriction
LBW	Low Birth Weight
LGA	Large for Gestational Age
MCH	Maternal and Child Health
MSH	Minilik Specialize Hospita
NICU	Neonatal Intensive Care Unit
PEMD	Point Estimate Mean Difference
PsH	Petros Hospital
SD	Standard Deviation
SDG	Sustainable Developmental Goals
SGT	Small for Gestational Age
SPH	Saint Paulo's Hospital
TASH	Tikur Anbasea Specialized Hospital
Y12H	Yekatit 12 Hospital

Table of contents

LIST OF TABLES

LISTS OF SUPPLEMENTARY TABLES

LIST OF FIGURES

ABSTRACT

Introduction: Pregnancy at advanced maternal age (≥35 years old) is considered a risk factor for different adverse neonatal outcomes. Adverse neonatal outcomes are the leading cause of neonatal and infant mortality worldwide. In Ethiopia, studies were conducted to identify adverse neonatal outcomes, however, having updated information on the status of adverse neonatal outcomes could be helpful in future effective policy and program formulation.

Objective: This study aimed to compare adverse neonatal outcomes and its associated factors among adult and advanced-aged pregnant women at the public hospitals of Addis Ababa City

Methods: A hospital-based comparative cross-sectional study was conducted at the public hospitals of Addis Ababa City from April 29/2024 to June 30/2024 among 707 mothers (471 adults and 236 advanced-age mothers). The data was collected by a systematic random sampling technique using Kobo tool Kit, and analyzed using SPSS version 26.0. Chi-square and independent t-tests was performed. Logistic regression analyses was employed to estimate the COR and AOR with a CI of 95% and a P-value of <0.05 considered statistically significant.

Results: The response rate was 97.7% and 97.9% among adult and advanced aged mothers respectively. Almost half (51.5%) (95% CI=44.7-57.9) of advanced aged mothers had at least one adverse neonatal outcome, while it was 40.2% (95% CI=35.7-44.6) among adult aged mothers. The adverse neonatal outcomes was significantly higher among advanced aged mothers than adult aged mothers, with a point estimate mean difference of 11.3% (95% CI = 0.035-0.191). Meanwhile, the overall adverse neonatal outcomes was 44.0% (95% CI = 40.2-47.6). Unfavorable neonatal outcomes [AOR=1.51, 95%, CI=1.02-2.25] were significantly associated with maternal age. Preterm birth [AOR =1.84, 95% CI=1.18-2.85], large for gestational age [AOR =2.68, 95% CI=1.31-5.49], stillbirth [AOR =3.35, 95% CI=1.27-.8.82], and post-term birth (AOR=0.25, 95% CI=1.08-.083] were significantly associated with advanced maternal age.

Conclusions: The proportion of adverse neonatal outcomes were higher among advanced aged mothers compared to adult aged mothers. Preterm birth, large for gestational age and stillbirth were positively, while post-term birth negatively associated with adverse neonatal outcomes among advanced aged mothers. This study indicates a need of stratagies devoplment in order to create awareness on the advantage of having the desired number of children in the early adulthood ages.

Keywords: adult; advanced maternal age; adverse neonatal outcomes; mean; pregnancy; unfavorable outcome; mothers; neonate; Addis Ababa; Ethiopia.

1. INTRODUCTION

1.1. Background

Pregnancy in advanced maternal age is defined as a pregnant woman who has an estimated delivery date established for a time when a mother is ≥35 years of age (1). The pregnancy rate of advanced maternal age (AMA) is increasing worldwide (2, 3). Studies conducted in Canada, the United Kingdom, low and middle-income countries, and South Africa showed that 22.6%, 18.63%, 12.3%, and 17.5% of pregnancies occurred at the AMA level respectively (3-6). Studies conducted in Ethiopia show that pregnancy in AMA ranged from 6.8% to 41.3% (7-10)

The increased occurrence of pregnancy in AMA is due to the increased population of women at 35 years of age especially in countries with advanced fertility specialists (11). AMA pregnancies, with women approaching their upper fertility limits, are consistently associated with an increased risk of adverse neonatal outcomes, contributing to persistent global neonatal mortality (12). Fertility is impacted by the age at a woman decides to begin her childbearing period and is reduced as a woman's age increases, with a significant reduction in ovarian oocyte reserves after the age of 35 years (13). The aging of oocytes is also associated with this reduced ovarian reserve and contributes to pregnancy complications and adverse neonatal outcomes (ANOs), including increased rate of spontaneous abortion, chromosomal abnormalities, congenital malformations, and placental problems including placenta previa and abruption (14, 15).

Advanced maternal age increases the risk of ANOs (16, 17). It is associated with perinatal morbidity including low birth weight (LBW), preterm birth and delivery, low Apgar score, small for gestational age (SGA), Intrauterine Fetal Growth Restriction (IUGR), large for gestational age (LGA) (18), an increased risk of Neonatal Intensive Care Unit (NICU) admissions, stillbirth, congenital malformation and may contribute to poor pregnancy outcomes including neonatal mortality (19-24).

Studies conducted in high-income countries showed that the prevalence of ANOs higher in AMA, such as preterm birth ranged from 7% to 48% (4, 25), congenital malformation 2.06% (26), SGA 12.1% (27). A study conducted in South Africa found that the prevalence of LBW, preterm birth, and perinatal death among AMA was 27.9%, 19.2%, and 5.6% respectively (5).

Studies conducted in Ethiopia found that the prevalence of ANOs among AMAs ranged from 3.4% to 74.7% (8, 9, 28-30). A systematic review and meta-analysis conducted in Ethiopia showed that AMA increased risk of perinatal mortality (31). Lack of Antenatal Care (ANC), extremes in maternal age, pre-existing medical diseases including diabetes mellitus, anemia, and chronic hypertension, along with obstetric complications such as antepartum hemorrhage (32), the premature rupture of membranes (PROM), pregnancy-induced hypertension are related to neonatal morbidity and mortality (33, 34).

1.2. Statement of the Problem

Globally, AMA is a significant factor affecting pregnancy outcomes and increases the rate of adverse perinatal outcomes by at least more than two times as compared with adult-aged pregnancy (31, 35). Increasing maternal age without a clear cutoff is an independent and substantial risk factor for adverse perinatal outcomes (36). As the number of women having their babies at 35 or older dramatically increases, problems associated with pregnancy in AMA are considered to have a significant impact on perinatal mortality (37).

Large scale global survey across 29 counties in Africa, Asia, the Middle East, and Latin America indicated that AMA predisposes women to have ANOs including stillbirth, LBW, NICU admission, and preterm birth, which causes perinatal mortality and morbidity compared to adult-aged women (3). Preterm birth contributes to more than one million neonatal deaths annually (38), an estimated 15 million infants worldwide are born before 37 weeks of gestation annually (39), and LBW is estimated to account for 15% to 20% of all births worldwide (40). In Ethiopia according to the systematic review report the prevalence of preterm birth was 10.5% regardless of maternal age (41). Further, preterm birth increased incidence of respiratory distress syndrome (RDS), and necrotizing entrocolitis (NEC) (42-44). Many of the survivors face a lifetime of disability, including learning disabilities and visual and hearing problems (45)

Social and cultural shifts influenced women's choices, including delaying pregnancy until they are ready to support children considering the economic influence, the availability of better family planning (FP) options, wider opportunities for further education, and the availability of maternity leave have impacted AMA pregnancies prevalence (46). The other conditions which make the women get pregnant in AMA may be the lower utilization of FP methods, and remarriage (47). Proponents of encouraging women to delay pregnancies until a family has secure financial and psychosocial stability assert that many AMA pregnancies have excellent neonatal outcomes and mothers with maturity can easily cope with the physical and emotional stresses of pregnancy (48).

Most adverse outcomes in older women appear to be related to the aging process alone, even though coexisting factors such as multiple gestation, higher parity, and chronic medical conditions, are less likely to be observed in younger women (49). Women who are in advanced

age are more likely to be overweight, have gestational diabetes mellitus (GDM) and pregnancy-induced hypertension, malpresentation, maternal near-miss, placenta problems, postpartum hemorrhage (PPH), undergoing induced labor, and assisted delivery, which will further increase the risks of ANOs (8, 17, 23, 24). It is evidenced that different obstetric complications were associated with LBW, preterm birth, and perinatal death (50).

Advanced maternal age predisposes a pregnancy to an increased congenital malformation and chromosomal abnormalities (51), which contribute to long-term disability, and have significant impacts on individuals, families, and societies (52). Some studies have reported inconsistent results about ANOs and AMA pregnancies. Even though, there are reports of AMA pregnancy associated with ANOs, other studies failed to support AMA as a risk factor (27, 53, 54). Pregnancy of AMA predisposes to increased risk for ANOs, which significantly contribute to neonatal mortality, and it may represent a gap in the ability to reach the Sustainable Development Goals (SDG) targets (26).

In Ethiopia, studies were conducted regarding ANOs, majorly using secondary data (28, 55). Hence, there is a need to carry out research to have an updated magnitude of the adverse perinatal outcomes in AMA and adult women, which will be useful in designing effective programs for couples and empowering them about informed choices for pregnancies during AMA. In a country like Ethiopia where striving to reduce neonatal mortality through the SDG in 2030 to less than 12 per 1000 live births (56), conducting such a study will have paramount input for the planning of maternal and child healthcare services and future neonatal health improvement to achieve the goals. Therefore, this study was conducted to compare the adverse neonatal outcomes among women with adult and AMA pregnancy and its associated factors at the public hospitals of Addis Ababa City.

1.3. Significance of the Study

Getting pregnant at any reproductive age is not risk-free, however, pregnancy in AMA usually culminates with ANOs. Even though coexisting chronic medical factors and obstetrical complications increase the risk of ANOs in both age groups, in older pregnant women without such comorbidities there are still worse ANOs, which indicates that AMA is an independent strong risk factor alone. Reduction of neonatal mortality is one of the major SDGs target to be achieved by 2030. However, neonatal mortality is still unacceptably high, specifically in Ethiopia as confirmed in the Ethiopian Mini Demographic Health Survey 2019 report. Despite AMA being a major contributor to ANOs; most Ethiopian studies do not address ANOs of AMA and its impact on neonatal morbidity and mortality. The research focus given on birth outcomes of the advanced-aged population is scarce. As a result, the findings of this study will enrich the existing literature, which describes the impact of AMA on neonatal morbidity and mortality in Ethiopia and assist in pinpointing factors associated with AMA.

Therefore the finding of this study may show the impact of AMA on pregnancy outcomes, which could help the policy makers to identify the gaps in health policy and care that can be addressed to improve neonatal health. This research outcome can also be used by health care providers to pass evidence-based information during the counseling and advising session on reproductive health issues including infertility, which could enable women or couples to securely choose to achieve their desired family size between the ages of 20 and 34. The finding of this research can aid with establishing in-country baselines for AMA's impact on neonatal outcomes, which could help to have a target-based improvement of neonatal outcomes. Finally, interested researchers in the subject area for the future can use the information generated from the study as a reference.

2. LITERATURE REVIEW

2.1. The magnitude of Adverse Neonatal Outcomes

A comparative study conducted in Denmark found that ANOs among advanced aged mothers (AAMs) were 10.8%, while it was 5.4% among adult-aged mothers (57). A study conducted in Canada indicated that the prevalence of preterm birth among AAMs was 7% whereas 5.76% in adult-aged mothers. It also shows that IUGR and stillbirth were significantly higher among maternal age ≥45 years (4). Studies conducted in Sweden and meta-analysis from Portugal showed that AMA significantly increased the risk of ANOs including LBW, low Apgar score, preterm birth, and early neonatal death compared to younger women (12, 20, 49, 58).

Studies conducted in Taiwan and Japan reported that AMA increased the risk of composite ANOs and LBW (59, 60). Other studies done in India indicated that the risk of chromosomal abnormality, congenital anomaly, preterm birth, LBW, IUGR, stillbirth, neonatal mortality, and NICU admission were higher among pregnancies of AMA (51, 61). Consistently, a study conducted in Italian found that preterm birth and congenital malformation among AAMs were 13.9% and 2.06%, whereas 9.8% and 1.38% among adult-aged mothers respectively (26). However, another study conducted in Italy reported that there was no difference in neonatal outcomes between pregnancy of maternal age 20-34 and ≥35 except LBW was more prevalent in the later age groups (53). A study conducted in Barcelona, Spain revealed that AMA was an independent risk factor for preterm delivery and LBW (62).

Studies conducted in the United Kingdom and Finland reported a significant increase in stillbirth, preterm birth, SGA, macrosomia, and extreme LGA among AMA pregnancies (2, 63, 64). Consistently, a review of evidence in Australia reported that women aged 45 years or more had significant increases in stillbirth, perinatal mortality, preterm birth, and LBW (37). A comparative cross-sectional study conducted in Turkey indicated that SGA and late preterm birth were more significant in AAMs (12.1% and 7.6%) compared to adult aged mothers (4.5% and 7.25%) respectively (27). Another study conducted in London found that AMA was associated with increased risk of SGA, but not with stillbirth and preterm birth (63), and a study conducted in Malaysia confirmed no association between AMA and ANOs (54). A study done in Saudi Arabia found that the rate of preterm labor was 48% among AMA and 12.6% had neonatal complications such as congenital anomalies and neonatal jaundice (25).

A similar study done in South Africa confirmed that the prevalence of LBW, preterm birth, and perinatal death among AAMs were higher (27.9%, 19.2%, and 5.6%) compared to adult-aged mothers (18.8%, 14.7% and 4.8%) respectively (5). A study conducted in Jimma showed that the prevalence of ANOs among AAMs was higher (40.5%) when compared to adult-aged mothers (29.4%) (55). Similarly, a study done in Ayder Comprehensive Specialized Hospital evidenced that the prevalence of ANOs among AAMs was higher than adult-aged mothers specifically, LBW (17.8% vs 5.4%), preterm birth (11.3% vs 2.7%), perinatal death (10.1% vs 3.2%) and fifth minute low Apgar score (14.4% vs 2.4%) respectively (28). A comparative cross-sectional study conducted in Awi zone public hospital showed that the proportion of ANOS was 29.1% among AAMs and 14.5% in adult aged mothers, and the proportion of LBW, preterm birth, and low Apgar scores were significantly higher among AAMs (8). Another comparative cross-sectional study conducted in Dessie Referral Hospital found that the overall ANOs among AAMs was 74.7%, while among adult-age mothers was 25.3% (30). A study conducted in Debre Markos Referral Hospital indicated that the ANOs including stillbirth, preterm birth, and LBW in the AAMs group were 13.2%, 19.8%, and 16.5%, respectively, while 3.1%, 8.4%, and 12.4% in adult aged mothers respectively (29)

2.2. Factors associated with Adverse Neonatal Outcomes

2.2.1. Socio-demographic factors

Analysis from a global network population-based systematic review on birth registration and birth outcomes in low and middle-income countries and studies from South Africa, Tanzania, Nigeria, Zambia, and Egypt confirmed that ANOs including stillbirths were increased with poverty, extreme maternal ages (less than 20 years and greater than 34 years) was (65-69). Studies done in the United States of America, China, Bangladesh, Turkey, India, and Afghanistan evidenced that, no or lower formal education, rural residence, and a low family income significantly increased the risk of ANOs (70-76). Studies conducted in Ethiopia confirmed that the risk of ANOs was increased with AMA, no formal education, low education, rural residence, and low income (8, 29, 30, 33, 34, 77-85).

2.2.2. Reproductive and Obstetric factors

Analysis from a global network population-based systematic review on birth registration and birth outcomes in low and middle-income countries confirmed that ANOs including stillbirths

were increased with multiparity, poor obstetric-history, placental and amniotic fluid-related complications, lack of prenatal care and neonatal related problems like asphyxia and meconium aspiration syndrome (65, 66). Studies done in the United States of America, China, Bangladesh, and Turkey evidenced that short birth intervals, abnormal presentation, hypertension during pregnancy, PROM, and placenta previa significantly increased the risk of ANOs (70-74).

Studies conducted in India and Afghanistan showed that ANOs were increased with lack of ANC contact, early pregnancy bleeding, complications during pregnancy and delivery, and a birth interval of less than two years (86, 87). A study conducted in Uganda revealed that mothers with severe preeclampsia were at significantly increased risk of ANOs (88). In relation, studies done in South Africa, Tanzania, Nigeria, and Egypt evidenced that, ANOs were associated with fewer ANC contact, short birth intervals, and PROM (89-92). Studies in Ethiopia confirmed that the risk of ANOs was increased with obstetric complications during pregnancy and delivery, short birth interval, emergency C/S, and grand multigravidas (8, 33, 34, 77-82).

2.2.3. Medical and other factors

Analysis from a global network population-based systematic review on birth registration and birth outcomes in low and middle-income countries confirmed that maternal infection during pregnancy was associated with ANOs (65, 66). Studies done in South Africa, Tanzania, Nigeria, and Egypt evidenced that, ANOs were associated with maternal anemia, and infections during pregnancy (like malaria) (89-92). Studies conducted in Ethiopia revealed that the risk of ANOs increased with medical diseases (including anemia), and middle upper arm circumference less than 23cm (33, 34, 77-82).

2.3. Conceptual framework

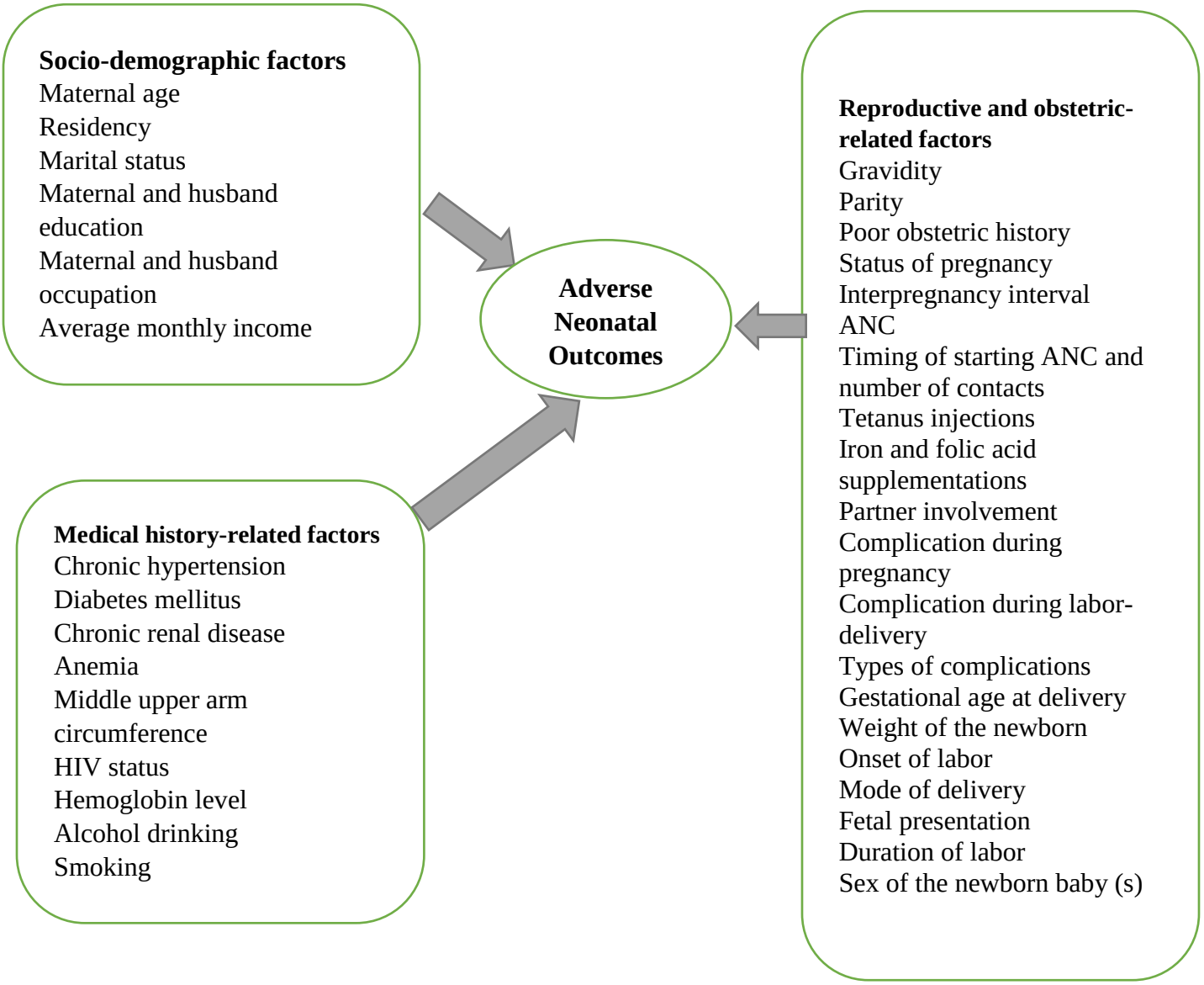


***Figure 1*:** Conceptual framework adapted from different works of literature *(*8, 9, 28-30*)*.

3. OBJECTIVES OF THE STUDY

3.1. General objective

To compare adverse neonatal outcomes and their associated factors among women with adult and advanced-aged pregnancy at the public hospitals of Addis Ababa City, Ethiopia 2024

3.2. Specific objectives

- To compare adverse neonatal outcomes among women with adult and advanced-aged pregnancies at the public hospitals of Addis Ababa city
- To identify factors associated with adverse neonatal outcomes of women with advanced and adult-aged pregnancy at the public hospitals of Addis Ababa City

4. METHODS AND MATERIALS

4.1. Study Area and Period

The study was conducted in selected public hospitals of Addis Ababa City from April 29/2024 to June 30/2024. Addis Ababa is the capital city of Ethiopia and covers an area of 527 kilometers. It is located on a well-watered plateau surrounded by hills and mountains, in the geographic center of the country. There are 13 public hospitals in the city and except Ammanuel Mental Health Hospital, 12 of them give maternal and child health care services (MCH), of these five hospitals are administered under the Federal Ministry of Health, six are managed by the Addis Ababa health bureau, one is under the police force, and one is governed by the armed force. The study will be conducted at Saint Paulo's Hospital (SPH), Gandhi Memorial Hospital, (GMH), Minilik Specialize Hospital (MSH), Tikur Anbesa Specialized Hospital (TASH), Yekatit 12 Hospital (Y12H), Petros Hospital (PsH). Each of these hospitals provides inpatient and outpatient services and has MCH services including FP, ANC, labor and delivery, postnatal care, child immunization, and other services. The labor and childbirth services provided in these hospitals are free for all women like the rest of public health facilities in Ethiopia.

4.2. Study Design

Hospital-based comparative cross-sectional study was conducted.

4.3. Population

4.3.1. Source Population

Exposed – all advanced-age women (≥35 years old) who gave childbirth at 28 weeks of gestation or greater at selected public hospitals of Addis Ababa City

Unexposed – all adult-age women (20-34 years old) who gave childbirth at 28 weeks of gestation or greater at selected public hospitals of Addis Ababa City

4.3.2. Study Population

Exposed – systematically selected advanced-age women (≥35 years old) who gave childbirth at 28 weeks of gestation or greater at selected public hospitals of Addis Ababa City during the data collection period.

Unexposed – systematically selected adult-age women (20-34 years old) who gave childbirth at 28 weeks of gestation or greater at selected public hospitals of Addis Ababa City during the data collection period.

4.4. Eligibility Criteria

4.4.1. Inclusion Criteria

All women aged ≥20 years old who gave childbirth at 28 weeks of gestation or greater at the public hospitals of Addis Ababa City were included in this study.

4.4.2. Exclusion Criteria

Women with unknown or unreliable last normal menstrual periods or no early obstetric ultrasound, and multiple pregnancy were excluded from this study.

4.5. Sample size Determination

The sample size for the first objective was calculated using a double population formula by considering the following assumptions: taking the proportion of ANOs from a study conducted in Northwest Ethiopia, which was found that the proportion (P1) among AAMs (exposed) was 40.5% and proportion (P2) among adult aged mothers (unexposed) was 29.4%, (55), with a 95% of the level of confidence and a power of 80% calculated as follows:

$$n_1 = \frac{\left[Z_{\alpha/2}\sqrt{\bar{p}\bar{q}\,(1+1/\lambda)} + Z_{\beta}\sqrt{p_1q_1+p_2q_2/\lambda}\right]^2}{\Delta^2}$$

Where $n_2=n_1\lambda$, $\bar{p} = (p_1+\lambda p_2)/(1+\lambda)$

$\bar{q} = 1 - \bar{p}$. $\Delta = |p1-p2|$, $\lambda = n2/n1$

Zα/2= Value of Z for the level of significance alpha (at 0.05 level of significance value of Z is **1.96**), Zβ = power, which indicates that change did not occur by chance. Value of Z for power β (at power level 0.80, the value of Zβ is **0.84**)

P1=proportion of ANOs among AAMs (exposed) = **0.405** (55).

P2= proportion of ANOs among adult aged mothers (unexposed) = **0.294** (55)

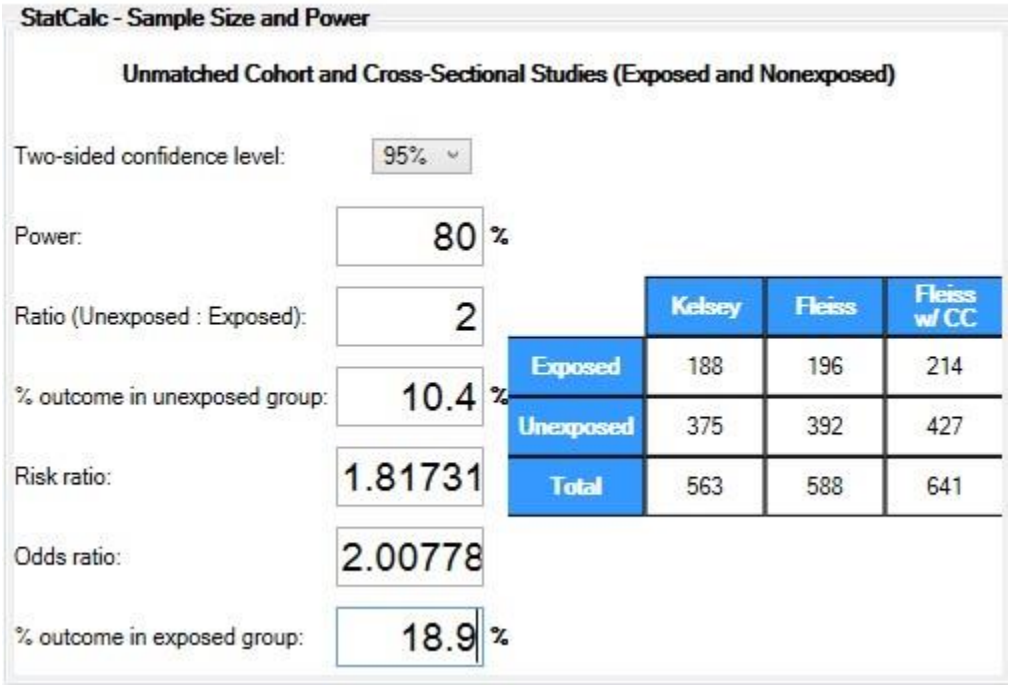
Therefore, $\bar{P}$ = (0.405 +2*0.294)/1+2 =**0.33**, $\bar{q}$ = 1-0.33 **= 0.67**, q1 = 1-0.405 = **0.595**, q2 =1-0.294 = **0.706**, Δ = 0.405-0.294 = **0.111,** and λ =n2/n1 = **2** at a ratio of 1:2 for AAMs (exposed) and adult aged mothers (unexposed) respectively.

$$\mathbf{n1} = \frac{[1.96\sqrt{0.33} * 0.67\ (1 + 1/2) + 0.84\sqrt{0.405} * 0.595 + 0.294 * 0.706/2]^2}{(0.111)^2} = 214$$

n2 = 2*214 = 428. By adding a 10% nonresponse rate the sample size of the first objective becomes (214+214*10/100 =236 for AAMs, and 428 + 428*10/100 =471 for adult aged mothers), which gives a total sample size of 236+471 =707.

The sample size for the second objective was calculated using a double population formula with Epi-info version 7.1.2.0 software by considering the following assumptions; taking the proportion of low APGAR score within the first minute among exposed which was 18.9% and 10.4% among unexposed (8), a 1:2 ratio of exposed to the unexposed group, the two-sided confidence level of 95% and a power of 80% was assumed as follows.

Table 1: *Sample size calculation for the second objective*



By adding a 10% non-response rate, (214+ 214*10/100 =236 for AAMs and 427+427*10/100 =470 for adult-aged mothers, and it becomes 706. The sample sizes obtained from the first and second objectives were almost similar. However, the sample size obtained from the first

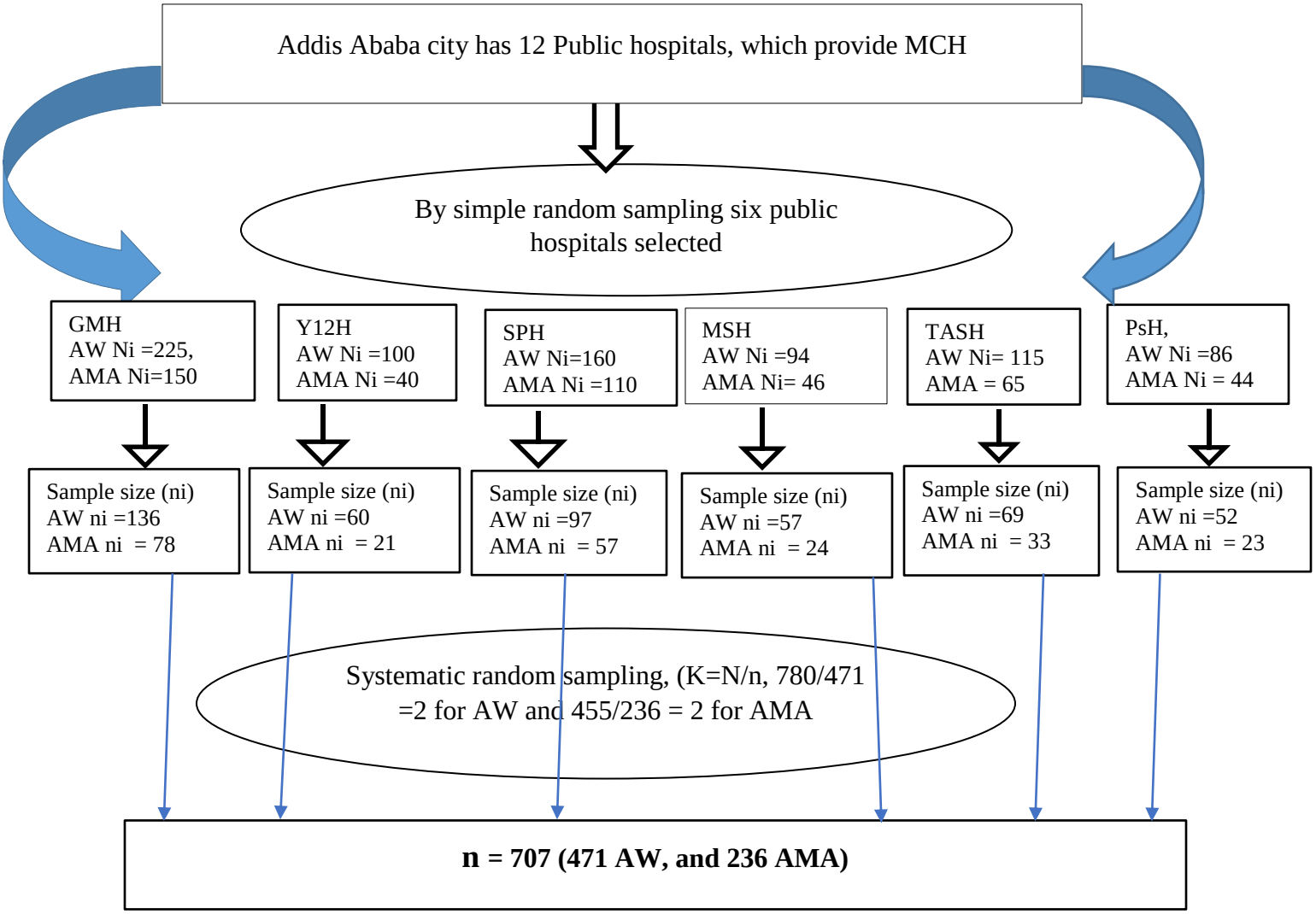
objective is higher by one subject, therefore, the final sample size becomes 707 women (236 AAMs and 471 adult aged mothers).

4.6. Sampling Procedure and Sampling Technique

In Addis Ababa, there are 12 public hospitals which give MCH care services. From these public hospitals in the city, six hospitals were selected by a simple random (lottery) method. The selected hospitals were SPH, GMH, MSH, TASH, Y12H and PsH. Then the two months delivery report was taken from each selected hospital. From January1/2024 to February 30/2024 a total of 1230 (780 adult and 455 AMA) women gave childbirth in selected hospitals; 270 (160 adult and 110 AMA) in SPH, 375 (225 adult and 150 AMA) in GMH, 140 (94 adult and 46 AMA) in MSH, 180 (115 adult and 65 AMA) in TASH, 140 (100 adult and 40 AMA) in Y12H and 130 (86 adult and 44 AMA) in PsH. The total sample size of the study is proportionally allocated for each hospital and each group (adult and AMA) based on the two months delivery report as follows:

$$\text{Sample size in the hospital (ni)} = \frac{\text{the final sample size (n)} * \text{total sample population in the hospital (Ni)}}{\text{Total population sample of the hospitals (N)}}$$

After proportional allocation, the sample size for each hospital became 152 (97 adults and 57 AMA) for SPH, 214 (136 adults and 78 AMA) for GMH, 81 (57 adults and 24 AMA), 103 (69 adults and 33 AMA) for TASH, 81 (60 adult and 21 AMA) for Y12H and 75 (52 adult and 23 AMA) for PsH. The eligible women invited to participate using a systematic random sampling technique. The sampling fraction or K^{th} units was calculated by dividing the total two months deliveries in selected public hospitals by the sample size of the study (780/471=2 for adults) and (455/236 =2 for AMA). The starting unit was selected by using the lottery method among the first K^{th} units (Figure 2). Then women who gave childbirth at the selected public hospitals of Addis Ababa City were interviewed and their charts reviewed within 24 hours of the postpartum period, after assessing eligibility and obtaining informed written consent.



Where; total subjects in study site; **Ni**= total subjects in each facility; **ni** =study subjects in each facility; **AW**= adult women, **K** =sampling interval; **n** = the total numbers of the study subjects in the study site

***Figure 2*:** Schematic presentation of sampling procedure

4.7. Study Variables

4.7.1. Dependent Variable

Adverse neonatal outcomes

4.7.2. Independent Variables

- Socio-demographic variables (age, residence, maternal and husband educational level, maternal and husband occupation status, marital status, average monthly income of the family)
- Reproductive and obstetric-related variables (gravidity, parity, bad obstetric history, inter-pregnancy interval, gestational age (GA), ANC contact, timing of starting ANC contact, number of ANC contacts, iron and folic acid supplementation (IFAS), and duration of taking tetanus the supplemented iron and folic acid, TT vaccination, and number of injections, fetal presentation, onset of labor, mode of delivery, indication for C/S, duration of labor, status of pregnancy, complication during pregnancy and labor-delivery, sex of the newborn, Rh status, preeclampsia, PROM, APH, and GDM)
- Lifestyle and medical disease-related (alcohol, smoking, chronic hypertension, pre-pregnancy diabetes mellitus, anemia, chronic renal disease, middle upper arm circumference (MUAC), HIV status, hemoglobin level)

4.8. Operational and Terms definitions

Advanced maternal age is considered when maternal age is ≥ 35 years old (8).

Adult maternal age is considered when maternal age is between 20-34 years old (8).

The adverse neonatal outcome is the occurrence of at least one of the following: LBW, preterm birth, SGA, LGA, LGA/macrosomia, low 1st and 5th minute Apgar score, stillbirth, congenital malformation, IUGR, NICU admission, neonatal death within 24 hours, and post-maturity. The neonate was considered to have ANOs where experienced at least one of the ANOs (8).

A low 5th minute Apgar score is when the score is <7 at the fifth minute of life (93).

Preterm birth is live birth before 37 completed weeks of GA (94).

Low birth weight is weighing of newborn less than 2500g

Small for Gestational Age is the birth weight of a newborn less than the 10th percentile(95).

Large for Gestational Age is the birth weight of a newborn greater than the 90th percentile (95).

Stillbirth is the death of the fetus after 28 weeks of GA, or during the intrapartum period, but before delivery (96).

Neonatal death is the death of a newborn between 0 and 28 days of life (97).

A gross congenital anomaly is when the newborn has been diagnosed with a congenital anomaly (hydrocephalus, spinal bifida, anencephaly, cleft lip or pallet, and polydactyl) (57).

Bad obstetric history is considered when the woman has at least one of the following conditions in a previous pregnancy: stillbirth, early neonatal death, and ≥3 recurrent abortion (98).

Short inter-pregnancy interval is when < 24 months from the date of birth to the conception of the subsequent pregnancy or/and who had an abortion history of < 6 months.

4.9. Data Collection Tool and Procedure

The data was collected using a structured interviewer-administered questionnaire and chart reviews were performed using a checklist by a pre-programmed, smartphone-based application, Kobo tool Kit (ODK Collect VVI.27.3). The tool was adapted from relevant works of literatures and modified to the local context (8, 9, 28-30). The questionnaire was first prepared in English language and then translated into Amharic language and back to the English language again to maintain its consistency. The questionnaire consisted of socio-demographics, obstetric and reproductive characteristics, medical and lifestyle-related data, and neonatal outcomes-related questions. The data was collected by six BSc midwives and supervised by two MSc midwives who are working out of the selected public hospitals.

4.10. Data Quality Control

The data was collected by trained data collectors and pretesting of the instrument done before the actual data collection. The data collectors and supervisors were trained for one day by the investigators on how to use the data collection tool before embarking on data collection. The questionnaire was pre-tested on 5% (24 adult and 12 advanced) aged mothers who gave childbirth at Zewditu Hospital, to assess the reliability, clarity, sequence, consistency, understandability, and total time it takes to finish the questionnaire. Necessary modifications and corrections was done to standardize and ensure its reliability and validity based on the results of the pre-test. Daily supervision was done for data completeness by the supervisors, and investigator

4.11. Data Processing and Statistical Analysis

The collected data was exported from Kobo tool Kit (ODK Collect VVI.27.3) to SPSS 26.0 version for analysis. Descriptive statistics like frequency tables, figures, and summaries were used to describe the study variables. Chi-square and independent t-tests were performed to compare categorical and continuous variables between adult and AMA respectively. Logistic regression was employed for the overall unfavorable neonatal outcomes, and for each adverse outcome after checking the logistic regression assumptions. During the analysis, all explanatory variables that have a significant association in bivariate analysis with a P-value <0.20 were entered into a multivariable logistic regression model to get AOR and those variables with 95% of CI and a P-value of < 0.05 were considered as statistically significant with ANOs. The multicollinearity test was done using the variance inflation factor and tolerance test to assess the existence of collinearity between the independent variables. There were collinearity between gravidity and parity at a variance inflation factor of 4.5, and tolerance value of 0.225 and then parity was removed from the analysis. The model goodness of the test was checked by the Hosmer- Lemeshow goodness of the fit test, and in all assumption its P-value was >0.05.

4.12. Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board (IRB) of Addis Ababa University College of Health Sciences Department of Midwifery. The letter of permission was also granted from the Chief Executive Officer or Director of each selected public hospital of Addis Ababa city. This study was conducted according to the recommendations of the Declaration of Helsinki. At the time of data collection, written informed consent was obtained from each study participant. Confidentiality was kept using anonymous codes and all respondents were assured that the data will not have any negative consequences on any aspect of their lives.

4.13. Dissemination and Utilization of Results

The final report of the study will be presented and submitted to the AAU College of Health Science, Department of Midwifery. The result will be also disseminated to the public hospitals of Addis Ababa city. The findings from this study will also be presented in various seminars/workshops. Finally, possible efforts will be made to publish the results in national and international peer-reviewed journals.

5. RESULTS

5.1. Socio demographic characteristics

A total of 707 (471 adult and 236 advanced aged) mothers participated in this study with a response rate of 98.6% (97.7% vs 97.9% for adult and advanced aged mothers respectively). The median age of the adult aged mothers was 28 years with ± 5 inter quartile range (IQR), while 38 years with ± 4 IQR for AAMs. Majority, 250 (88.7%) adult aged mothers, and 390 (84.8%) AAMs were urban resident. Of the AAMs, 227 (98.3%) were married, while it was 421 (91.5%) in adult aged mothers. Nearly one-third (32.1%) of AAMs had primary educational level, whereas 143 (31.1%) of adult aged mothers had secondary educational level. More than half (53.1%) of AAMs, and (54.3%) of adult aged mothers were housewife. More than one third (35.7%) of AAMs, and 184 (43.7%) of adult aged mothers husband had diploma and above educational level. Almost one-quarter (25.6%) of AAMs and more than one third (35.4%) of adult aged mothers husbands were government employee. About, 150 (64.9%) of AAMs and 247 (53.7%) of adult aged mothers were had an average monthly family income of 5221-13920 (US$ 3-8) Ethiopian birr (table 2).

Table 2: Socio- demographic characteristic of advanced and adult age mothers at the public hospitals of Addis Ababa City, Ethiopia, (n=691).

Characteristics		**Maternal age**			
		Advanced (n=231)	**Adult (n=460)**	**Total (n=691)**	
Variables	**Category**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**X^2, P-value**
Residency	Urban Rural	205 (88.7) 26 (11.3)	390 (84.8) 70 (15.2)	595 (86.1) 96 (13.9)	X^2 =2.0, *P*=0.155
Marital status	Married Single Divorced	227 (98.3) 3 (1.3) 1 (0.4)	421 (91.5) 35 (7.6) 4 (0.9)	648 (93.8) 38 (5.5) 5 (0.7)	X^2=12.3, *P* =0.002
Maternal educational level	Had no formal education Primary education Secondary education Diploma and above	58 (25.1) 74 (32.1) 47 (20.3) 52 (22.5)	80 (17.4) 109 (23.7) 143 (31.1) 128 (27.8)	138 (20.0) 183 ((26.5) 190 (27.5) 180 (26.0)	X^2=16.7, *P* =0.001
Husband educational	Had no formal education Primary education	34 (15.0) 47 (20.7)	50 (11.9) 71 (16.8)	81 (13.0) 118 (18.2)	X^2=4.7, *P* =0.197

level (n=648)	Secondary education Diploma and above	65 (28.6) 81 (35.7)	116 (27.6) 184 (43.7)	181 (27.9) 265 (40.9)	
Maternal occupation	Housewife Government employee Private employee Merchant Others[a]	123 (53.2) 38 (16.5) 23 (10.0) 43 (18.6) 4 (1.7)	252 (54.8) 75 (16.3) 58 (12.6) 31 (11.1) 24 (5.2)	371 (54.3) 113 (16.3) 81 (11.7) 94 (13.6) 28 (4.1)	X^2=12.0, *P* =0.017
Husband occupation (n=648)	Government employee Private employee Merchants Car driver Farmer Others[b]	58 (25.6) 55 (24.2) 52 (22.9) 41 (18.1) 15 (6.6) 6 (2.6)	149 (35.4) 88 (20.9) 98 (23.3) 47 (11.2) 20 (4.8) 19 (4.5)	207 (31.9) 143 (22.1) 150 (23.1) 88 (13.6) 35 (5.4) 25 (3.9)	X^2=12.7, *P* =0.027
Average monthly family income in ETB*	≤5220 5221-13920 ≥13,921	35 (15.2) 150 (64.9) 46 (19.9)	107 (23.3) 247 (53.7) 106 (23.0)	142 (20.5) 397 (57.5) 152 (22.0)	X^2=9.0, *P* =0.011

[a](student, and day laborer), [b](day laborer, student, and carpenter), *US$1=58 Ethiopian birr (ETB) at the time of the data collection period.

5.2. Lifestyle and medical history-related factors

Of the mothers, 40 (17.3%) AAMs and 51 (11.1%) adult aged mothers had history of alcohol drinking in their current pregnancy, and among them majority 35 (87.5%) of AAMs and 37 (72.5%) of adult aged mothers were drink alcohol sometimes. Having history of medical problems before the current pregnancy were significantly higher for AAMs 73 (33.3%) compared to adult aged mothers 71 (15.4%). Among AAMs 26 (11.3%), and 23 (10.0%) had anemia and chronic hypertension respectively, similarly it was 25 (5.4%), and 16 (3.5%) among adult aged mothers. Mothers MUAC <23 cm were significantly more common among adult aged mothers 142 (30.9%) than AAMs 51 (22.1%). Almost two out of the ten AAMs (20.3%), and 105 (22.8%) of the adult aged mothers had hemoglobin level of <11g/dl. None of the mothers were smoke cigarette (table 3).

Table 3: Lifestyle and medical-related factors of advanced and adult age mothers at the public hospitals of Addis Ababa City, Ethiopia, (n=691).

Characteristics		**Maternal age**		**Total (n=691)**	
		Advanced (n=231)	**Adult (n=460)**		
Variables	**Category**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**X^2, P-value**
Alcohol drinking	Yes No	40 (17.3) 191 (82.7)	51 (11.1) 409 (88.9)	91 (13.2) 600 (86.8)	X^2=5.2 *P*=0.022
How often did you drink	Sometimes	35 (87.5)	37 (72.5)	72 (79.1)	X^2= 3.0

alcohol (n=91)		Daily Weekly	4 (10.0) 1 (2.5)	11 (21.6) 3 (5.9)	15 (16.5) 4 (4.4)	*P*=0.219
Cigarette smoking		No	231 (100.0)	460 (100.0)	691 (100.0)	n/a
Medical problems before pregnancy		Yes No	77 (33.3) 154 (66.7)	71 (15.4) 389 (84.6)	148 (21.4) 543 (78.6)	X^2=29.3 *P*=0.001
Types of medical disease (multiple response were possible)	Hypertention	Yes No	23 (10.0) 208 (90.0)	16 (3.5) 444 (96.5)	39 (5.6) 652 (94.4)	X^2=12.1 *P*=0.001
	DM	Yes No	9 (3.9) 222 (96.1)	5 (1.1) 455 (98.9)	14 (2.0) 677 (98.0)	X^2=6.1 *P*=0.013
	Chronic renal disease	Yes No	10 (4.3) 221 (95.7)	13 (2.8) 447 (97.2)	23 (3.3) 668 (96.7)	X^2=1.1 *P*=0.299
	Anemia	Yes No	26 (11.3) 205 (88.7)	25 (5.4) 435 (94.6)	51 (7.4) 640 (92.6)	X^2=7.6 *P*=0.006
	Peptic ulcer disease	Yes No	20 (8.7) 211 (91.3)	16 (3.5) 444 (96.5)	36 (5.2) 655 (94.8)	X^2=8.3 *P*=0.004
	HIV	Yes No	10 (4.3) 221 (95.7)	13 (2.8) 447 (97.2)	23 (3.3) 668 (96.7)	X^2= 1.1 *P*=0.299
	Goiter	Yes No	3 (1.3) 228 (98.7)	3 (0.7) 457 (99.3)	6 (0.9) 685 (99.1)	X^2=0.7 *P*=0.388
	Asthma	Yes No	5 (2.2 226 (97.8)	2 (0.4) 458 (99.6)	7 (1.0) 684 (99.0)	X^2=4.6 *P*=0.032
Mothers MUAC		<23 cm ≥23 cm	51 (22.1) 180 (77.9)	142 (30.9) 318 (69.1)	193 (27.9) 498 (72.1)	X^2=5.9 *P*=0.015
Maternal Rh status		Rh negative Rh positive	24 (10.4) 207 (89.6)	56 (12.2) 404 (87.8)	80 (11.6) 611 (88.4)	X^2=0.5 *P*=0.489
HIV status		Positive Negative	13 (5.6) 218 (94.4)	18 (3.9) 443 (96.1)	31 (4.5) 660 (95.5)	X^2=1.05 *P*=0.304
Hemoglobin level		<11 g/dl ≥11 g/dl	47 (20.3) 184 (79.7)	105 (22.8) 355 (77.2)	152 (22.0) 639 (78.0)	X^2=0.55 *P*=0.458

5.3. Antepartum obstetrics characteristics

More than half (54.5%) of AAMs were grand multigravida, whereas 241 (52.4%) of adult aged mothers were multigravida. With significance difference, nearly two thirds (65.4%) of AAMs were multipara compared to 247 (53.7%) of adult aged mothers. Short inter pregnancy interval is higher among adult aged mothers 60 (22.6%) than AAMs 34 (15.7%). The median inter pregnancy interval in months were higher among AAMs 36 ± 18 IQR than 26 ± 12 IQR among adult aged mothers. Nearly two out of the ten (18.9%) AAMs had BOH relative to adult aged mothers 34 (12.8%). Among AAMs, stillbirth 23 (56.1%) was the common BOH, whereas it was neonatal loss 18 (52.9%) among adult aged mothers. Almost three-fourths of the pregnancy, 171 (74%) and 353 (76.7%) were planned among AAMs and adult aged mothers respectively. All of the mothers 691 (100.0%) had at least one ANC contact. Nearly one thirds (32.5%) of AAMs and 171 (37.2%) of adult aged mothers were start ANC contact at or before 16 weeks of GA.

There is no significance differences regarding to the mean GA at first ANC contact, which was 17.9 ± 4.5 SD vs 17.3 ± 4.9 SD for AAMs and adult aged mothers respectively. Three out of the ten (29.9%) AAMs and 121 (26.3%) of adult aged mothers had eight or more ANC contact. The mean number of ANC contact has no differences between the two groups, which was 6.3 ± 2.1 vs 6.2 ±1.9 SD AMAs and adult aged mothers respectively. Majority, 210 (90.9%) of AAMs and 425 (92.4) of adult aged mothers were vaccinated for TT at least once. Almost seven out of the ten (69.9%) and (70.1%) of AAMs and adult aged mothers were vaccinated for TT two times. Majority, 200 (86.6%) of AAMs, and 408 (88.7%) of adult aged mothers were obtained IFAS. Significantly, 81 (40.5%) of AAMs were took the IFAS for ≥3 months, compared to adult age mothers 127 (31.1%). Complication during pregnancy were significantly more common among AAMs 114 (49.4%) than adult aged mothers 127 (27.6%). PROM, APH, and pre-eclampsia were significantly more common among AAMs 50 (21.6%), 39 (16.9%), and 28 (12.1%) than adult aged mothers 44 (9.6%), 41 (8.9%), and 27 (5.9%) respectively. Almost half (50.4%) of adult aged mothers and 110 (47.6%) of AAMs were accompanied to ANC contact by their husband at least once (table 4).

Table 4: Antepartum obstetrics characteristics of advanced and adult age mothers at the public hospitals of Addis Ababa City, Ethiopia, (n=691).

Characteristics		**Maternal age**		**Total (n=691)**	
		Advanced (n=231)	**Adult (n=460)**		
Variables	**Category**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**X^2, P-value**
Gravidity	Primigravida Multigravida Grand multigravida	14 (6.1) 91 (39.4) 126 (54.5)	195 (42.4) 241 (52.4) 24 (5.2)	209 (30.2) 332 (48.1) 150 (21.7)	X^2, =244.9 *P*=0.001
Parity	Nullipara Multipara Grand multipara	15 (6.5) 151 (65.4) 65 (28.1)	207 (45.0) 247 (53.7) 6 (1.3)	222 (32.1) 398 (57.6) 71 (10.3)	X^2, =182.4 *P*=0.001
Inter pregnancy interval (n=482)	<24 months ≥24 months	34 (15.7) 183 (84.3)	60 (22.6) 205 (77.4)	94 (19.5) 388 (80.5)	X^2, =3.7 *P*=0.055
History of BOH (n=482)	Yes No	41 (18.9) 176 (81.1)	34 (12.8) 231 (87.2)	75 (15.6) 407 (84.4)	X^2, =3.4 *P*=0.068
Types of BOH (n=75)	Early neonatal loss Still birth Recurrent abortion	14 (34.1) 23 (56.1) 4 (9.8)	18 (52.9) 14 (41.2) 2 (5.9)	6 (8.0) 37 (49.3) 32 (42.7)	X^2, =2.7 *P*=0.256
Status of pregnancy	Planned Unplanned and wanted	171 (74.0) 60 (26.0)	353 (76.7) 107 (23.3)	524 (75.8) 167 (24.2)	X^2, =0.6 *P*=0.432
History of ANC contact	Yes	231 (100.)	460 (100.0)	691 (100.0)	n/a
GA when ANC contact	≤16 weeks	75 (32.5)	171 (37.2)	246 (35.6)	X^2,=1.5

started		>16 weeks	156 (67.5)	289 (62.8)	445 (64.4)	*P*=0.223
Number of ANC contact		1-8 contact ≥ 8 contact	162 (70.1) 69 (29.9)	339 (73.7) 121 (26.3)	501 (72.5) 190 (27.5)	X^2, =1.0 *P*=0.322
Tetanus toxoid vaccinated		Yes No	210 (90.9) 21 (9.1)	425 (92.4) 35 (7.6)	635 (91.9) 56 (8.1)	X^2, =0.4 *P*=0.501
Number of TT vaccine (n=635)		1 2	65 (31.0) 145 (69.0)	127 (29.9) 298 (70.1)	192 (30.2) 443 (69.8)	X^2, =0.1 *P*=0.782
IFAS		Yes No	200 (86.6) 31 (13.4)	408 (88.7) 52 (11.3)	608 (88.0) 83 (12.0)	X^2, =0.6 *P*=0.420
Duration of IFAS (n=608)		< 3 months ≥3 months	119 (59.5) 81 (40.5)	281 (68.9) 127 (31.1)	400 (65.8) 208 (34.2)	X^2, =5.2 *P*=0.022
Complication during pregnancy		Yes No	114 (49.4) 117 (50.6)	127 (27.6) 333 (72.4)	241 (34.9) 451 (65.1)	X^2, =32.0 *P*=<0.001
Types of complication during pregnancy (multiple response were possible)	Pre eclampsia	Yes No	28 (12.1) 203 (87.9)	27 (5.9) 433 (94.1)	55 (8.0) 636 (92.0)	X^2, =8.2 *P*=0.004
	Gestational DM	Yes No	9 (3.9) 222 (96.1)	7 (1.5) 453 (98.5)	16 (2.3) 575 (97.7)	X^2, =3.8 *P*=0.050
	APH	Yes No	39 (16.9) 192 (83.1)	41 (8.9) 419 (91.1)	80 (11.6) 611 (88.4)	X^2, =9.5 *P*=0.002
	PROM	Yes No	50 (21.6) 181 (78.4)	44 (9.6) 416 (90.4)	94 (13.6) 597 (86.4)	X^2, =19.1 *P*=0.001
	HEG	Yes No	9 (3.9) 222 (96.1)	15 (3.3) 445 (96.7)	24 (3.5) 667 (96.5)	X^2, =0.2 *P*=0.667
	Decreasing fetal mov`t	Yes No	25 (10.8) 206 (89.2)	19 (4.1) 441 (95.9)	44 (6.4) 647 (93.6)	X^2, =6.5 *P*=0.001
	Decreasing amniotic fluid	Yes No	7 (3.0) 224 (97.0)	9 (2.0) 451 (98.0)	16 (2.3) 675 (97.7)	X^2, =0.8 *P*=0.376
Accompanied by husband to ANC at least once		Yes No	110 (47.6) 121 (52.4)	232 (50.4) 228 (49.6)	342 (50.5) 349 (49.5)	X^2, =0.5 *P*=0.485

5.4. Intrapartum obstetrics characteristics

In this study, in seven out of the ten (70.5%) of AAMs and 357 (77.6%) of adult aged mothers the onset of labor was spontaneous, and among them 22 (13.5%) and 52 (14.6%) of the labor were augmented respectively. Two-thirds (66.7%) of adult aged mothers, and 144 (62.3%) of AAMs were gave childbirth by SVD. Failed induction 29 (27.6%) vs 14 (22.2%) and fetal distress 24 (22.9%) vs 13 (20.6%) were the main indication for CS among adult aged mothers and AAMs respectively. In Majority, 205 (88.7%) of AAMs and 432 (94.0%) of adult aged mother the fetal presentation was vertex. Significantly, in 209 (90.5%) of AAMs the duration of the labor were <24 hours, compared to adult aged mothers 373 (81.1%). The independent t-test showed a significant differences between the mean (±SD) total duration of labor of AAMs and adult aged mothers, which was 11.58 (± 6.24) vs 15.07 (±6.87) hours respectively, and the mean difference was 3.48 (CI=2.43-4.54) hours at a P- value <0.001. Complication during labor and

delivery were significantly more common among AAMs 144 (62.3%) than adult aged mothers 249 (54.1%). Fetal distress 64 (27.7%), PPH 39 (16.9%), malpresentation 36 (15.6%) and intrapartum preeclampsia 31 (13.4%) were significantly more common among AAMs, whereas prolonged labor 87 (18.9%) were common among adult aged mothers (table 5).

Table 5: Intrapartum obstetrics characteristics of advanced and adult age mothers at the public hospitals of Addis Ababa City, Ethiopia, (n=691).

Characteristics			**Maternal age**		**Total (n=691)**	
			Advanced (n=231)	**Adult (n=460)**		
Variables		**Category**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**X^2, P-value**
Onset of labor		Spontaneous Induced Elective C/S	163 (70.5) 48 (20.8) 20 (8.7)	357 (77.6) 77 (16.7) 26 (5.7)	520 (75.3) 125 (18.1) 46 (6.7)	X^2, =4.5 *P*=0.106
Augmentation (n=520)		Yes No	22 (13.5) 141 (86.5)	52 (14.6) 305 (85.4)	74 (14.2) 446 (85.8)	X^2, =0.1 *P*=0.746
Mode of delivery		SVD Operative VD Emergency C/S Elective C/S	144 (62.3) 24 (10.4) 43 (18.6) 20 (8.7)	307 (66.7) 48 (10.4) 79 (17.2) 26 (5.7)	451 (65.3) 72 (10.4) 122 (17.7) 46 (6.7)	X^2, =2.7 *P*=0.436
Indication of C/S (n=168)		Fetal distress Failed induction Planned repeated C/S Failed VBAC Malpresentation APH Macrosomia CPD Cord prolapse Sever oligohydramnios	13 (20.6) 14 (22.2) 10 (15.9) 4 (6.3) 9 (14.3) 3 (4.8) 4 (6.3) 1 (1.6) 3 (4.8) 2 (3.2)	24 (22.9) 29 (27.6) 12 (11.4) 10 (9.5) 11 (10.5) 7 (6.6) 5 (4.8) 4 (3.8) 1 (1.0) 2 (1.9)	37 (22.0) 43 (25.6) 22 (13.1) 14 (8.3) 19 (11.9) 10 (6.0) 9 (5.3) 5 (3.0) 4 (2.4) 4 (2.4)	X^2, =5.8 *P*=0.757
Fetal presentation		Vertex Breech Others*	205 (88.7) 20 (8.7) 6 (2.6)	432 (94.0) 20 (4.3) 8 (1.7)	437 (92.2) 40 (5.8) 14 (2.0)	X^2, =5.9 *P*=0.051
Duration of labor		≤24 hours >24 hours	209 (90.5) 22 (9.5)	373 (81.1) 87 (18.9)	582 (84.2) 109 (15.8)	X^2, =10.2 *P*=0.001
Complication during labor and delivery		Yes No	144 (62.3) 87 (37.7)	249 (54.1) 211 (45.9)	393 (56.9) 298 (43.1)	X^2, =4.2 *P*=0.040
Types of complication during labor and delivery (multiple response	Intrapartum preeclampsia	Yes No	31 (13.4) 200 (86.6)	36 (7.8) 424 (92.2)	67 (9.7) 624 (90.3)	X^2, =5.5 *P*=0.019
	Prolonged labor	Yes No	22 (9.5) 209 (90.5)	87 (18.9) 373 (81.1)	109 (15.8) 582 (84.2)	X^2, =10.2 *P*=0.001
	Obstructed labor	Yes No	5 (2.2) 226 (97.8)	9 (2.0) 451 (98.0)	4 (2.0) 677 (98.0)	X^2, =0.03 *P*=0.885
	Malpresentation/malposition	Yes No	36 (15.6) 195 (84.4)	28 (6.1) 432 (93.9)	64 (9.3) 627 (90.7)	X^2, =16.4 *P*=0.001

were possible)	Failed induction	Yes No	14 (6.1) 217 (93.9)	29 (6.3) 431 (93.7)	43 (6.2) 648 (93.8)	X^2, =0.02 *P*=0.900
	Decreasing uterine contraction	Yes No	31 (13.4) 200 (86.6)	54 (11.7) 406 (88.3)	85 (12.3) 606 (87.7)	X^2, =0.4 *P*=0.526
	Fetal distress	Yes No	64 (27.7) 167 (72.3)	78 (17.0) 382 (83.0)	142 (20.5) 549 (79.5)	X^2, =10.9 *P*=0.001
	Cord prolapse	Yes No	5 (2.2) 226 (97.8)	4 (0.9) 456 (99.1)	9 (1.3) 682 (98.7)	X^2, =2.1 *P*=0.157
	PPH	Yes No	39 (16.9) 192 (83.1)	46 (10.0) 414 (90.0)	85 (12.3) 606 (87.7)	X^2, =6.7 *P*=0.009
	Perineal tear	Yes No	6 (2.6) 225 (97.4)	19 (4.1) 441 (95.9)	25 (3.6) 666 (96.4)	X^2, =1.1 *P*=0.309
	Uterine rupture	Yes No	4 (1.7) 227 (98.3)	3 (0.7) 457 (99.3)	7 (1.0) 684 (99.0)	X^2, =1.8 *P*=0.181
	Retained placenta	Yes No	8 (3.5) 223 (96.5)	12 (2.6) 448 (97.4)	20 (2.9) 671 (97.1)	X^2, =0.4 *P*=0.527
	Chorioamnionitis	Yes No	7 (3.0) 224 (97.0)	9 (2.0) 451 (98.0)	16 (2.3) 675 (97.7)	X^2, =0.8 *P*=0.376

*face, brow, shoulder and cord presentation

5.5. Neonatal characteristics

Three-fourths (75.0%) of adult aged mothers and nearly, two-thirds (65.4%) of AAMs were gave birth at term. The independent t-test showed a significant differences between the mean (±SD) GA at delivery of AAMs and adult aged mothers, which was 37.7 (±2) vs 38.3 (±2) weeks respectively, and the mean difference was 0.6 (CI=0.29-0.91) at P-value <0.001. Almost, more than half 51.1% of the AAMs and 51.5% of the adult aged mothers' neonates were female. Significantly, dead neonatal outcome were more common among AAMs 27 (11.7%) than adult aged mothers 20 (4.3%). AAMs were significantly gave birth of LBW 63 (27.3%) and macrocosmic 23 (10.0%) baby than adult aged mothers 90 (19.6%), and 23 (5.0%) respectively. Overall the mean (±SD) birth weight was 2951.16 (± 612.17) gm, which was 2961.9 (±692.5) and 2945.8 (±568.3) among AAMs and adult aged mothers respectively. Majority, 384 (83.3%) of adult aged mother newborn babies were AGA, while it was 170 (73.7%) among AAMs. Newborn babies of AAMs were significantly had low 1st and 5th minutes Apgar score 64 (27.7%) and 42 (18.2%) than adult aged mothers 72 (15.7%) and 45 (9.8%) respectively. About, 49 (21.2%), and 72 (15.7%) of the AAMs and adult aged mothers newborn babies were admitted to NICU respectively with no significant differences. Birth asphyxia was the main indication for NICU admission in 32 (44.4%) of adult aged mothers and 18 (36.8%) of AAMs (table 6).

Table 6: Neonatal characteristics of advanced and adult age mothers at the public hospitals of Addis Ababa City, Ethiopia, (n=691).

Characteristics			**Maternal age**		**Total (n=691)**	
			Advanced (n=231)	**Adult (n=460)**		
Variables		**Category**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**X^2, P-value**
GA at delivery		28^{+0day}-36^{+6days} weeks 37^{+0day}-41^{+6days} weeks ≥42 weeks	71 (30.7) 151 (65.4) 9 (3.9)	78 (17.0) 345 (75.0) 37 (8.0)	149 (21.6) 496 (71.7) 46 (6.7)	X^2, =19.5 *P*=0.001
Sex of the newborn		Female Male	118 (51.1) 113 (48.9)	237 (51.5) 223 (48.5)	355 (51.4) 336 (48.6)	X^2, =0.01 *P*=0.913
Newborn outcome		Alive Dead	204 (88.3) 27 (11.7)	440 (95.7) 20 (4.3)	644 (93.2) 47 (6.8)	X^2, =13.1 *P*=0.000
Type of death	Still birth	Yes No	14 (6.0) 217 (94.0)	8 (1.7) 452 (98.3)	22 (3.2) 669 (96.8)	X^2, =9.3 *P*=0.002
	Immediate neonatal death	Yes No	13 (5.6) 218 (94.4)	12 (2.6) 448 (97.4)	25 (3.6) 666 (96.4)	X^2, =4.0 *P*=0.045
Cause of immediate neonatal death (n=25)		Prematurity Asphyxia Congenital malformation Unknown	6 (46.2) 4 (30.8) 1 (7.7) 2 (15.4)	4 (33.3) 4 (33.3) 1 (8.3) 3 (25.0)	10 (40.0) 8 (32.0) 2 (8.0) 5 (20.0)	X^2, =0.5 *P*=0.905
Birth weight of the baby		<2500gm (LBW) 2500-4000gm (normal) ≥4000gm (macrosomia)	63 (27.3) 145 (62.7) 23 (10.0)	90 (19.6) 347 (75.4) 23 (5.0)	153 (22.1) 492 (71.2) 46 (6.7)	X^2, =13.3 *P*=0001
Newborn to gestational age		SGA AGA LGA	38 (16.4) 170 (73.7) 23 (9.9)	54 (11.7) 384 (83.3) 23 (5.0)	92 (13.3) 553 (80.0) 46 (6.7)	X^2, =10.0 *P*=0.007
1^{st} minuet APGAR score		<7 ≥7	64 (27.7) 167 (72.3)	72 (15.7) 388 (84.3)	136 (19.7) 555 (80.3)	X^2, =14.1 *P*=0.001
5^{th} minute APGAR score		<7 ≥7	42 (18.2) 189 (81.8)	45 (9.8) 415 (90.2)	87 (12.6) 604 (87.4)	X^2, =9.8 *P*=0.002
Congenital malformation		Yes No	9 (3.9) 222 (96.1)	6 (1.3) 454 (98.7)	15 (2.2) 676 (97.8)	X^2, =4.9 *P*=0.027
Types of congenital malformation (n=15)		Spinal bifida Anencephaly Hydrocephalus	5 (55.6) 2 (22.2) 2 (22.2)	3 (50.0) 2 (33.3) 1 (16.7)	8 (53.3) 4 (26.7) 3 (20.0)	X^2, =0.2 *P*=0.886
IUGR		Yes No	6 (2.6) 225 (97.4)	7 (1.5) 453 (98.5)	13 (1.9) 678 (98.1)	X^2, =0.9 *P*=0.326
Neonatal jaundice		Yes No	12 (5.2) 219 (94.8)	16 (3.5) 444 (96.5)	28 (4.1) 663 (95.1)	X^2, =1.1 *P*=0.281
Neonate admitted to NICU		Yes No	49 (21.2) 182 (78.8)	72 (15.7) 388 (84.3)	121 (17.5) 570 (82.5)	X^2, =3.3 *P*=0.070
Reason of NICU admission (n=121)		Prematurity LBW Asphyxia Infection	7 (14.3) 5 (10.2) 18 (36.8) 2 (4.1)	10 (13.9) 6 (8.2) 32 (44.4) 4 (5.6)	17 (14.0) 11 (9.1) 50 (41.3) 6 (5.0)	X^2, =2.1 *P*=0.989

	Congenital malformation	2 (4.1)	1 (1.4)	3 (2.5)	
	Jaundice	1 (2.0)	1 (1.4)	2 (1.7)	
	Hypoglycemia	6 (12.2)	7 (9.7)	13 (10.6)	
	Hypothermia	2 (4.1)	4 (5.6)	6 (5.0)	
	IUGR	3 (6.1)	3 (4.2)	6 (5.0)	
	Unable to breast feed	3 (6.1)	4 (5.6)	7 (5.8)	
General neonatal outcome	Unfavorable	119 (51.5)	185 (40.2)	304 (44.0)	X^2, =8.0
	Favorable	112 (48.5)	275 (59.8)	387 (56.0)	*P*=0.005

5.6. Adverse neonatal outcomes

The adverse neonatal scale reliability analysis results of Cronbach`s alpha in this study was equal to 0.773. This scale consisted of 13 items and demonstrated acceptable internal consistency (figure 3). The finding of the study showed that, 119 (51.5%) (95% CI =44.7-57.9) of AAMs had at least one ANOs, while it was 185 (40.2%) (95% CI=35.7-44.6) among adult aged mothers. Meanwhile, the overall ANOs was 44.0% (n=304) (95% CI = 40.2-47.6). The ANOs was higher among AAMs than adult aged mothers, with a point estimate mean difference (PEMD) of 11.3% (95% CI = 0.035-0.191) at a P- value of 0.05. The independent t-test showed that, there were a statistical significant PEMD differences between maternal ages across the 9 neonatal outcomes at P-value of <0.05. Notably, AAMs were had more common preterm birth with a PEMD of 13.8% (95% CI = 0.073-0.202) at a P-value of <0.001 than adult aged mothers. Likewise, the newborn babies of AAMs group were more likely had low 1^{st} and 5^{th} minutes Apgar score at a PEMD of 12.0% (95%, CI = 0.058-0.183), and 8.4% (95%, CI = 0.032-0.136) respectively relative to adult aged mothers. Significantly, the new babies of AAMs were had LBW and LGA at a PEMD of 7.7% (95%, CI = 0.011-0.143) and 4.9% (95%, CI = 0.01-0.088) respectively than adult aged mothers. The proportion of stillbirth and immediate neonatal death were significantly more common among AAMs at a PEMD of 4.3% (95%, CI = 0.015-0.071), and 3.0% (95%, CI = 0.001-0.059) respectively than adult aged mothers. Congenital malformation were significantly more common among AAMs at a PEMD of 2.6% (95%, CI= 0.003-0.04) than adult aged mothers. On the other hand, post-term birth were significantly more common among adult aged mothers at a PEMD of 4.1% (95%, CI= 0.002-0.080) compared to AAMs. However, the independent t-test showed that there were no significance PEMD in SGA, NICU admission, IUGR, and jaundice among AAMs and adult aged mothers (table 7).

Table 7: Adverse neonatal outcomes and independent sample proportion test results among advanced and adult age mothers at the public hospitals of Addis Ababa City, Ethiopia, (n= 460 adult & advanced =231).

Characteristics		**Maternal age**	**Frequency**	**Propo rtion**	**Proportion difference**	***P*-value**	**[95% CI of difference]**
Variables	**Category**						
Unfavorable neonatal outcome		Advanced 35^{+}	119	0.515	0.113	0.005	[0.035-0.191]
		Adult (20-24)	185	0.402			
Adverse neonatal outcomes	Preterm birth	Advanced 35^{+}	71	0.307	0.138	<0.001	[0.073-0.202]
		Adult (20-24)	78	0.169			
	Post-term birth	Advanced 35^{+}	9	0.039			
		Adult (20-24)	37	0.080	0.041	0.039	[0.002-0.080]
	Low 1^{st} minute APGAR score	Advanced 35^{+}	64	0.277	0.120	0.001	[0.058-0.183]
		Adult (20-24)	72	0.157			
	Low 5^{th} minutes APGAR score	Advanced 35^{+}	42	0.182	0.084	0.002	[0.032-0.136]
		Adult (20-24)	45	0.098			
	LBW	Advanced 35^{+}	63	0.273	0.077	0.021	[0.011-0.143]
		Adult (20-24)	90	0.196			
	SGA	Advanced 35^{+}	38	0.164	0.047	0.086	[0.009-0.103]
		Adult (20-24)	55	0.117			
	LGA	Advanced 35^{+}	23	0.099	0.049	0.014	[0.010-0.088]
		Adult (20-24)	23	0.050			
	Still birth	Advanced 35^{+}	14	0.060	0.043	0.002	[0.015-0.071]
		Adult (20-24)	8	0.017			
	immediate neonatal death	Advanced 35^{+}	13	0.056	0.030	0.045	[0.001-0.059]
		Adult (20-24)	12	0.026			
	NICU admission	Advanced 35^{+}	49	0.212	0.055	0.070	[0.008-0.118]
		Adult (20-24)	72	0.157			
	IUGR	Advanced 35^{+}	6	0.026	0.011	0.327	[0.012-0.034]
		Adult (20-24)	7	0.015			
	Congenital malformation	Advanced 35^{+}	9	0.039	0.026	0.027	[0.003-0.049]
		Adult (20-24)	6	0.013			
	Jaundice	Advanced 35^{+}	12	0.052	0.017	0.281	[0.016-0.050]
		Adult (20-24)	16	0.035			

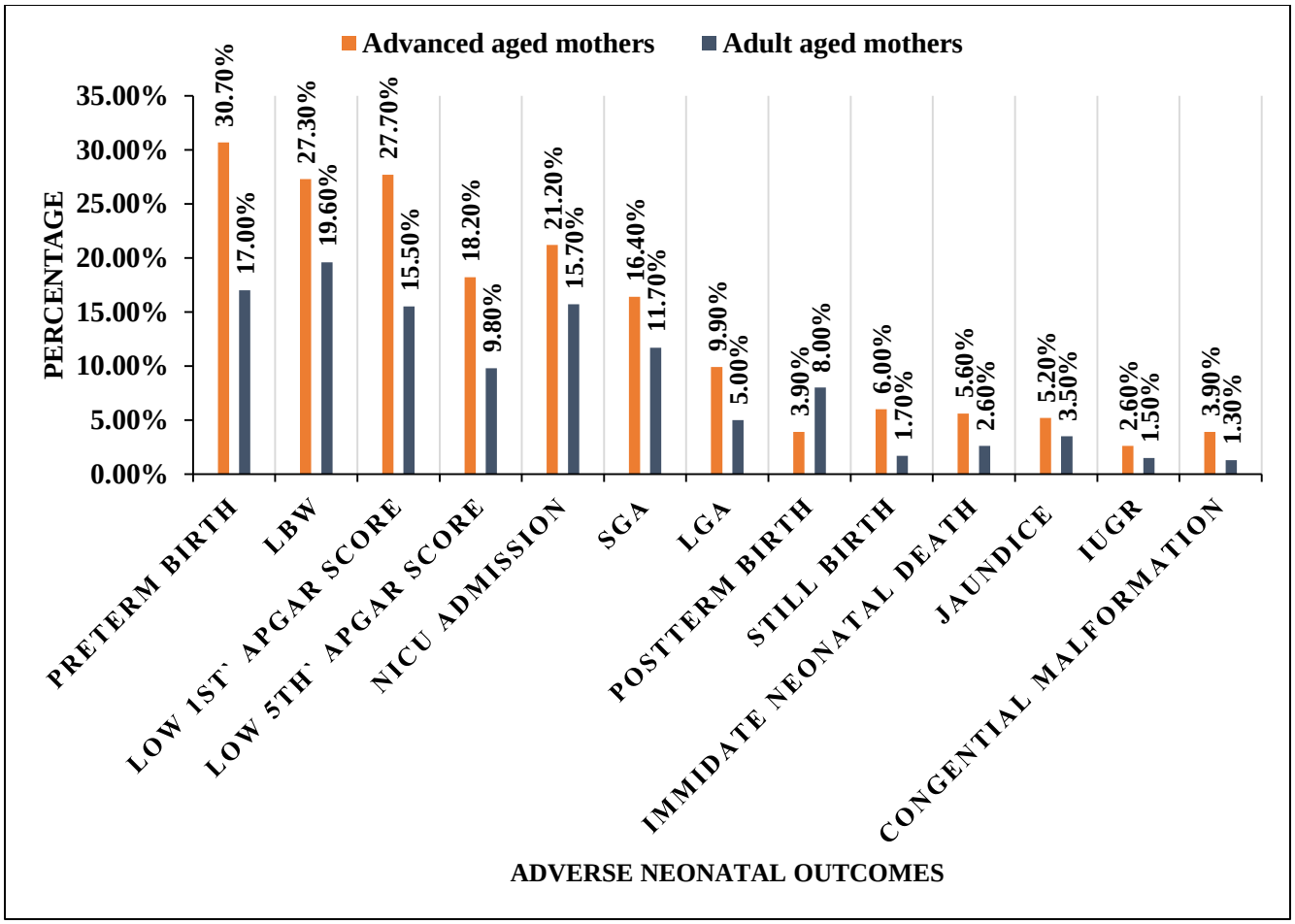


Figure 3: Adverse neonatal outcomes among advanced and adult age mothers at the public hospitals of Addis Ababa City, Ethiopia, [n= 691, (460 adult & 232 advanced)].

5.7. Factors associated with adverse neonatal outcomes

Logistic regression was run for the overall ANOs and for each adverse outcome separately by regressing the dependant variable with maternal age, socio demographic factors, lifestyle and medical history-related factors, antepartum and intrapartum obstetrics factors. In each bivariate analysis, variables that have association at a P-value of <0.20 were entered into a multivariable analysis, and in each multivariable analysis those variables with 95% of CI and a P-value of < 0.05 were considered as statistically significant with the overall ANOs and with each adverse outcome.

After regressing the overall ANOs with maternal age and other independent variables; AAMs were 1.51 times more likely had unfavorable neonatal outcomes relative to adult aged mothers

[AOR=1.51, 95%, CI=1.02-2.25] (table 8). In addition to the maternal age, ANOs were higher among mothers who have chronic medical problems, MUAC <23cm, negative maternal Rh status, short inter-pregnancy interval, not taking IFAS, had complication during pregnancy, gave childbirth by C/S and drinking alcohol at a P-value of <0.05 than their counterparts (table S1). Among AAMs; the chance of their baby to have ANOs were higher in case of having no formal education, drinking alcohol, short inter-pregnancy interval, PROM, and giving childbirth by emergency C/S at a P-value of <0.05 (table S2). On the other hand, among adult aged mothers the probability of their baby to have ANOs were higher in those who had average family monthly income of less than 5220 Ethiopian birr, have chronic medical problems, negative maternal Rh status, short inter-pregnancy interval, PROM, pre- eclampsia during pregnancy, induced labor, gave childbirth by elective and emergency C/S at a P- value of <0.05 (table S3).

Likewise, each ANO were regressed with maternal age and other independent variables; AAMs were 1.84 times more likely to give preterm birth than adult aged mothers [AOR =1.84, 95% CI=1.18-2.85]. The likelihoods of having LGA baby were 2.68 times higher among AAMs compared to adult aged mothers [AOR =2.68, 95% CI=1.31-5.49]. AAMs were 3.35 times more likely to encounter stillbirth relative to adult aged mothers [AOR =3.35, 95% CI=1.27-.8.82]. On the other hand, the chance of having post-term birth were 75% less likely among AAMs than adult aged mothers (AOR=0.25, 95% CI=1.08-.083]. However, low fifth minute Apgar score, LBW, SGA, immediate neonatal death, NICU admission and congenital malformation were not significantly associated with maternal age in multivariable analysis (table 8, and additional tables: table S4, table S5, table S6, table S7, table S8, table S9, table S10, table S11, table S12, and table S13). Logistic regression was not run for IUGR and neonatal jaundice because their P-value in bivariate analysis was >0.20.

Table 8: Bivariate and multivariate analyses of adverse neonatal outcomes among advanced and adult aged mothers at the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

General neonatal outcome[1]					
Age group	Unfavorable	Favorable	COR (95% CI)	AOR (95% CI)	P-value
≥35 years	119	112	1.58 (1.15-2.17)	**1.51 (1.02-2.25)**	**0.039***
20-34 years	185	275	1	1	
Preterm birth[2]					
Age group	Yes	No	COR (95% CI)	AOR (95% CI)	P-value
≥35 years	71	160	2.17 (1.50-3.15)	**1.84 (1.18-2.85)**	**0.007***

20-34 years	78	382	1	1	
Post-term birth[3]					
Age group	Yes	No	COR (95% CI)	AOR (95% CI)	P-value
≥35 years	9	222	0.46 (0.22-0.98)	**0.25 (1.08-0.83)**	**0.024***
20-34 years	37	423	1		
Low fifth minute Apgar score[4]					
Age group	Yes	No	COR (95% CI)	AOR (95% CI)	P-value
≥35 years	42	189	2.05 (1.30-3.23)	1.40 (0.81-2.43)	0.230
20-34 years	45	415	1	1	
LBW[5]					
Age group	Yes	No	COR (95% CI)	AOR (95% CI)	P-value
≥35 years	63	168	1.54 (1.06-2.23)	1.26 (0.80-2.01)	0.320
20-34 years	90	370	1	1	
SGA[6]					
Age group	Yes	No	COR (95% CI)	AOR (95% CI)	P-value
≥35 years	38	193	1.48 (0.94-2.32)	1.18 (0.71-1.95)	0.526
20-34 years	54	406	1	1	
LGA[7]					
Age group	Yes	No	COR (95% CI)	AOR (95% CI)	P-value
≥35 years	23	208	2.10 (1.15-3.83)	**2.68 (1.31-5.49)**	**0.007***
20-34 years	23	437	1	1	
Stillbirth[8]					
Age group	Yes	No	COR (95% CI)	AOR (95% CI)	P-value
≥35 years	14	217	3.64 (1.51-8.82)	**3.35 (1.27-8.82)**	**0.014***
20-34 years	8	452	1	1	
immediate neonatal death[9]					
Age group	Yes	No	COR (95% CI)	AOR (95% CI)	P-value
≥35 years	13	218	2.23 (1.01-4.96)	1.06 (0.33-3.36)	0.920
20-34 years	12	448	1	1	
NICU admitted[10]					
Age group	Yes	No	COR (95% CI)	AOR (95% CI)	P-value
≥35 years	49	182	1.45 (0.972.17)	1.07 (0.61-1.89)	0.803
20-34 years	72	388	1	1	
Congenital malformation[11]					
Age group	Yes	No	COR (95% CI)	AOR (95% CI)	P-value
≥35 years	9	222	3.07 (1.08-8.73)	2.34 (0.72-7.61)	0.156
20-34 years	6	454	1	1	

*significant at a P-value of <0.05.

[1]The dependant variable was regressed with maternal age, residency, maternal educational level, maternal occupation, alcohol drinking, chronic medical problems, MUAC, maternal RH status, HIV status, Hb level, gravidity, birth interval, BOH, status of pregnancy, GA at first ANC contact, number of ANC contact, TT vaccination, IFAS, complication during pregnancy, onset of labor, mode of delivery, and complication during labor and delivery. Hosmer and Lemeshow test P-value =0.139

[2]The dependant variable was regressed with maternal age, residency, maternal educational level, average monthly household, alcohol drinking, chronic medical problems, MUAC, maternal RH status, HIV status, Hb level, gravidity, birth interval, BOH, status of pregnancy, TT vaccination, IFAS, and complication during pregnancy. Hosmer and Lemeshow test P-value =0.319

[3]The dependant variable was regressed with maternal age, chronic medical problem, gravidity, GDM and LGA. Hosmer and Lemeshow test P-value =0.430

[4]The dependant variable was regressed with maternal age, residency, maternal educational level, average monthly household, alcohol drinking, chronic medical problems, MUAC, maternal RH status, Hb level, gravidity, BOH, status of pregnancy, TT vaccination, IFAS, complication during pregnancy, GA at delivery, fetal presentation, complication during labor and delivery, and birth weight. Hosmer and Lemeshow test P-value =0.360

[5]The dependant variable was regressed with maternal age, residency, maternal educational level, average monthly household, alcohol drinking, chronic medical problems, MUAC, maternal RH status, HIV status, Hb level, birth interval, BOH, status of pregnancy, GA at first ANC contact, number of ANC contact, TT vaccination, IFAS, and complication during pregnancy. Hosmer and Lemeshow test P-value =0.798

[6]The dependant variable was regressed with maternal age, residency, average monthly household, alcohol drinking, chronic medical problems, MUAC, maternal RH status, HIV status, Hb level, birth interval, BOH, status of pregnancy, GA at first ANC contact, number of ANC contact, TT vaccination, IFAS, and complication during pregnancy. Hosmer and Lemeshow test P-value =0.267

[7]The dependant variable was regressed with maternal age, maternal educational level, gravidity, GDM and post-term pregnancy. Hosmer and Lemeshow test P-value =0.756

[8]The dependant variable was regressed with maternal age, residency, alcohol drinking, chronic medical problems, maternal RH status, Hb level, BOH, status of pregnancy, TT vaccination, IFAS, and complication during pregnancy. Hosmer and Lemeshow test P-value =0.381

[9]The dependant variable was regressed with maternal age, alcohol drinking, chronic medical problems, MUAC, gravidity, TT vaccination, IFAS, complication during pregnancy, preterm birth, complication during labor and delivery and SGA. Hosmer and Lemeshow test P-value =0.835

[10]The dependant variable was regressed with maternal age, residency, chronic medical problems, MUAC, maternal RH status, HIV status, Hb level, birth interval, BOH, TT vaccination, complication during pregnancy, GA at delivery, fetal presentation, mode of delivery, complication during labor and delivery, and birth weight. Hosmer and Lemeshow test P-value =0.121

[11]The dependant variable was regressed with maternal age, residency, alcohol drinking, chronic medical problem, maternal Rh status, Hb level, TT vaccination, and IFAS. Hosmer and Lemeshow test P-value =0.289

6. DISCUSSION

The prevalence of ANOs was 51.5% (95% CI =44.7-57.9) among AAMs, while it was 40.2% (95% CI=35.7-44.6) among adult aged mothers. Meanwhile, the overall ANOs was 44.0% (95% CI = 40.2-47.6). This study finding was higher than studies conducted in Awi zone public hospitals where the ANOs was 19.4% (29.1% vs 14.5% among AAMs and adult aged mothers respectively) (8), Jimma it was 40.5% among AAMs and 29.4% among adult-aged mothers (55). The higher prevalence of ANOs in this study can be reflects the difference in the study sitting, as this study was solely conducted in the public hospitals where most complicated pregnancies are managed. Studies showed that in addition to the maternal age, the risk of developing ANOs were increased in case of complicated pregnancy (50, 99).

In this study, ANOs among AAMs where lower compared to a study conducted in Dessie Referral Hospital 74.7%, whereas the prevalence of ANOs among adult aged mothers higher in this study compared to the study conducted in Dessie Referral Hospital, which was 25.3% (30). This discrepancy could be due to the differences in a ratio of exposed to the unexposed group sample size, where they used 1:1 ratio, whereas the sample size of this study was calculated by assuming 1:2 ratio. However, it is higher than a study conducted in Denmark where 10.8% vs 5.4% among advanced and adult-aged mothers respectively (57). It is also higher than studies conducted in Taiwan and Japan (59, 60). This could be due to the differences in the socio-economic status, and access to quality of health care services between in this study area and the aforementioned study countries. Literature indicated that the maternal nutritional status, level of income and educational level affects the pregnancy outcomes (100, 101).

The independent t-test showed that the overall ANOs was higher among AAMs than adult aged mothers, with a PEMD of 11.3% [95% (CI=0.035-0.191), p = 0.005]. It was also remained significantly associated with the maternal age after regressing with other variables, and found that babies born from AAMs were 1.51 times more likely had unfavorable outcomes compared to adult aged mothers. This finding is in harmonious with studies conducted in Awi zone public hospitals (8), Hawassa governmental health institutions (102), Debre Tabor town (103), Developing countries birth registry (104), Sweden (105), United Kingdom (106), and Poland (107). It also supported by other studies findings, which indicated that AMA significantly increased the risk of ANOs compared with adult age (12, 20, 49, 58). This could be due to the

reason that advanced age is one of the non- modifiable risk factors for different ANOs as seen in this study and other studies (8, 108). It could be also related to ageing process alone or the increased risk of obstetrical complications during pregnancy in AAMs (106, 109, 110). Another study also found an increasing maternal age without a clear cutoff as an independent and substantial risk factor for ANOs (36).

At the same time, the unfavorable neonatal outcomes were also significantly associated with other factors like: chronic medical problems, alcohol drinking during pregnancy, MUAC less than 23 cm, maternal Rh negative status, having short inter-pregnancy interval, not taking IFAS, presence of complication during pregnancy, and giving childbirth by C/S (table S1). Similar finding was reported in a study conducted in Awi zone public hospitals indicated that beside the maternal age, the likelihood of ANOs were higher among mothers with short inter-pregnancy interval and had complication during pregnancy (8).

On the other hand the separate analysis showed that, among AAMs the chance of their baby to have ANOs were higher in case of having no formal education, drinking alcohol, short inter-pregnancy interval, PROM, and giving childbirth by emergency C/S at a P-value of <0.05 (table S2). Likewise, among adult aged mothers the probability of their baby to have ANOs were higher in those who had average family monthly income of less than 5220 Ethiopian birr, have chronic medical problems, negative maternal Rh status, short inter-pregnancy interval, PROM, pre- eclampsia during pregnancy, induced labor, gave childbirth by elective and emergency C/S at a P- value of <0.05 (table S3). This showed that the risk of ANOs is not only depends on the maternal age, it also affected by the others maternal socio-demographic, medical and obstetrical factors. There are supporting findings from studies conducted in Ethiopia (8, 29, 30, 33, 34, 77-85), United States of America, China, Bangladesh, and Turkey (70-74).

According to the independent t-test findings, out of the thirteen ANOs there were a statistical significant PEMD between maternal ages across the nine ANOs at P-value of <0.05. Among them ten of the ANOs were fulfill the assumption for logistic regression and then each of them were regressed with maternal age and other factors separately. After regression of each ANOs with maternal age and other independent variables; only preterm birth, LGA, still birth and post term birth were showed significant association with maternal age.

Based on this, babies born form AAMs were more likely born premature with a PEMD of 13.8% (95% CI = 0.073-0.202, p = <0.001). The chance of preterm birth were remained significantly associated with maternal age after regressing with other variables and showed that AAMs were 1.84 times more likely had the chance of giving preterm birth relative to adult aged mothers. This finding is in line with studies conducted in Ayder Comprehensive Specialized Hospital (28), Dessie Referral Hospital (30), and Debre Markos Referral Hospital (29). It is also in agreement with studies done in South Africa (5), India (51, 61), Saudi Arabia (25), United Kingdom (111), Italy (26), Spain (62), Finland (112), and Australia (37). A The other possible reason can be that the risk of developing medical and obstetrical complications could be increased when the age of the mothers increase, thus co-morbidities increased the risk of early labor induction or pregnancy termination (109, 113) Additionally, beside the maternal age premature birth also significantly associated with average household monthly income less than 5220 Ethiopian birr, alcohol drinking, MUAC less than 23 cm, negative maternal Rh status, not taking IFAS, and presence of at least one complication during pregnancy (table S4). It is evidenced that other maternal characteristics and different obstetric complications were also associated with different ANOs (50).

On the contrary, post-term birth were significantly more common among adult aged mothers at a PEMD of 4.1% [95%, (CI= 0.002-0.080), p = 0.039] compared to AAMs. It is also remained significantly associated with maternal age after regressing with other variables, and found that babies born from AAMs were had 75% less likely chance of becomes post term compared to babies born from adult aged mothers. It is consistent with another study findings which showed that AMA were less likely associated with post-term birth (114). Beside the maternal age, post-mature delivery also significantly associated with multigravida, GDM, and being LGA (table S5). Babies born from AAMs were had low 5th minutes Apgar score at a PEMD of 8.4% [95%, (CI = 0.032-0.136), p = 0.002] than adult aged mothers. Similarly, findings were reported form studies conducted in Ayder Comprehensive Specialized Hospital (28), and Dessie Referral Hospital (30). However, when regressed with other variables it is not associated with maternal age. Instead it becomes significantly associated with GA at delivery, complication during labor and delivery, LBW at delivery and alcohol drinking during pregnancy (table S6). It is supported by another study finding, which showed that low fifth minute Apgar score associated with other maternal socio-demographic and obstetric characteristics (93).

This study found that some of the babies born from AAMs were had LBW at a PEMD of 7.7% [95%, (CI = 0.011-0.143), p = 0.021]. This finding is supported by the studies done in Ethiopia: Ayder Comprehensive Specialized Hospital (28), Debre Markos Referral Hospital (29), and Dessie Referral Hospital (30), South Africa (5), developed countries (53, 112), and India (51, 61). When it regressed with other variables, the LBW were more likely common in mothers with MUAC <23 cm, alcohol drinking during pregnancy, negative maternal Rh status, Hb level <11g/dl, having BOH, starting ANC contact after 16 weeks of GA, not taking IFAS and having complication during pregnancy (table S7). There are supporting studies conducted in Ethiopia (33, 34, 77-82), India and Afghanistan (86, 87). Furthermore, some of the AAMs babies were LGA with a PEMD of 4.9% [95%, (CI = 0.01-0.088), p= 0.014] relative to adult aged mothers. It found that AAMs babies were 2.68 times more probable their baby becomes LGA or macrosomia compared to adult aged mothers. This finding is consistent with a study conducted in Brazilian births (115). Similar finding also reported form the studies conducted in United Kingdom and Finland (2, 63, 64). Likewise LGA becomes higher among babies born from mothers who had no formal education, developed GDM, and gave post-term birth (table S9). It is evidenced that women with post-term pregnancy had a higher risk of delivering a macrocosmic baby (114).

Moreover, the proportion of stillbirth were significantly more common among AAMs at a PEMD of 4.3% [95%, (CI = 0.015-0.071), p = 0.002]. AAMs were 3.35 times more likely to encounter still birth relative to adult aged mothers [AOR =3.35, 95% CI=1.27-.8.82]. This result is in line with studies done in Ayder Comprehensive Specialized Hospital (28), Dessie Referral Hospital (30), and Debre Markos Referral Hospital (29). It is also consistent with studies done in South Africa (5), and India (51, 61). In addition to the maternal age the stillbirth rate were higher in case of negative maternal Rh status, drinking alcohol during pregnancy, and not taking IAFS (table S10). There were a 3.0% [95%, (CI = 0.001-0.059), p = 0.045] significant PEMD on the chance of the AAMs baby to die within twenty four hours of delivery compared to adult aged mothers baby. This might be attributed to the higher labor and delivery complications for AAMs relative to the adult aged mothers. For instance, in this study complication during labor and delivery were 62.3% vs 54.1% among the AAMs and adult aged mothers respectively. It is supported from studies done in India indicated that the risk of neonatal mortality were higher among pregnancies of AMA (51, 61). On the other hand, when it was regressed with other

variables, it becomes more common in mothers who are not vaccinated with TT, gave preterm birth, and whose babies are SGA (table S11). Study indicated that not getting TT vaccination during pregnancy associated with increased risk of neonatal deaths (116).

Moreover, congenital malformation were significantly more common among AAMs at a PEMD of 2.6% [95%, (CI= 0.003-0.04), p = 0.027] than adult aged mothers. It is supported by studies conducted in South Korea (117), Saudi Arabia (25), and Italy (26) found that congenital malformation among AMA were higher than adult-aged mothers. This might be attributed to the chromosomal abnormalities, which increases the risk of congenital malformation as age advanced and due to other environmental factors (51). However, congenital malformation were not statistically associate with maternal age when regressed with other factors. It becomes more common in mothers who are reside in rural area, drinking alcohol and not taking IFAS (table S13).

On the other hand, in this study the independent t-test showed that there were no significance PEMD in SGA among AAMs and adult aged mothers. This finding is in contrary with studies conducted in Turkey (27), and London found that AMA was associated with increased risk of SGA (63). On the other hand, SGA becomes more common among mothers with MUAC less than 23 cm, HIV positive, BOH, not taking IFAS, and having complication during pregnancy (table S8). This study also indicated that there were no significant differences in neonatal jaundice among the AMA and adult aged mother babies, however it was in contrast to the study findings from Saudi Arabia showed that the rate of neonatal jaundice where higher mongo AAMs (25). Furthermore, in this study there were no significance differences on NICU admission and IUGR in both group. It is in contrary with studies conducted in India indicated that the rate of NICU admission and IUGR were higher among AAMs (51, 61). This differences could be due to the difference in the study sitting and socio-economic status of the study participants. In overall the NICU admission rate were higher among mothers who had MUAC less than 23 cm, babies born premature and post-term, delivered by elective and emergency C/S, whose mothers had labor and delivery complications, being LBW and macrocosmic babies (table S12).

7. LIMITATIONS

This study was assessed only the immediate and the first 24 hours neonatal outcomes, because of this it miss to assess the status of the neonate in the later neonatal periods. Another limitation of this study was exclusion of women who gave childbirth in health center and private health facility. It was conducted at health facility level, so that the outcomes of home delivered neonates were not evaluated. Additionally, some reproductive variables might be subjected to recall bias, for example mothers were asked to recall the GA of starting ANC and number of ANC contact, TT vaccination and the duration of IFAS. Thus, could lead to over or underestimating.

8. CONCLUSIONS

In this study area, the proportion of ANOs were higher among AAMs compared to adult aged mothers. Preterm birth, large for gestational age and stillbirth were positively, while post-term birth negatively associated with ANOs among AMA group. Moreover, LBW, low fifth minute Apgar score, immediate neonatal death, and congenital malformation where higher among AAMs with a significant PEMD than adult aged mothers. On the other hand, regarding to SGA, NICU admission, IUGR, and jaundice there were no significant differences among the advanced and adult aged mothers.

Beside the maternal age, the ANOs were significantly associated with other maternal socio-demographic, medical history-related factors, antepartum and intrapartum obstetrics factors. Those other factors which increase the rate of ANOs were rural residency, having no formal education, average family monthly income of less than 5220 Ethiopian birr, chronic medical problems, MUAC <23 cm, multigravidas, short inter-pregnancy interval, BOH, negative maternal Rh status, drinking alcohol, Hb level <11g/dl, positive HIV status, not taking IFAS, GA at first ANC contact, not vaccinated with TT, had complication during pregnancy (like: PROM, preeclampsia and GDM), induced labor, gave birth by elective or eminency CS, and had complication during labor and delivery.

9. RECOMMENDATIONS

To Ethiopian Ministry of Health and Addis Ababa City Health Bureau

- ✓ Strengthen strategies' of provision of comprehensive maternal health care service for all reproductive age women
- ✓ Increasing access to FP services, which could help to short inter-pregnancy interval, and pregnancy in advanced age
- ✓ Increase the accessibility of health facility in order to early detect and manage pre-existing medical problems and pregnancy complications
- ✓ Should have to develop strategies' and plan to encourage the couples to have their desired numbers of children in their early adulthood periods. Thus could help to decrease the ANOs in the general population

To Ethiopian Ministry of Education

- ✓ Increasing access of education for all women
- ✓ Should incorporating the advantage of having the desired numbers of children in the early adulthood period in the curriculum

To health care providers

- ✓ Should have to provide good maternal health care service, and give additional care for the high risk pregnant mothers
- ✓ Should have to give evidence-based counseling to couples to have the desired number of children in the early adulthood period (20 -34 years).
- ✓ Should have to provide health education to women or couples on the advantage of having child in the early adulthood periods, and the associated risk of getting pregnant in the advanced age.
- ✓ Should have to encourage pregnant women or couples to start ANC contacts in order to detect pregnancy complications early, which in turn helps to decrease ANOs
- ✓ Should have to provide preventive care for all pregnant mothers like TT vaccination and IFAS

To researchers

- ✓ Finally, longitudinal study evaluating neonatal outcomes regardless of delivery sitting and in the extended neonatal period is recommended.

Supplementary tables

Table S1: Bivariate and multivariate analyses of the general ANOs among advanced and adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

Independent variables	Category	Neonatal outcome		COR (95% CI)	AOR (95% CI)	P-value
		Unfavorable	Favorable			
Maternal age	≥35	119	112	1.58 (1.15-2.17)	1.51 (1.02-2.25)	0.039*
	20-34	185	275	1	1	
Residency	Rural	49	47	1.39 (0.90-2.14)	0.93 (0.54-1.61)	0.801
	Urban	255	340	1	1	
Maternal educational level	Had no formal education	77	61	1.98 (1.26-3.11)	1.90 (0.97-3.72)	0.063
	Primary education	79	104	1.19 (0.78-1.81)	1.62 (0.87-3.01)	0.128
	Secondary education	78	112	1.09 (0.72-1.66)	1.25 (0.70-2.24)	0.448
	Diploma and above	70	110	1	1	
Maternal occupation	Housewife	158	217	0.92 (0.60-1.40)	0.83 (0.51-1.33)	0.433
	Merchants	44	50	1.11 (0.64-1.92)	1.20 (0.64-2.23)	0.571
	Others	19	9	2.66 (1.11-6.38)	1.87 (0.66-5.26)	0.238
	Private employee	33	48	0.87 (0.49-1.54)	0.99 (0.52-1.87)	0.976
	Government employee	50	63	1	1	
Alcohol drinking	Yes	60	31	2.82 (1.78-4.49)	2.19 (1.29-3.71)	0.003*
	No	244	356	1	1	
Chronic medical problems	Yes	92	56	2.56 (1.76-3.73)	2.02 (1.31-3.10)	0.001*
	No	212	331	1	1	
MUAC	<23 cm	108	85	1.96 (1.40-2.74)	1.58 (1.07-2.34)	0.021*
	>23 cm	196	302	1	1	
Maternal Rh status	Negative	50	30	2.34 (1.45-3.79)	1.88 (1.09-3.23)	0.022*
	Positive	284	357	1	1	
HIV status	Positive	18	13	1.81 (0.87-3.76)	1.46 (0.60-3.54)	0.406
	Negative	286	372	1	1	
Hb level	<11 g/dl	85	67	1.85 (1.29-2.67)	1.12 (0.71-1.77)	0.611
	>11 g/dl	219	320	1	1	
Gravidity	Multigravida	204	278	0.80 (0.58-1.11)	0.70 (0.04-12.29)	0.806
	Primigravida	100	109	1	1	
Inter-pregnancy interval	<24 months	53	41	2.03 (1.29-3.20	1.98 ((1.19-3.31)	0.009*
	>=24 months	151	237	1	1	
BOH	Yes	42	33	1.72 (1.06-2.79)	1.60 (0.91-2.80)	0.104
	No	262	354	1	1	
Status of the pregnancy	Unplanned	82	83	1.40 (0.98-1.98)	1.18 (0.78-1.79)	0.433
	Planned	220	304	1	1	
GA at first ANC	>16 weeks	210	235	1.44 (1.05-1.99)	1.20 (0.81-1.80)	0.366

contact	≤16 weeks	94	152		1	
Number of ANC contact	< 8 contact ≥8 contacts	236 68	265 122	1.60 (1.13-2.26) 1	1.44 (0.97-2.13) 1	0.068
TT vaccinated	No Yes	37 267	19 368	2.68 (1.51-4.77) 1	1.43 (0.70-2.93) 1	0.327
IFAS	No Yes	60 244	23 364	3.89 (2.34-6.46) 1	2.86 (1.62-5.02)	<0.001*
Complication during pregnancy	Yes No	151 153	90 297	3.26 (2.35-4.51) 1	2.77 (1.92-4.00)	<0.001*
Onset of labor	Elective C/S Induced Spontaneous	25 73 206	21 52 314	1.81 (0.99-3.33) 2.14 (1.44-3.18) 1	1.05 (0.48-2.28) 1.56 (0.98-2.48) 1	0.909 0.060
Mode of delivery	C/S Vaginal	92 212	76 311	1.78 (1.25-2.52) 1	2.07 (1.39-3.08) 1	<0.001*
Complication during labor and delivery	Yes No	194 110	199 189	1.67 (1.23-2.27) 1	1.08 (0.73-1.59) 1	0.699

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =0.139

Table S2: Bivariate and multivariate analyses of ANOs among advanced aged mothers in the public hospitals of Addis Ababa City, Ethiopia, (n=231).

Independent variables	**Category**	**Neonatal outcome**		**COR (95% CI)**	**AOR (95% CI)**	**P-value**
		Unfavorable	**Favorable**			
Residency	Rural Urban	21 98	5 105	4.59 (1.66-12.63) 1	0.98 (0.26-3.61) 1	0.973
Maternal educational level	Had no formal education Primary education Secondary education Diploma and above	46 30 22 21	12 44 25 31	5.66 (2.44-13.14) 1.01 (0.49-2.07) 1.30 (0.58-2.88) 1	5.88 (2.09-16.52) 1.25 (0.53-2.91) 1.34 (0.54-3.32) 1	<0.001* 0.612 0.524
Average household monthly income	≤5220 5221-13920 ≥13920	22 76 21	13 74 25	2.01 (0.82-4.95) 1.22 (0.63-2.37) 1	0.74 (0.21-2.68) 1.05 (0.45-2.43) 1	0.650 0.908
Alcohol drinking	Yes No	34 85	6 106	7.07 (2.83-17.62) 1	4.72 (1.65-13.50) 1	0.004*
Chronic medical problem	Yes No	48 71	29 83	1.93 (1.11-3.38) 1	0.89 (0.41-1.94) 1	0.778
MUAC	<23 cm >23 cm	34 85	17 95	2.23 (1.16-4.29) 1	1.85 (0.82-4.17) 1	0.141
Maternal Rh status	Negative Positive	17 102	7 105	2.50 (0.99-6.28) 1	1.42 (0.45-4.53) 1	0.550
Hb level	<11 g/dl >11 g/dl	32 87	15 97	2.38 (1.21-4.69) 1	1.41 (0.52-3.81) 1	0.493
Inter-pregnancy interval	<24 months >=24 months	24 89	10 94	2.53 (1.15-5.60) 1	4.26 (1.72-10.53) 1	0.002*
BOH	Yes No	27 92	14 98	2.05 (1.01-4.16) 1	1.39 (0.57-3.37) 1	0.466
Status of	Unplanned	38	22	1.92 (1.05-3.51)	1.22 (0.59-2.56)	0.590

pregnancy	Planned	81	90	1	1	
GA at first ANC contact	>16 weeks ≤16 weeks	86 33	70 42	1.56 (0.90-2.72) 1	1.31 (0.66-2.62) 1	0.438
Number of ANC contact	< 8 contact ≥8 contacts	88 31	74 38	1.46 (0.83-2.570 1	1.04 (0.48-2.35) 1	0.926
TT vaccinated	No Yes	16 103	5 107	2.32 (1.17-9.40) 1	2.38 (0.67-8.47) 1	0.180
APH	Yes No	24 95	15 97	1.63 (0.81-3.30) 1	0.77 (0.32-1.87) 1	0.568
PROM	Yes No	38 81	12 100	3.91 (1.92-7.97) 1	4.36 (1.94-9.82) 1	<0.001*
Preeclampsia	Yes No	18 101	10 102	1.82 (0.80-4.13) 1	1.49 (0.53-4.17)	0.446
Mode of delivery	Emergency C/S Elective C/S Operative VD SVD	26 10 6 77	17 10 18 67	1.33 (0.66-2.66) 0.87 (0.34-2.22) 0.29 (0.11-0.77) 1	2.35 (1.04-5.35) 1.92 (0.67-5.48) 0.46 (0.15-1.39) 1	0.041* 0.225 0.171
Complication during labor and delivery	Yes No	80 39	64 48	1.54 (0.90-2.63) 1	1.63 (0.80-3.30) 1	0.176

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =0.290

Table S3: *Bivariate and multivariate analyses of ANOs among adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, (n= 460].*

Independent variables	**Category**	**Neonatal outcome**		**COR (95% CI)**	**AOR (95% CI)**	**P-value**
		Unfavorable	**Favorable**			
Maternal occupation	Housewife Merchants Others Private employee Government employee	89 24 16 24 32	163 27 8 34 43	1.63 (0.89-2.99) 3.66 (1.51-8.89) 1.29 (0.72-2.320 1.36 (0.81-2.300 1	0.71 (0.38-1.33) 1.54 (0.67-3.56) 2.34 (0.75-7.30) 1.13 (0.51-2.51) 1	0.287 0.311 0.144 0.760
Average household monthly income	≤5220 5221-13920 ≥13920	57 94 34	50 153 72	2.41 (1.38-4.21) 1.30 (0.80-2.11) 1	2.98 (1.52-5.84) 1.56 (0.88-2.74) 1	0.001* 0.125
Alcohol drinking	Yes No	26 159	25 250	1.63 (0.91-2.93) 1	0.94 (0.45-1.98)	0.880
Chronic medical problem	Yes No	44 141	27 248	2.87 (1.70-4.83) 1	4.16 (2.24-7.72) 1	<0.001*
MUAC	<23 cm >23 cm	74 111	68 207	2.03 (1.36-3.03) 1	1.47 (0.92-2.34) 1	0.107
Maternal Rh status	Negative Positive	33 152	23 252	2.38 (1.35-4.20) 1	2.42 (1.25-4.67) 1	0.009*
HIV status	Positive Negative	10 175	8 267	1.91 (0.74-4.93) 1	1.49 (0.46-4.86) 1	0.510
Hb level	<11 g/dl ≥11 g/dl	53 132	52 223	1.72 (1.11-2.67) 1	1.09 (0.64-1.86) 1	0.758
Gravidity	Grand multigravida	11	13	0.91 (0.39-2.13)	0.80 (0.03-22.43)	0.896

	Multigravida Primigravida	80 94	161 101	0.53 (0.36-0.79) 1	0.69 (0.03-16.43) 1	0.818
Inter-pregnancy interval	<24 months >24 months	29 62	31 143	2.16 (1.20-3.88) 1	2.04 (1.04-4.01) 1	0.039*
GA at first ANC contact	>16 weeks ≤16 weeks	124 61	165 110	1.36 (0.92-2.01) 1	1.07 (0.65-1.77) 1	0.787
Number of ANC contact	< 8 contact ≥8 contacts	148 37	191 84	1.76 (1.13-2.74) 1	1.59 (0.95-2.67) 1	0.080
TT vaccinated	No Yes	21 164	14 261	2.39 (1.18-4.83) 1	1.36 (0.56-3.32) 1	0.496
IFAS	Yes No	33 152	19 256	2.92 (1.61-5.32) 1	1.82 (0.87-3.78) 1	0.109
PROM	Yes No	22 163	22 253	1.55 (0.83-2.89) 1	2.19 (1.02-4.70) 1	0.043*
Preeclampsia	Yes No	19 166	8 267	3.82 (1.63-8.92) 1	6.33 (2.38-16.83) 1	<0.001*
Onset of labor	Elective C/S Induced Spontaneous	15 45 125	11 32 232	2.53 (1.13-5.68) 2.61 (1.58-4.31) 1	3.10 (1.23-7.80) 2.45 (1.30-4.62) 1	0.016* 0.006*
Mode of delivery	Emergency C/S Elective C/S Operative VD SVD	41 15 16 113	38 11 32 194	1.85 (1.12-3.05) 2.34 (1.04-5.27) 0.86 (0.45-1.63) 1	2.04 (1.08-3.82) - 0.54 (0.25-1.19) 1	0.027* - 0.126
Fetal presentation	Malpresentation Vertex	18 167	10 265	2.86 (1.29-6.34) 1	2.01 (0.79-5.07) 1	0.141
Complication during labor and delivery	Yes No	11 71	35 140	1.66 (1.14-2.43) 1	0.77 (0.45-1.31) 1	0.333

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =0.754

Table S4: Bivariate and multivariate analyses of preterm birth among advanced and adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

Independent variables	**Category**	**Preterm birth**		**COR (95% CI)**	**AOR (95% CI)**	**P-value**
		Yes	**No**			
Maternal age	≥35 20-34	71 78	160 382	2.17 (1.50-3.15) 1	1.84 (1.18-2.85) 1	0.007*
Residency	Rural Urban	21 122	69 473	1.51 (0.93-2.47) 1	0.88 (0.49-1.60) 1	0.686
Maternal educational level	Had no formal education Primary education Secondary education Diploma and above	40 42 38 29	98 141 152 151	2.12 (1.24-3.65) 1.55 (0.92-2.62) 1.30 (0.76-2.22) 1	0.91 (0.45-1.84) 1.15 (0.64-2.07) 1.05 (0.58-1.89) 1	0.795 0.648 0.874
Average household monthly income	<5220 5221-13920 >13920	39 87 23	103 310 129	2.12 (1.19-3.78) 1.57 (0.95-2.60) 1	1.92 (1.02-3.59) 1.38 (0.81-2.34) 1	0.042* 0.240
Alcohol drinking	Yes No	38 111	53 489	3.16 (1.98-5.03) 1	2.34 (1.39-3.94) 1	0.001*

Chronic medical problem	Yes No	41 108	107 435	1.64 (1.02-2.34) 1	0.79 (0.47-1.32) 1	0.363
MUAC	<23 cm >23 cm	57 92	136 406	1.85 (126-2.71) 1	1.66 (1.07-2.58) 1	0.023*
Maternal Rh status	Negative Positive	34 115	46 496	3.19 (1.96-5.19) 1	2.74 (1.61-4.68) 1	<0.001*
HIV status	Positive Negative	12 137	19 523	2.41 (1.14-5.09) 1	2.04 (0.90-4.65) 1	0.089
Hb level	<11 g/dl >11 g/dl	44 109	108 434	1.68 (1.12-2.54)	1.06 (0.63-1.79)	0.824
Gravidity	Grand multigravida Multigravida Primigravida	54 60 35	96 272 174	2.80 (1.71-4.58) 1.10 (0.69-1.73) 1	1.45 (0.03-69.76) 0.99 (0.02-45.77) 1	0.850 0.997
Inter-pregnancy interval	<24 months >=24 months	30 84	64 304	1.70 (1.03-2.78) 1	1.67 (0.96-2.91) 1	0.068
BOH	Yes No	25 124	50 492	1.98 (1.18-3.33) 1	1.43 (0.78-2.61) 1	0.242
Status of pregnancy	Unplanned Planned	47 102	120 422	1.62 (1.09-2.42) 1	1.36 (0.86-2.15) 1	0.186
TT vaccinated	No Yes	20 129	36 506	2.18 (1.22-3.89) 1	1.23 (0.58-2.60) 1	0.593
IFAS	No Yes	35 114	48 494	3.16 (1.95-5.11) 1	2.36 (1.37-4.08) 1	0.002*
Complication during pregnancy	Yes No	76 73	165 377	2.38 (1.64-3.44) 1	1.76 (1.17-2.64) 1	<0.001*

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =0.319

Table S5: Bivariate and multivariate analyses of post-term birth among advanced and adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

Independent variables	**Category**	**Post-term birth**		**COR (95% CI)**	**AOR (95% CI)**	**P-value**
		Yes	**No**			
Maternal age	≥35 20-34	9 37	222 423	0.46 (0.22-0.98) 1	0.25 (1.08-0.83)	0.024*
Chronic medical problem	Yes No	14 32	134 511	1.67 (0.87-3.22) 1	1.38 (0.59-3.20) 1	0.457
Gravidity	Grand multigravida Multigravida Primigravida	9 11 26	141 321 183	0.45 (0.20-0.99) 0.24 (0.12-0.50) 1	0.52 (0.15-1.77) 0.22 (0.09-0.49) 1	0.293 <0.001*
GDM	Yes No	7 39	9 636	12.68 (4.49-35.86) 1	11.89 (3.13-45.19) 1	<0.001*
LGA	Yes No	18 28	28 617	14.17 (7.01-28.61) 1	19.55 (8.28-46.16) 1	<0.001*

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =0.430

Table S6: Bivariate and multivariate analyses of low fifth minute Apgar score among advanced and adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

Independent variables	Category	Low 5th minute APGAR		COR (95% CI)	AOR (95% CI)	P-value
		Asphyxiated	Non-asphyxiated			
Maternal age	≥35	42	189	2.05 (1.30-3.23)	1.40 (0.81-2.43)	0.230
	20-34	45	415	1	1	
Residency	Rural	23	73	2.61 (1.53-4.47)	1.89 (0.97-3.66)	0.059
	Urban	64	531	1	1	
Maternal educational level	Had no formal education	30	108	2.10 (1.14-3.86)	0.66 (0.28-1.55)	0.339
	Primary education	21	162	0.98 (0.52-1.87)	0.71 (0.33-1.50)	0.364
	Secondary education	15	175	0.65 (0.32-1.30)	0.47 (0.21-1.06)	0.068
	Diploma and above	21	159	1	1	
Average household monthly income	<5220	24	118	2.01 (0.99-44.05)	1.37 (0.55-3.40)	0.500
	5221-13920	49	348	1.39 (0.74-2.59)	1.25 (0.59-2.65)	0.553
	>13920	14	138	1	1	
Alcohol drinking	Yes	27	64	3.80 (2.25-6.40)	2.03 (1.07-3.83)	0.029*
	No	60	540	1	1	
Chronic medical problem	Yes	25	123	1.58 (0.95-2.61)	0.78 (0.40-1.53)	0.479
	No	62	481	1	1	
MUAC	<23 cm	33	160	1.70 (1.06-2.71)	1.34 (0.69-2.60)	0.390
	≥23 cm	54	444	1	1	
Maternal Rh status	Negative	19	61	2.49 (1.40-4.41)	1.39 (0.69-2.82)	0.360
	Positive	68	543	1	1	
Hb level	<11 g/dl	24	128	1.42 (0.85-2.36)	0.73 (0.38-1.40)	0.351
	≥11 g/dl	63	476	1	1	
Gravidity	Grand multigravida	33	117	2.52 (1.39-4.57)	1.64 (0.62-4.35)	0.320
	Multigravida	33	299	0.99 (0.55-1.76)	1.28 (0.61-2.69)	0.512
	Primigravida	21	188	1	1	
BOH	Yes	15	60	1.89 (1.02-3.50)	0.94 (0.39-2.72)	0.900
	No	72	544	1	1	
Status of pregnancy	Unplanned	27	140	1.49 (0.91-2.44)	1.29 (0.71-2.36)	0.399
	Planned	60	464	1	1	
TT vaccinated	No	17	39	3.52 (1.89-6.55)	2.15 (0.99-4.69)	0.053
	Yes	70	565	1	1	
IFAS	No	23	60	3.26 (1.89-5.62)	1.19 (0.54-2.64)	0.664
	Yes	64	544	1	1	
Complication during pregnancy	Yes	43	198	2.01 (1.27-3.15)	0.75 (0.42-1.36)	0.347
	No	44	406	1	1	
GA at delivery	Preterm	54	95	9.87 (5.92-16.47)	4.04 (2.08-7.82)	<0.001*
	Post-term	6	40	2.61 (1.02-6.68)	1.95 (0.65-5.87)	0.233
	Term	27	469	1	1	
Fetal presentation	Malpresentation	12	42	2.14 (1.08-4.25)	0.87 (0.37-2.07)	0751
	Vertex	75	562	1	1	
Complication during labor and delivery	Yes	68	325	3.07 (1.80-5.24)	3.03 (1.65-5.56)	<0.001*
	No	19	279	1	1	
Birth weight	LBW	57	96	11.58 (6.85-19.57)	4.27 (2.21-8.27)	<0.001*
	Macrosomia	6	40	2.92 (1.13-7.57)	1.79 (0.59-5.45)	0.302

	Normal	24	468	1	1	

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =0.360

Table S7: Bivariate and multivariate analyses of LBW among advanced and adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

Independent variables	**Category**	**LBW**		**COR (95% CI)**	**AOR (95% CI)**	**P-value**
		Yes	**No**			
Maternal age	≥35	63	168	1.54 (1.06-2.23)	1.26 (0.80-2.01)	0.317
	20-34	90	370	1	1	
Residency	Rural	30	66	1.74 (1.08-280)	1.01 (0.53-1.90)	0.981
	Urban	123	472	1	1	
Maternal educational level	Had no formal education	43	95	1.75 (1.05-2.91)	0.77 (0.42-1.47)	0.453
	Primary education	36	147	0.95 (0.57-1.58)	0.71 (0.40-1.26)	0.243
	Secondary education	37	153	0.93 (0.56-1.55)	0.63 (0.35-1.13)	0.121
	Diploma and above	37	143	1	1	
Average household monthly income	<5220	42	100	2.03 (1.17-3.55)	1.51 (0.81-2.82)	0.196
	5221-13920	85	312	1.32 (0.81-2.14)	1.19 (0.70-2.02)	0.527
	>13920	26	126	1	1	
Alcohol drinking	Yes	38	53	3.02 (1.90-4.81)	1.98 (1.17-3.37)	0.012*
	No	115	485	1	1	
Chronic medical problem	Yes	47	101	1.92 (1.28-2.88)	1.01 (0.60-1.69)	0.969
	No	106	437	1	1	
MUAC	<23 cm	71	122	2.95 (2.03-4.30)	2.45 (1.56-3.86)	<0.001*
	>23 cm	82	416	1	1	
Maternal Rh status	Negative	32	48	2.70 (1.65-4.40)	2.01 (1.16-3.46)	0.012*
	Positive	121	490	1	1	
HIV status	Positive	13	18	2.68 (1.28-5.61)	2.11 (0.89-4.99)	0.089
	Negative	140	520	1	1	
Hb level	<11 g/dl	56	96	2.66 (1.79-3.95)	1.66 (1.03-2.68)	0.038*
	>11 g/dl	97	442	1	1	
Inter-pregnancy interval	<24 months	31	63	1.99 (1.21-3.27)	1.56 (0.89-2.74)	0.122
	>=24 months	77	311	1	1	
BOH	Yes	25	50	1.91 (1.14-3.20)	2.03 (1.12-3.70)	0.020*
	No	128	488	1	1	
Status of pregnancy	Unplanned	45	122	1.42 (0.95-2.12)	1.11 (0.69-1.79)	0.670
	Planned	108	416	1	1	
GA at first ANC contact	>16 weeks	110	335	1.55 (1.05-2.30)	1.58 (1.01-2.46)	0.044*
	≤16 weeks	43	203	1	1	
Number of ANC contact	< 8 contact	121	389	1.57 (1.02-2.42)	1.09 (0.64-1.85)	0.760
	≥8 contacts	32	158	1	1	
TT vaccinated	No	23	33	2.71 (1.54-4.77)	1.17 (0.56-2.46)	0.676
	Yes	130	505	1	1	
IFAS	No	39	44	3.84 (2.38-6.19)	2.49 (1.45-4.30)	0.001*
	Yes	114	494	1	1	
Complication during pregnancy	Yes	81	160	2.66 (1.84-3.84)	2.42 (1.61-3.63)	<0.001*
	No	72	378	1	1	

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =0.798

Table S8: Bivariate and multivariate analyses of SGA among advanced and adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

Independent variables	**Category**	**SGA**		**COR (95% CI)**	**AOR (95% CI)**	**P-value**
		Yes	**No**			
Maternal age	≥35	38	193	1.48 (0.94-2.32)	1.18 (0.71-1.95)	0.526
	20-34	54	406	1	1	
Residency	Rural	18	78	1.62 (0.92-2.87)	0.99 (0.53-1.88)	0.936
	Urban	74	521	1	1	
Average household monthly income	<5220	27	115	1.86 (0.97-3.59)	1.33 (0.65-2.37)	0.440
	5221-13920	48	349	1.09 (0.61-1.97)	0.97 (0.53-1.88)	0.991
	>13920	17	135	1	1	
Alcohol drinking	Yes	20	71	2.07 (1.19-3.59)	1.09 (0.56-2.10)	0.800
	No	72	528	1	1	
Chronic medical problem	Yes	30	118	1.97 (1.22-3.19)	1.05 (0.58-1.89)	0.883
	No	62	481	1	1	
MUAC	<23 cm	45	148	2.92 (1.86-4.57)	2.48 (1.45-4.24)	0.001*
	>23 cm	47	451	1	1	
Maternal Rh status	Negative	17	63	1.93 (1.07-3.47)	1.42 (0.75-2.69)	0.277
	Positive	75	536	1	1	
HIV status	Positive	10	21	3.36 (1.53-7.38)	2.58 (1.06-6.26)	0.036*
	Negative	82	578	1	1	
Hb level	<11 g/dl	36	116	2.68 (1.68-4.26)	1.64 (0.94-2.87)	0.081
	>11 g/dl	56	483	1	1	
Inter-pregnancy interval	<24 months	16	78	1.52 (0.82-2.83)	0.97 (0.48-2.04)	0.970
	>=24 months	46	342	1	1	
BOH	Yes	17	58	2.11 (1.17-3.82)	2.40 (1.23-4.67)	0.010*
	No	75	541	1	1	
Status of pregnancy	Unplanned	30	137	1.63 (1.01-2.63)	1.42 (0.85-2.37)	0.177
	Planned	62	462	1	1	
GA at first ANC contact	>16 weeks	67	378	1.57 (0.96-2.55)	1.64 (0.96-2.81)	0.070
	≤16 weeks	25	221	1	1	
Number of ANC contact	< 8 contact	75	426	1.79 (1.03-3.12)	1.30 (0.68-2.48)	0.435
	≥8 contacts	17	173	1	1	
TT vaccinated	No	14	42	2.38 (1.24-4.56)	0.95 (0.42-2.15)	0.899
	Yes	78	557	1	1	
IFAS	No	24	59	3.23 (1.89-5.53)	1.29 (1.27-4.13)	0.006*
	Yes	68	540	1	1	
Complication during pregnancy	Yes	51	190	2.68 (1.71-4.18)	2.42 (1.50-3.90)	<0.001*
	No	41	409	1		

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =0.267

Table S9: Bivariate and multivariate analyses of LGA among advanced and adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

Independent variables	Category	LGA		COR (95% CI)	AOR (95% CI)	P-value
		Yes	No			
Maternal age	≥35	23	208	2.10 (1.15-3.83)	2.68 (1.31-5.49)	0.007*
	20-34	23	437	1	1	
Maternal educational level	Had no formal education	19	119	2.71 (1.22-6.04)	3.57 (1.43-8.87)	0.006*
	Primary education	11	172	1.09 (0.45-2.63)	1.15 (0.43-3.11)	0.779
	Secondary education	6	184	0.55 (0.20-1.56)	0.53 (0.17-1.65)	0.272
	Diploma and above	10	107	1	1	
Gravidity	Grand multigravida	17	133	2.30 (1.04-5.07)	1.53 (0.48-4.87)	0.473
	Multigravida	18	314	1.03 (0.48-2.23)	1.76 (0.66-4.70)	0.262
	Primigravida	11	198	1	1	
GDM	Yes	6	10	9.52 (3.30-27.53)	3.76 (1.02-13.87)	0.047*
	No	40	635	1	1	
Post-term pregnancy	Yes	18	28	14.17 (70.04-28.61)	19.85 (8.48-46.44)	<0.001*
	No	28	617	1	1	

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =0.756

Table S10: Bivariate and multivariate analyses of stillbirth among advanced and adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

Independent variables	Category	Stillbirth		COR (95% CI)	AOR (95% CI)	P-value
		Yes	No			
Maternal age	≥35	14	217	3.64 (1.51-8.82)	3.35 (1.27-8.82)	0.014*
	20-34	8	452	1	1	
Residency	Rural	8	88	3.77 (1.54-9.25)	2.22 (0.78-6.31)	0.135
	Urban	14	581	1	1	
Alcohol drinking	Yes	11	80	7.36 (3.09-17.53)	3.92 (1.50-10.23)	0.005*
	No	11	589	1	1	
Chronic medical problem	Yes	10	38	3.21 (1.36-1.58)	1.88 (0.67-5.22)	0.228
	No	12	531	1	1	
Maternal Rh status	Negative	8	72	4.74 (1.92-11.68)	3.78 (1.38-10.37)	0.010*
	Positive	14	597	1	1	
Hb level	<11 g/dl	8	144	2.08 0.86-5.06)	0.93 (0.32-2.74)	0.901
	>11 g/dl	14	525	1	1	
BOH	Yes	5	70	2.52 (0.90-7.03)	1.15 (0.31-4.28)	0.838
	No	17	599	1	1	
Status of pregnancy	Unplanned and wanted	9	158	2.24 (0.94-5.34)	2.37 (0.92-6.11)	0.075
	Planned	13	511	1	1	
TT vaccinated	No	5	51	3.56 (1.26-10.05)	0.85 (0.22-3.32)	0.811
	Yes	17	618	1	1	
IFAS	No	12	71	10.11 (4.21-24.23)	6.47 (2.52-16.64)	<0.001*
	Yes	10	598	1	1	
Complication during pregnancy	Yes	14	227	3.41 (1.41-8.24)	1.39 (0.49.3.97)	0.540
	No	8	442	1	1	

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =381

Table S11: Bivariate and multivariate analyses of immediate neonatal death among advanced and adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

Independent variables	**Category**	**immediate neonatal death**		**COR (95% CI)**	**AOR (95% CI)**	**P-value**
		Yes	**No**			
Maternal age	≥35 20-34	13 12	218 448	2.23 (1.01-4.96)	1.06 (0.33-3.36) 1	0.920
Alcohol drinking	Yes No	9 16	82 584	4.01 (1.71-9.36) 1	1.85 (0.69-4.95) 1	0.220
Chronic medical problem	Yes No	10 15	138 528	2.55 (1.12-5.80) 1	1.35 (0.51-3.58) 1	0.545
MUAC	<23 cm ≥23 cm	12 13	81 485	2.47 (1.11-5.52) 1	1.53 (0.62-3.81) 1	0.358
Gravidity	Grand multigravida Multigravida Primigravida	10 10 5	204 322 140	1.26 (0.43-3.76) 2.91 (0.97-8.710 1	1.73 (0.48-6.30) 2.13 (0.62-7.26) 1	0.403 0.227
TT vaccinated	No Yes	8 17	48 618	6.06 (2.49-14.76) 1	4.02 (1.51-10.68) 1	0.005*
IFAS	No Yes	9 16	74 592	4.50 (1.92-10.54) 1	1.27 (0.38-4.32)	0.697
Complication during pregnancy	Yes No	15 10	226 440	2.92 (1.29-6.60) 1	1.21 (0.44-3.35) 1	0.705
Preterm labor	Yes No	17 8	32 534	8.60 (3.63-20.35) 1	5.68 (2.25-14.38) 1	<0.001*
Complication during labor and delivery	Yes No	20 5	373 293	3.14 (1.16-8.47) 1	2.46 (0.87-6.98) 1	0.090
SGA	Yes No	12 13	80 586	6.76 (2.98-15.33) 1	2.96 (1.17-7.43) 1	0.021*

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =835

Table S12: Bivariate and multivariate analyses of NICU admission among advanced and adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

Independent variables	**Category**	**NICU admitted**		**COR (95% CI)**	**AOR (95% CI)**	**P-value**
		Asphyxiated	**Non-asphyxiated**			
Maternal age	≥35 20-34	49 72	182 388	1.45 (0.972.17) 1	1.07 (0.61-1.89) 1	0.803
Residency	Rural Urban	22 99	74 496	1.49 (0.88-2.51) 1	0.99 (0.51-1.94) 1	0.987
Chronic medical problem	Yes No	36 85	112 458	1.73 (1.11-2.69) 1	0.86 (0.48-1.52) 1	0.596
MUAC	<23 cm ≥23 cm	50 71	143 427	2.10 (1.40-3.16) 1	1.80 (1.07-3.02) 1	0.026*
Maternal Rh	Negative	24	56	2.27 (1.43-3.84)	1.28 (0.66-2.49)	0.465

status	Positive	97	514	1	1	
HIV status	Positive Negative	10 111	21 549	2.35 (1.08-5.14) 1	1.75 (0.63-4.89) 1	0.286
Hb level	<11 g/dl ≥11 g/dl	37 84	115 455	1.74 (1.12-2.70) 1	0.95 (0.51-1.80) 1	0.885
Inter-pregnancy interval	<24 months >=24 months	23 63	71 325	1.67 (0.97-2.87) 1	1.35 (0.68-2.67) 1	0.394
BOH	Yes No	9 102	56 514	1.71 (0.97-2.99) 1	1.26 (0.63-2.54) 1	0.515
TT vaccinated	No Yes	16 105	40 530	2.02 (1.09-3.74) 1	0.92 (0.42-1.99) 1	0.824
Complication during pregnancy	Yes No	61 60	180 390	2.20 (1.48-3.28) 1	1.11 (0.66-1.84) 1	0.698
GA at delivery	Preterm Post-term Term	67 12 42	82 34 454	8.83 (5.62-13.87) 3.81 (1.84-7.92) 1	3.82 (2.10-6.94) 2.52 (1.07-5.94) 1	<0.001* 0.034*
Mode of delivery	Emergency C/S Elective C/S Operative VD SVD	34 12 9 99	88 34 63 385	2.25 (1.40-3.62) 2.06 (1.01-4.18) 0.83 (0.39-1.76) 1	2.80 (1.44-5.45) 2.77 (1.14-6.75) 1.67 (0.66-4.20) 1	0.002* 0.025* 0.277
Fetal presentation	Malpresentation Vertex	18 103	36 534	2.59 (1.42-4.74) 1	0.79 (0.34-1.85) 1	0.592
Complication during labor and delivery	Yes No	89 32	04 266	2.43 (1.57-3.76) 1	1.78 (1.01-3.14) 1	0.047*
Birth weight	LBW Macrosomia Normal	78 13 30	75 33 462	10.02 (9.84-20.06) 6.07 (2.89-12.72) 1	8.53 (4.71-15.46) 3.75 (1.59-8.81) 1	<0.001* 0.002*

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =0.121

Table S13: Bivariate and multivariate analyses of congenital malformation among advanced and adult aged mothers in the public hospitals of Addis Ababa City, Ethiopia, [n=691, (n= 460 adult & advanced =231)].

Independent variables	**Category**	**Congenital malformation**		**COR (95% CI)**	**AOR (95% CI)**	**P-value**
		Yes	**No**			
Maternal age	≥35 20-34	9 6	222 454	3.07 (1.08-8.73) 1	2.34 (0.72-7.61) 1	0.156
Residency	Rural Urban	7 8	89 587	5.77 (2.04-16.30) 1	3.61 (1.14-11.44) 1	0.029*
Alcohol drinking	Yes No	8 7	83 593	8.16 (2.89-23.10) 1	3.75 (1.17-12.01) 1	0.026*
Chronic medical problem	Yes No	7 8	41 535	3.32 (1.18-9.31) 1	1.67 (0.46-5.98) 1	0.433
Maternal Rh status	Negative Positive	5 10	75 601	4.01 (1.33-12.04) 1	2.59 (0.78-8.62) 1	0.120
Hb level	<11 g/dl ≥11 g/dl	7 8	145 531	3.20 (1.14-8.98) 1	1.17 (0.35-3.97) 1	0.795
TT vaccinated	No Yes	6 9	50 626	8.35 (2.85-24.39) 1	2.11 (0.56-7.97)	0.271
IFAS	No	10	73	16.52 (5.50-49.66)	10.87 (3.38-34.93)	<0.001*

	Yes	5	603	1	1	

*significant at a P-value of <0.05. Hosmer and Lemeshow test P-value =0.289

10. REFERENCES

1. Rebecca D. Evidence on Advanced Maternal Age. Evidence Based Birth. 2018.
2. Kenny Louise, Lavender Tina, and McNamee Roseanne et al. Advanced maternal age and adverse pregnancy outcome: evidence from a large contemporary cohort. PloS one. 2013;8(2):e56583.
3. Laopaiboon M, Lumbiganon P, and Intarut N et al. Advanced maternal age and pregnancy outcomes: WHO Multicountry Survey on Maternal Newborn Health Research Network. BJOG. 2014;121:49-56.
4. Wu Yuelin, Chen Yan, and Shen Minxue et al. Adverse maternal and neonatal outcomes among singleton pregnancies in women of very advanced maternal age: a retrospective cohort study. BMC pregnancy and childbirth. 2019;19(1):3.
5. Hoque ME. Advanced maternal age and outcomes of pregnancy: A retrospective study from South Africa. 2012.
6. Kenny LC, Lavender T, McNamee R, O'Neill SM, Mills T, Khashan AS. Advanced maternal age and adverse pregnancy outcome: evidence from a large contemporary cohort. PloS one. 2013;8(2):e56583.
7. Cherie N, Mebratu A. Adverse birth out comes and associated factors among delivered mothers in dessie referral hospital. North East Ethiopia. 2018:1-6.
8. Getaneh T, Asres A, Hiyaru T, Lake S. Adverse perinatal outcomes and its associated factors among adult and advanced maternal age pregnancy in Northwest Ethiopia. Scientific Reports. 2021;11(1):14072.
9. Ediris M, Belachew T, Yadassa F, Getu K. Disparities in adverse pregnancy outcomes between advanced maternal age and younger age in Ethiopia: institution based comparative cross-sectional study. International Journal of Nursing and Midwifery. 2018;10(6):54-61.
10. Degno S, Lencha B, Aman R, Atlaw D, Mekonnen A, Woldeyohannes D, et al. Adverse birth outcomes and associated factors among mothers who delivered in Bale zone hospitals, Oromia Region, Southeast Ethiopia. Journal of International Medical Research. 2021;49(5):03000605211013209.
11. Walker Kate F, and Thornton Jim G. Advanced maternal age. Obstetrics, Gynaecology & Reproductive Medicine. 2016;26(12):354-7.
12. Sydsjö Gunilla, Pettersson Malin Lindell, and Bladh Marie et al. Evaluation of risk factors' importance on adverse pregnancy and neonatal outcomes in women aged 40 years or older. BMC pregnancy and childbirth. 2019;19(1):92.
13. ACOG. Having a Baby After Age 35: How Aging Affects Fertility and Pregnancy. 2018.
14. Ruth C Fretts. Management of pregnancy in women of advanced age. UpToDate. 2013.
15. Rajput N, Paldiya D, Verma YS. Effects of advanced maternal age on pregnancy outcome. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2018;7(10):3941-6.
16. Tolefac PN, Tamambang RF, Yeika E, Mbwagbaw LT, Egbe TO. Ten years analysis of stillbirth in a tertiary hospital in sub-Sahara Africa: a case control study. BMC research notes. 2017;10:1-6.

17. Gedefaw G, Alemnew B, Demis A. Adverse fetal outcomes and its associated factors in Ethiopia: a systematic review and meta-analysis. BMC pediatrics. 2020;20:1-12.
18. Sabonete S, Lopes H, Rosado D, Reis J. Quality of Work Life According to Walton's Model: Case Study of the Higher Institute of Defense Studies of Mozambique. Social Sciences. 2021;10:244.
19. Fitzpatrick KE, Tuffnell D, and Kurinczuk JJ et al. Pregnancy at very advanced maternal age: a UK population-based cohort study. BJOG: An International Journal of Obstetrics & Gynaecology. 2017;124(7):1097-106.
20. Waldenström U, Cnattingius S, and Vixner Linda et al. Advanced maternal age increases the risk of very preterm birth, irrespective of parity: a population-based register study. BJOG: An International Journal of Obstetrics & Gynaecology. 2017;124(8):1235-44.
21. Adane AA, Ayele TA, Ararsa LG, Bitew BD, Zeleke BM. Adverse birth outcomes among deliveries at Gondar University hospital, Northwest Ethiopia. BMC pregnancy and childbirth. 2014;14:1-8.
22. Campbell CL, Furlotte NA, Eriksson N, Hinds D, Auton A. Escape from crossover interference increases with maternal age. Nature communications. 2015;6(1):6260.
23. Lean SC, Derricott H, Jones RL, Heazell AE. Advanced maternal age and adverse pregnancy outcomes: A systematic review and meta-analysis. PloS one. 2017;12(10):e0186287.
24. Pinheiro RL, Areia AL, Mota Pinto A, Donato H. Advanced maternal age: adverse outcomes of pregnancy, a meta-analysis. Acta medica portuguesa. 2019;32(3):219-26.
25. Gari RA, Alrefaei GM, Alsuwaida SA, Alalwan ZM, Aljeshi ZH, Al Jumah AH. Obstetric Outcomes in Advanced Maternal Age among Women at King Abdulaziz University Hospital. Open Journal of Obstetrics and Gynecology. 2023;13(1):108-20.
26. Londero Ambrogio P, Rossetti Emma, and Pittini Carla et al. Maternal age and the risk of adverse pregnancy outcomes: a retrospective cohort study. BMC pregnancy and childbirth. 2019;19(1):261.
27. Kahveci Bekir, Melekoglu Rauf, and Evruke Ismail Cuneyt et al. The effect of advanced maternal age on perinatal outcomes in nulliparous singleton pregnancies. BMC pregnancy and childbirth. 2018;18(1):343.
28. Mehari M-a, Maeruf H, Robles CC, Woldemariam S, Adhena T, Mulugeta M, et al. Advanced maternal age pregnancy and its adverse obstetrical and perinatal outcomes in Ayder comprehensive specialized hospital, Northern Ethiopia, 2017: a comparative cross-sectional study. BMC pregnancy and childbirth. 2020;20:1-10.
29. Debelo BT, Hunie Asratie M, Solomon AA. Risk of selected fetal adverse pregnancy outcomes at advanced maternal age: a retrospective cohort study in Debre Markos Referral Hospital, Northwest Ethiopia. Obstetrics and gynecology international. 2020;2020.
30. Asefa U, Ayele WM. Adverse obstetrical and perinatal outcomes among advanced age pregnant mothers in Northeast Ethiopia: a comparative cross-sectional study. International journal of women's health. 2020:1161-9.
31. Bekele GG, Yohannes Roga E, Gonfa DN, Yami AT, Fekene DB, Kabale WD. The effects of advanced maternal age on perinatal mortality in Ethiopia: A systematic review and meta-analysis. SAGE Open Medicine. 2023;11:20503121231201282.

32. Isah A, Duru E, Babatunde A, Abubakar M, Ezinwanne T, Enwereakuh U, et al. Predictors of the quality of work life and job satisfaction among serving military healthcare personnel in the Nigerian armed forces. Journal of Public Health. 2023;31.
33. Agena Alemayehu Gebremariam, and Modiba Lebitsi Maud. Maternal and foetal medical conditions during pregnancy as determinants of intrapartum stillbirth in public health facilities of Addis Ababa: a case-control study. Pan African Medical Journal. 2019;33(21).
34. Yeshialem Eyosias, Abera Mulumebet, and Tesfay Amanuel. Determinants of adverse pregnancy outcomes among mothers who gave birth from jan 1-dec 31/2015 in Jimma university specialized hospital, case control study, 2016. Ethiopian Journal of Reproductive Health. 2019;11(1):10-.
35. Huang C, Jiang Q, Su W, Lv F, Zeng J, Huang P, et al. Age-specific effects on adverse pregnancy outcomes vary by maternal characteristics: a population-based retrospective study in Xiamen, China. BMC Public Health. 2023;23(1):326.
36. Koo Yu-Jin, Ryu Hyun-Mee, and Yang Jae-Hyug et al. Pregnancy outcomes according to increasing maternal age. Taiwanese Journal of Obstetrics and Gynecology. 2012;51(1):60-5.
37. Carolan Mary. Maternal age≥ 45 years and maternal and perinatal outcomes: a review of the evidence. Midwifery. 2013;29(5):479-89.
38. Vogel JP, Chawanpaiboon S, Watananirun K, Lumbiganon P, Petzold M, Moller A-B, et al. Global, regional and national levels and trends of preterm birth rates for 1990 to 2014: protocol for development of World Health Organization estimates. Reproductive health. 2016;13:1-9.
39. Organization WH. Born too soon: the global action report on preterm birth. 2012.
40. Blencowe H, Cousens S, Jassir FB, Say L, Chou D, Mathers C, et al. National, regional, and worldwide estimates of stillbirth rates in 2015, with trends from 2000: a systematic analysis. The Lancet Global Health. 2016;4(2):e98-e108.
41. Muchie KF, Lakew AM, Teshome DF, Yenit MK, Sisay MM, Mekonnen FA, et al. Epidemiology of preterm birth in Ethiopia: systematic review and meta-analysis. BMC pregnancy and childbirth. 2020;20:1-12.
42. Rodrigues I, Soares H, Rocha G, Azevedo I. Impact of advanced maternal age on neonatal morbidity: a systematic review. The Journal of Maternal-Fetal & Neonatal Medicine. 2023;36(2):2287981.
43. Boo N-Y, Cheah G. Risk factors associated with necrotising enterocolitis in very low birth weight infants in Malaysian neonatal intensive care units. Singapore medical journal. 2012;53(12):826.
44. Dani C, Reali M, Bertini G, Wiechmann L, Spagnolo A, Tangucci M, et al. Risk factors for the development of respiratory distress syndrome and transient tachypnoea in newborn infants. Italian Group of Neonatal Pneumology. European Respiratory Journal. 1999;14(1):155-9.
45. Swierczynski A. Pathogenicity of endocrine dysregulation in autism: the role of the melanin-concentrating hormone system. SciMedicine Journal. 2019;1(2):74-111.
46. Mills M, Rindfuss RR, McDonald P, Te Velde E, Reproduction E, Force ST. Why do people postpone parenthood? Reasons and social policy incentives. Human reproduction update. 2011;17(6):848-60.
47. Guedes M, Canavarro MC. Characteristics of primiparous women of advanced age and their partners: a homogenous or heterogenous group? Birth. 2014;41(1):46-55.
48. Carolan Mary, Davey Mary-Ann, and Biro Maryanne et al. Very advanced maternal age and morbidity in Victoria, Australia: a population based study. BMC pregnancy and childbirth. 2013;13(1):80.

49. Blomberg Marie, Tyrberg Rasmus Birch, and Kjølhede Preben et al. Impact of maternal age on obstetric and neonatal outcome with emphasis on primiparous adolescents and older women: a Swedish Medical Birth Register Study. BMJ open. 2014;4(11):e005840.
50. Anggondowati T, El-Mohandes AA, Qomariyah SN, Kiely M, Ryon JJ, Gipson RF, et al. Maternal characteristics and obstetrical complications impact neonatal outcomes in Indonesia: a prospective study. BMC pregnancy and childbirth. 2017;17:1-12.
51. Kalewad PS, and Nadkarni T. The perinatal and maternal outcome in pregnancy with advanced maternal age 35 years and> 35 years. Int J Reprod Contraception, Obstet Gynecol. 2016;5(6):1929-35.
52. Mathers C, Stevens G, Hogan D, Mahanani WR, Ho J. Global and regional causes of death: patterns and trends, 2000–15. 2018.
53. Marozio Luca, Picardo Elisa, and Filippini Claudia et al. Maternal age over 40 years and pregnancy outcome: a hospital-based survey. The Journal of Maternal-Fetal & Neonatal Medicine. 2019;32(10):1602-8.
54. Rashed Herny Erdawati, AWALUDDIN SMaria, and Ahmad Noor Ani et al. Advanced maternal age and adverse pregnancy outcomes in Muar, Johor, Malaysia. Sains Malaysiana. 2016;45(10):1537-42.
55. Ediris Mekiya, Belachew Tefera, and Yadassa Fekadu et al. Disparities in adverse pregnancy outcomes between advanced maternal age and younger age in Ethiopia: institution based comparative cross-sectional study. International Journal of Nursing and Midwifery. 2018;10(6):54-61.
56. Sustianable Developmental Goals. General Assembly Transforming our world: . 2015.
57. Frederiksen Line Elmerdahl, Ernst Andreas, and Brix Nis et al. Risk of adverse pregnancy outcomes at advanced maternal age. Obstetrics & Gynecology. 2018;131(3):457-63.
58. Pinheiro Rosa Lomelino, Areia Ana Luísa, and Mota Pinto Anabela et al. Advanced Maternal Age: Adverse Outcomes of Pregnancy, A Meta-Analysis. Acta Médica Portuguesa. 2019;32(3):219-26.
59. Weng Yi-Hao, Yang Chun-Yuh, and Chiu Ya-Wen. Risk assessment of adverse birth outcomes in relation to maternal age. PloS one. 2014;9(12).
60. Ogawa Kohei, Urayama Kevin Y, and Tanigaki Shinji et al. Association between very advanced maternal age and adverse pregnancy outcomes: a cross sectional Japanese study. BMC pregnancy and childbirth. 2017;17(1):349.
61. Neelam Rajput, Deepak Paldiya, and Yogendra S. Verma. Effects of advanced maternal age on pregnancy outcome. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2018;7(10):3941-5.
62. Claramonte Nieto M, Meler Barrabes E, Garcia Martínez S, Gutiérrez Prat M, Serra Zantop B. Impact of aging on obstetric outcomes: defining advanced maternal age in Barcelona. BMC pregnancy and childbirth. 2019;19:1-10.
63. Khalil Asma, Syngelaki Argyro, and Maiz Nerea et al. Maternal age and adverse pregnancy outcome: a cohort study. Ultrasound in Obstetrics & Gynecology. 2013;42(6):634-43.
64. Goisis Alice, Remes Hanna, and Barclay Kieron et al. Advanced maternal age and the risk of low birth weight and preterm delivery: a within-family analysis using Finnish population registers. American journal of epidemiology. 2017;186(11):1219-26.

65. Saleem Sarah, Tikmani Shiyam Sunder, and McClure Elizabeth M et al. Trends and determinants of stillbirth in developing countries: results from the Global Network's Population-Based Birth Registry. Reproductive health. 2018;15(1):100.
66. Aminu Mamuda, Unkels Regine, and Mdegela Mselenge et al. Causes of and factors associated with stillbirth in low-and middle-income countries: a systematic literature review. BJOG: An International Journal of Obstetrics & Gynaecology. 2014;121:141-53.
67. Tshotetsi L, Dzikiti L, Hajison P, Feresu S. Maternal factors contributing to low birth weight deliveries in Tshwane District, South Africa. PloS one. 2019;14(3):e0213058.
68. Oladeinde HB, Oladeinde OB, Omoregie R, Onifade AA. Prevalence and determinants of low birth weight: the situation in a traditional birth home in Benin City, Nigeria. African health sciences. 2015;15(4):1123-9.
69. Mahfouz EM, El-Sherbiny NA, Wahed WYA, Hamed NS. Effect of inter-pregnancy interval on pregnancy outcome: a prospective study at Fayoum, Egypt. Int J Med Dev Ctries. 2018;2(2):38-44.
70. Jiang Min, Mishu Miskatul Mustafa, and Lu Dan et al. A case control study of risk factors and neonatal outcomes of preterm birth. Taiwanese Journal of Obstetrics and Gynecology. 2018;57(6):814-8.
71. De Jonge Hendrik, Azad Kishwar, and Seward Nadine et al. Determinants and consequences of short birth interval in rural Bangladesh: a cross-sectional study. BMC pregnancy and childbirth. 2014;14(1):427.
72. Ferguson Kelly, Rosario Zaira, and McElrath Thomas et al. Demographic risk factors for adverse birth outcomes in Puerto Rico in the PROTECT cohort. PloS one. 2019;14(6).
73. Saral Nevsen, and Ulas Seval Cambaz. The effect of short pregnancy interval on perinatal outcomes in Turkey: A retrospective study. Pakistan journal of medical sciences. 2019;35(5):1243.
74. Shan Dan, Qiu Pei-Yuan, and Wu Yu-Xia et al. Pregnancy outcomes in women of advanced maternal age: A retrospective cohort study from China. Scientific reports. 2018;8(1):12239.
75. Gupta RD, Swasey K, Burrowes V, Hashan MR, Al Kibria GM. Factors associated with low birth weight in Afghanistan: a cross-sectional analysis of the demographic and health survey 2015. BMJ open. 2019;9(5):e025715.
76. Das A, Panda S, Ahanthem S, Sourabh G, Bhanu Pratap S. Preterm birth: Analysis of risk factors and neonatal outcome. Gynecology & Obstetrics Case report. 2015;1:1-5.
77. Kebede Abraham Sahilemichael, Muche Achenef Asmamaw, and Alene Amelework Getinet. Factors associated with adverse pregnancy outcome in Debre Tabor town, Northwest Ethiopia: a case control study. BMC research notes. 2018;11(1):820.
78. Gebremeskel Feleke, Gultie Teklemariam, and Kejela Gemechu et al. Determinants of adverse birth outcome among mothers who gave birth at hospitals in Gamo Gofa Zone, Southern Ethiopia: a facility based case control study. Quality in Primary Care. 2017;25(5):259-66.
79. Cherie N, and Mebratu A. Adverse birth out comes and associated factors among delivered mothers in Dessie Referral Hospital, North East Ethiopia. J Women's Health Reprod Med. 2017;1(1):4.
80. Abdo RA, Halil HM, and Kebede BA. Prevalence and Predictors of Adverse Birth Outcome among Deliveries at Butajira General Hospital, Gurage Zone, Southern Nations, Nationalities, and People's Region, Ethiopia. J Women's Health Care. 2019;8(474):2167-0420.19.

81. Eshete Asmamaw, Birhanu Dereje, and Wassie Belaynew. Birth outcomes among laboring mothers in selected health facilities of north Wollo zone, Northeast Ethiopia: a facility based cross-sectional study. 2013.
82. Hailemichael Helen Tsehaye, Debelew Gurmesa Tura, and Alema Haileselasie Berhane et al. Determinants of adverse birth outcome in Tigrai region, North Ethiopia: Hospital-based case-control study. BMC pediatrics. 2020;20(1):1-9.
83. Kebede AS, Muche AA, Alene AG. Factors associated with adverse pregnancy outcome in Debre Tabor town, Northwest Ethiopia: a case control study. BMC research notes. 2018;11:1-6.
84. Mersha A, Ayele G, Worku T, Zerdo Z, Shibiru S, Bante A, et al. Association between maternal age and adverse perinatal outcomes in Arba Minch zuria, and Gacho Baba district, southern Ethiopia: a prospective cohort study. BMC pregnancy and childbirth. 2020;20:1-9.
85. Abdo RA, Halil HM, Birhanu LZ, Defara DA, Kebede B. Prevalence and associated factors of adverse birth outcome among deliveries at Butajira hospital, Southern Ethiopia. J Gynecol Womens Health. 2019;15(4):555920.
86. Gupta Rajat Das, Swasey Krystal, and Burrowes Vanessa et al. Factors associated with low birth weight in Afghanistan: a cross-sectional analysis of the demographic and health survey 2015. BMJ open. 2019;9(5):e025715.
87. Ananya Das, Subrat Panda, and Ahanthem SS et al. Preterm birth: Analysis of risk factors and neonatal outcome. ARCHIVOS DE MEDICINA. 2015;1(1):1.
88. Kiondo Paul, Tumwesigye Nazarius Mbona, and Wandabwa Julius et al. Adverse neonatal outcomes in women with pre-eclampsia in Mulago Hospital, Kampala, Uganda: a cross-sectional study. The Pan African medical journal. 2014;17(1).
89. Tshotetsi Lumbani, Dzikiti Loveness, and Hajison Precious et al. Maternal factors contributing to low birth weight deliveries in Tshwane District, South Africa. PloS one. 2019;14(3):e0213058.
90. Oladeinde Henry Bankole, Oladeinde Oladapo Babatunde, and Omoregie Richard et al. Prevalence and determinants of low birth weight: the situation in a traditional birth home in Benin City, Nigeria. African health sciences. 2015;15(4):1123-9.
91. Gwelo Abubakari S, and Mbishi Jackline V. Determinants of adverse neonatal outcomes among postnatal women in Dar es Salaam-Tanzania. African health sciences. 2019;19(2):1924-9.
92. Mahfouz Eman M, El-Sherbin NA, and Wahed WY et al. Effect of inter-pregnancy interval on pregnancy outcome: a prospective study at Fayoum, Egypt. Int J Med Dev Ctries. 2018;2(2):38-44.
93. Dabalo ML, et al. Perinatal asphyxia and its associated factors among live births in the public health facilities of Bahir Dar City, Northwest Ethiopia. International Journal of Pediatrics. 2021:1-9.
94. Althabe F. Born too soon: the global action report on preterm birth: World Health Organization; 2012.
95. Deputy NP, Nguyen PH, Pham H, Nguyen S, Neufeld L, Martorell R, et al. Validity of gestational age estimates by last menstrual period and neonatal examination compared to ultrasound in Vietnam. BMC Pregnancy and Childbirth. 2017;17:1-9.
96. Frøen F, Lawn J, Haezell A. Ending preventable stillbirths. An executive summary for The Lancet's series. Lancet. 2016:1-8.

97. Pathirana J, Muñoz FM, Abbing-Karahagopian V, Bhat N, Harris T, Kapoor A, et al. Neonatal death: Case definition & guidelines for data collection, analysis, and presentation of immunization safety data. Vaccine. 2016;34(49):6027-37.
98. Singh G, and Sidhu K. Bad obstetric history: A prospective study. Medical Journal Armed Forces India. 2013;66(2):117-20.
99. Maud AAGaaML. Maternal and foetal medical conditions during pregnancy as determinants of intrapartum stillbirth in public health facilities of Addis Ababa: a case-control study. Pan African Medical Journal. 2019;33(21).
100. Kiross Girmay Tsegay CC, and Barker Daniel et al. The effect of maternal education on infant mortality in Ethiopia: A systematic review and meta-analysis. PloS one. 2019;14(7).
101. Dunneram Y JR. Healthy diet and nutrition education program among women of reproductive age: a necessity of multilevel strategies or community responsibility. Health promotion perspectives 2015, 5(2):116. Health promotion perspectives 2015;5(2):116.
102. Tsegaye Berhan aKA. Prevalence of adverse birth outcome and associated factors among women who delivered in Hawassa town governmental health institutions, south Ethiopia, in 2017. Reproductive health 2018;15(1):193.
103. Kebede Abraham Sahilemichael MAA, and Alene Amelework Getinet. Factors associated with adverse pregnancy outcome in Debre Tabor town, Northwest Ethiopia: a case control study. BMC research notes. 2018;11(1):820.
104. Saleem Sarah TSS, and McClure Elizabeth M et al. Saleem Sarah, Tikmani Shiyam Sunder, and McClure Elizabeth M et al: Trends and determinants of stillbirth in developing countries: results from the Global Network's Population-Based Birth Registry. . Reproductive health. 2018;15(1):100.
105. Sydsjö Gunilla PML, and Bladh Marie et al. Evaluation of risk factors' importance on adverse pregnancy and neonatal outcomes in women aged 40 years or older. BMC pregnancy and childbirth. 2019;19(1):92.
106. Khalil Asma SA, and Maiz Nerea et al. Maternal age and adverse pregnancy outcome: a cohort study. Ultrasound in Obstetrics & Gynecology. 2013;42(6):634-43.
107. Radoń Pokracka Małgorzata AB, and Płonka Magdalena et al. Ealuation of Pregnancy Outcomes at Advanced Maternal Age. . Open Access Macedonian Journal of Medical Sciences 2019;7(12):951.
108. Mehari M-a MH, Robles CC, Woldemariam S, Adhena T, Mulugeta M, et al. Advanced maternal age pregnancy and its adverse obstetrical and perinatal outcomes in Ayder comprehensive specialized hospital, Northern Ethiopia, 2017: a comparative cross-sectional study. BMC pregnancy and childbirth. 2020;20(1-10).
109. Waldenström U CS, and Vixner Linda et al. Advanced maternal age increases the risk of very preterm birth, irrespective of parity: a population-based register study. BJOG: An International Journal of Obstetrics & Gynaecology 2017;124(8):1235-44.
110. Cavazos-Rehg Patricia A KMJ, and Spitznagel Edward L et al. Maternal age and risk of labor and delivery complications. Maternal and child health journal 2015;19(6):1202-11.
111. Kenny Louise LT, and McNamee Roseanne et al. Advanced maternal age and adverse pregnancy outcome: evidence from a large contemporary cohort. PloS one. 2013;8(2).

112. Goisis Alice RH, and Barclay Kieron et al. Advanced maternal age and the risk of low birth weight and preterm delivery: a within-family analysis using Finnish population registers. American journal of epidemiology 2017;186(11):1219-26.
113. Fuchs Florent MB, and Ducruet Thierry et al. Fuchs Florent, Monet Barbara, and Ducruet Thierry et al: Effect of maternal age on the risk of preterm birth: A large cohort study. PloS one. 2018;13(10.
114. Mitao M MW, Antony C, Adinan H, Shayo B, Amour C, et al. Recurrence of post-term pregnancy and associated factors among women who delivered at Kilimanjaro Christian Medical Center in northern Tanzania: A retrospective cohort study. PloS one. 2023;18(4).
115. Almeida NK AR, Pedreira CE. . Adverse perinatal outcomes for advanced maternal age: a cross-sectional study of Brazilian births. J Pediatr (Rio J) 2015;91(5):493-8.
116. Singh A PS, Ogollah R, Stones W. Maternal Tetanous Toxoid Vaccination and Neonatal Mortality in Rural North India. PloS one. 2012;7(11)(e48891).
117. Arnold A BM, Flenady V, et al. Term stillbirth in older women. Aust N Z J Obstet Gynaecol. 2012;52(3):268-9.

11. ANNEXES

Annex I. Information sheet

Title of the research: Comparison of the adverse neonatal outcomes and their associated factors among women with adult and advanced-aged pregnancy at the public hospitals of Addis Ababa City, Ethiopia, 2024: Hospital-based comparative cross-sectional study

Name of the organization: Addis Ababa University, College of Health Sciences

Name of the sponsor: Saint Paulo's Hospital

Name of principal investigator: Yonas Mengistu (BSc midwife)

Address

Email: yonasmengistu@gmail.com

Phone: +251912749113

Advisors:

1. Luel Deribe (PhD)

   Address

   Email:lue.deribe@gmail.com

   Phone: +251911973983

2. Addishiwot F. (MSc)

   Address

   Email: addishiwet.f@gmail.com

Phone: +251913017124

Purpose of the research project

The main aim of this research project is to compare the adverse neonatal outcomes and their associated factors among women with adult and advanced-aged pregnancies at the public hospitals of Addis Ababa City, Ethiopia. Assessing the status of neonatal adverse outcomes helps to design appropriate intervention programs to address the problem and to take appropriate actions to reduce the problems

Study period- March 1/2024 to March 30/2024

Process of the study

Permission processed from Addis Ababa University for administrators of the respective public hospitals of Addis Ababa city. The study involves women who utilize labor and delivery services in Addis Ababa city public hospitals. You are selected to be one of the study participants if you are willing to take part in this study and we kindly invite you to take part in our project. If you are willing to participate, we are so happy and we need you to clearly understand the aim of this study and show your agreement. Finally, you are kindly requested to give your genuine response.

Risk and/or discomfort:

There is no risk or discomfort that you will face by participating in this research except dedication of time (a maximum of 30 minutes) for responding. Any personal information registered in registration books will not be copied and transferred to other bodies. Every piece of information will be kept confidential.

Benefits

Your participation is important to know the magnitude of adverse neonatal outcomes among women with adult and advanced maternal ages. However, you have no risk or direct benefit in participating in this research project.

Incentives/payments for participating

You will not be provided with any incentives or payment to take part in this project.

Confidentiality

The information collected from you will be kept confidential and stored in a file, without your name by assigning a code number to it, and no report of the study ever identifies you.

Right to refuse or withdraw

You have a full right to refuse to participate in this research. You have also a full right to withdraw from this study at any time you wish.

Annex II. Consent form

Comparison of the adverse neonatal outcomes and its associated factors among women with adult and advanced aged pregnancy at the public hospitals of Addis Ababa City, Ethiopia, 2024

Dear!

My name is _____. I am working as a data collector in a study conducted by Yonas Mengistu at selected public hospitals in Adds Ababa City. The research supported in collaboration with Addis Ababa University College of Health Sciences, Department of Midwifery, and Saint Paulo's Hospital. I have identified you as a study participant hoping that you would be willing to help me by providing some information. As part of this study, different questions are prepared to be completed by you. For unclear questions, if you need clarification you can ask at any time. Since your participation in this survey depends on your voluntary basis you have the full right to refuse, to participate, and to stop at any time. I would like to ask you a few questions about your socio-demographic characteristics, reproductive history, health service utilization, and the health of your newborn baby, which may take 25 to 30 minutes. Certainly, I assure you that your name or your newborn baby's name will not be recorded anywhere. The confidentiality of the information you provided to me will be maintained and won't be accessed by a third party, but it's used for research only and burnt by the end of the survey. Your role in the success of the research is important and I appreciate your contribution to the research. You

have a full right to refuse part or the whole questionnaires and no one enforces you to do so. However, your honest participation and answers to the questionnaire will help us in a better understanding of the problem and give guidance on how to intervene in the study area.

If you have any questions regarding this study, you can contact the principal investigator **Yonas Mengistu** by cell phone number: **0912749113,** or by email address: yonasmengistu@gmail.com**.** Even you can call for institutional review board with phone number _____

So, are you willing to participate actively and honestly? I understand the advantage of the research, and the roles I will have in the research and have agreed to participate in the research. (*If yes, let her sign and go ahead, if No stop here*.)

Yes ☐ Signature of the participant _____ No ☐

Questionnaire code _____

Signature of data collector: _____ Date: _____

Signature of data supervisors: _____ Date: _____

Annex III: English version Questionnaire

Part –I. Socio-demographic characteristics

S.No	Variables	Response	Skip to
101.	Age	_____ in complete years	
102.	Residence	1. Urban 2. Rural	
103.	Marital status	1. Married 2. Unmarried 3. Divorced 4. Widowed	
104.	Maternal educational level	1. Unable to read and write 2. Can read and write 3. Primary education 4. Secondary education 5. Diploma and above	
105.	Maternal occupation	1. Housewife 2. Government employee 3. Private employee 4. Merchant 5. Other, specify _____	
106.	Husband educational level	1. Unable to read and write 2. Can read and write 3. Primary education 4. Secondary education 5. Diploma and above	
107.	Husband occupation	1. Government employee 2. Private employee	

		3. Merchant 4. Other, specify _____	
108.	Average household monthly income	_____ ETB	

Part-II. Lifestyle and medical history-related factors

S.No	Variables	Response	Skip to
201.	Did you drink alcohol during this pregnancy?	1. Yes 2. No	If 2 skip to Q203
202.	If yes for Q201, how often?	1. Sometimes (occasionally) 2. Daily 3. Weekly	
203.	Did you smoke cigarettes during this pregnancy	1. Yes 2. No	If 2 skip to Q205
204.	Did you have medical problems before the current pregnancy?	1. Yes 2. No	If 2 skip to Q209
205.	If yes for Q205---what type of pre-pregnancy disease? (more than one answer possible)	1. Hypertension 2. Diabetic mellitus 3. Chronic renal disease 4. Anemia 5. Others, specify_____	
206.	Mother's middle upper arm circumference	1. 23 cm and above 2. Less than 23 cm	
207.	Maternal Rh status	1. Rh positive 2. Rh-negative 3. Unknown	
208.	HIV status	1. Negative 2. Positive 3. Unknown	
209.	Hemoglobin level	1. ≥11g/dl 2. <11 g/dl	

Part-III. Reproductive and obstetric history

S.No	Variables	Response	Skip to
301	Gravidity?	_____in number	
302	Parity?	_____in number	
303	Inter-pregnancy interval?	_____in months or years	
304	Did you have a bad obstetric history?	1. Yes 2. No	If 2 skip to Q308
305	If yes for Q306, what type of bad obstetric history? (More than one answer possible)	1. Recurrent spontaneous abortion (three or more) 2. Stillbirth 3. Early neonatal death 4. Others, specify _____	
306	What was the status of the last pregnancy?	1. Planned, wanted 2. Unplanned, wanted 3. Unplanned, unwanted	

307	Did you attend pregnancy checkups/ANC for this pregnancy?	1. Yes 2. No	If 2 skip to Q312
308	If yes for Q308, at what gestational age did you start ANC?	_____months _____weeks	
309	If yes for Q308, how many times did you receive ANC?	_____in numbers _____don't know	
310	Did you receive a tetanus injection in the last pregnancy?	1. Yes 2. No	If 2 skip to Q314
311	If yes for Q312, during your last pregnancy, how many times did you receive tetanus injection?	_____ in numbers	
312	Have you received Iron and folic acid supplementation During your last pregnancy?	1. Yes 2. No	If 2 skip to Q316
313	If yes for how many months	_____months	
314	Did you have any complications during your last pregnancy?	1. Yes 2. No	If 2 skip to Q318
315	If yes for Q. No 316 what type of complication did you get? (more than one answer possible)	1. Pregnancy induced hypertension (Preeclampsia/Eclampsia) 2. Gestational diabetes mellitus 3. Antepartum hemorrhage 4. Premature rupture of membranes 5. Excessive vomiting/ hyperemesis gravidarum 6. Decreasing of fetal movement 7. Decreasing of amniotic fluid 8. Others, specify _____	
316	Did your spouse/partner come to a health facility for antenatal care purposes during the last pregnancy?	1. Yes 2. No	

Checklist template

Part-A. Obstetric history-related chart review/checklist questions

S.No	Variables	Response	Skip to
101	The onset of labor?	1. Spontaneous 2. Induction 3. Elective cesarean section	If 2 or 3 skip to Q103
102	If the onset of the labor is spontaneous, was it augmented?	1. Yes 2. No	
103	What was the delivery type/mode of delivery?	1. Spontaneous vaginal delivery 2. Elective cesarean Section 3. Emergency cesarean section 4. Vaginal operative delivery 5. Other procedures, specify _____	
104	Indication for cesarean section	1. Fetal distress 2. Failed VBAC 3. Planned repeated VBAC 4. Malpresentation 5. Failed induction	

		6. Others, specify _____	
105	What was the presentation of the fetus during delivery?	1. Vertex presentation 2. Breech presentation 3. Shoulder presentation 4. Face presentation 5. Other(specify) _____	
106	Total time duration from initiation of labor to delivery?	_____ hours	
107	Did you get any complications during this labor and delivery?	1. Yes 2. No	If 2 skip to Part B
108	If yes for Q-108, what type of complication (more than one answer possible)?	1. Intrapartum preeclampsia/eclampsia 2. Prolonged labor 3. Obstructed labor 4. Malpresentation/malposition 5. Failed induction 6. Decreasing of uterine contraction 7. Fetal distress 8. Umbilical cord prolapses 9. Post-partum hemorrhage 10. Perianal tear 11. Uterine rupture 12. Retained placenta 13. Infections 14. Others, specify _____	

Part-B. Neonatal outcomes chart review/checklist questions

S.No	Variables	Response	Skip to
201	At what gestational age did she deliver this neonate?	_____weeks of gestation	
202	What is the sex of the newborn baby?	1. Male 2. Female	
203	What was the newborn outcome?	1. Alive 2. Dead	If 1 skip to Q206
204	If dead, what was the type?	1. Stillbirth 2. Immediate neonatal mortality	
205	If neonatal mortality, what was the cause?	1. Prematurity 2. Infection 3. Asphyxia 4. Congenital malformation 5. Others, specify_____	
206	What was the birth weight of the baby (in grams)?	_____ grams	
207	What was the weight of newborn to gestational age?	1. Small for gestation 2. Appropriate for gestation 3. Large for gestation	
208	APGAR score 1st minute after birth	_____(write the score)	
209	APGAR score 5th minute after birth	_____(write the score)	
210	Does the newborn have any form of gross congenital malformation?	1. Yes 2. No	If 2 skip to Q212

211	If yes for Q-210, what was the type/diagnosis of malformation? (more than one answer possible)	1. Hydrocephalus 2. Anencephaly 3. Spinal Bifida 4. Others, specify	
212	Does the newborn have neonatal jaundice at birth?	1. Yes 2. No	
213	Was the newborn admitted to the NICU?	1. Yes 2. No	
214	If yes for Q-213, what was the reason for admission to NICU? (more than one answer possible)	1. Prematurity 2. LBW 3. Asphyxia 4. Infection 5. Congenital malformation 6. Jaundice 7. Hupoglacimia 8. Hypothermia 9. IUGR 10. Unable to breast feed 11. Other (specify) _____	

The end. Thank you for your time!!!

አባሪ IV. የአማርኛ ግልባጭ የመርጃ ቅጽ

የጥናቱ ርዕስ፡- በአዲስ አበባ ከተማ በተመረጡ የመንግስት ሆስፒታሎች እድሚቸዉ ከገፉ እና ካልገፉ እናቶች የሚወለዱ ጨቅላ ህፃናት የሚጋጥሙአቸዉ ችግሮች እና ተያያዝ ጉዳዮች መዳሰስ ላይ ያተኮረ ነው።

የድርጅቱ ስም፡- አዲስ አበባ ዩንቨርሲቲ፣ ጤና ሳይንስ ኮሌጅ

የስፖንሰሩ ስም፡- ቅዱስ ጳውሎስ ሆስፒታል

የዋና ተመርማሪ ስም፡ ዮናስ መንግስቱ (ቢኤስሲ አዋላጅ)

አድራሻ; ኢሜል፡ yonasmengistu@gmail.com

ስልክ፡ +251912749113

አማካሪዎች፡-

1. ልኡል ደሪቤ (ፒኤችዲ)

አድራሻ: ኢሜል፡ lue.deribe@gmail.com

ስልክ፡ +251911973983

2. አዲስህይወት ፈ. (ኤምኤስሲ)

አድራሻ፡ ኢሜል፡ addishiwet.f@gmail.com

ስልክ፡ +251913017124

የምርምር ፕሮጀክቱ ዓላማ

የዚህ የምርምር ፕሮጀክት ዋና አላማ በአዲስ አበባ ከተማ በተመረጡ የመንግስት ሆስፒታሎች እድሚቸዉ ከገፉ እና ካልገፉ እናቶች የሚወለዱ ጨቅላ ህፃናት የሚጋጥሙአቸዉ ችግሮች እና ተያያዥ ጉዳዮች መዳሰስ ላይ ያተኮረ ነው።

የጥናቱ ጊዜ፡ ከመጋቢት 1/2024 እስክ መገቢት 30/2024

የጥናቱ ቅድመ ተከተል

በመጀመሪያ የአዲሳባ ዩንቨርሰቲ ለተመራማሪዉ ፍቃድ ይሰጣል፤ ከዚያ አዲስ አበባ ዩንቨርሲቲ ለአዲስ አበባ ከተማ የመንግስት ሆስፒታሎች አስተዳዳሪዎች ለተመራማሪዉ ፍቃድ እንዲሰጡት ይጠቃል። ጥናቱ በአዲስ አበባ ከተማ የመንግስት ሆስፒታሎች ዉስጥ የወሊድ እገልግሎትን የሚጠቀሙ እናቶችን ያካተተ ነው። በዚህ ጥናት ላይ ለመሳተፍ ፍቃደኛ ከሆኑ ከጥናቱ ተሳታፊዎች አንዱ ለመሆን ተመርጠዋል እና በፕሮጀክታችን እንድትሳተፉ በአክብሮት እንጋብዛለን። ለመሳተፍ ፍቃደኛ ከሆናችሁ በጣም ደስ ይለኛል እናም የዚህን ጥናት አላማ በግልፅ እንድትረዱ እና ስምምነትዎን እንዲያሳዩ እንፈልጋለን። በመጨረሻም እውነተኛ ምላሽ እንዲሰጡኝ በትህትና እጠይቃለዉ።

ስጋት እና/ወይም ምቾት ማጣት፡

በዚህ ጥናት ምላሽ ለመስጠት ለመሰጠት ቢበዛ 30 ደቂቃ ሊወስድ ይችላል። በዚህ ጥናት ውስጥ በመሳተፍዎ የሚያጋጥምዎ ምንም አይነት ስጋት ወይም ምቾት የለም። በመመዝገቢያ ደብተሮች ውስጥ የተመዘገበ ማንኛውም የግል መረጃ ወደ ሌሎች አካላት አይተላለፍም፤ እያንዳንዱ መረጃ በሚስጥር ይጠበቃል።

ጥቅማጥቅም

የዚህ ጥናት ዉጤት እድሚቸዉ ከገፉ እና ካልገፉ እናቶች የሚወለዱ ጨቅላ ህፃናት የሚጋጥሙአቸዉ ችግሮች ለማወቅ ይረዳል። እናም እርስዎ በዚህ የምርምር ፕሮጀክት ውስጥ መሳተፍ ምንም አይነት አደጋ ወይም ቀጥተኛ ጥቅም የለዉም።

ለመሳተፍ ማበረታቻ/ክፍያ

በዚህ ፕሮጀክት ላይ ለመሳተፍ ምንም አይነት ማበረታቻ ወይም ክፍያ አይሰጥዎትም።

ሚስጥራዊነት

ከእርስዎ የሚሰበሰበው መረጃ ሚስጥራዊ ሆኖ በፋይል ውስጥ ያለእርስዎ ስም የቁጥር ኮድ በመመደብ ይቀመጣል፤ እና ስለዚህ እርስዎን የሚለይ የጥናቱ ሪፖርት የለም።

እምቢ የማለት ወይም የማቋጥ መብት

በዚህ ጥናት ውስጥ ላለመሳተፍ ሙሉ መብት አልዎት። እንዲሁም በፈለጉት ጊዜ ከዚህ ጥናት የመውጣት ሙሉ መብት አለዎት።

አባሪ V. የአማርኛ ቅጅ የፍቃደኝነት መጠየቂያ ቅፅ

መግቢያ፡- ጤና ይስጥልኝ፣ እኔ ስሜ _____ይባላል:: በዮናስ መንግስቱ በአዲስ አበባ ከተማ በተመረጡ የመንግስት ሆስፒታሎች በሚሰራው ጥናት የመረጃ ሰብሳቢ ነኝ። ይህ ጥናት የሚደረገዉ በሁለተኛ ድግሪ ተማረ በሆነዉ ዮናስ መንግስቱ በአዲስ አበባ ዩንቨርስቲ እና በቅዱስ ፓዉሎስ ሆስፒታል ድጋፍ አድራጊነት ሲሆን፤ በአዲስ አበባ ከተማ በተመረጡ የመንግስት ሆስፒታሎች እድሚቸዉ ከገፉ እና ካልገፉ እናቶች የሚወለዱ ጨቅላ ህፃናት የሚጋጥሙአቸዉ ችግሮች በሚል ይካሄዳል። እርስዎ በዚህ ጥናት ተሳታፊ እንዲሆኑ ተጋብዘዋል። እናም በዚህ ጥናት ንቁ ተሳትፎ እነዲደረጉ በትህትና እጠይቃለዉ። ለሚያደርጉት አስተዋፅኦ ከልብ አመሰግናለሁ። ለዚህ ጥናት መሳካት በቀጥታ ግንኙነት ያላቸው የተለያዩ መጠይቆች ተዘጋጅተዋል። ለማቀርባቸው ጥያቄዎች ተጨማሪ ማብራሪያ ከፈለጉ በማንኛውንም ግዜ መጠየቅ ይችላሉ:: ተሳትፎወት በፈቃደኝነት ላይ የተመሰረተ ስለሆነ በማነኛወም ሰአት ማስቆም ወይም ማቁአረጥ ይችላሉ። ለምጠይቅዎ ጥያቄ የሚያምኑበትንና ትክክለኛ መልስዎን እንዲሰጡኝ እጠይቃለው:: ይህ መጠይቅ ለማጠናቀቅ ቢበዛ ለ 25-30 ደቂቃ አብረን እንቆያለን። በዚህ ጥናት በመሳተፍዎ የሚከፈለወት ክፍያ ወይም ቀጥተኛ ጥቅም አያገኙም። ግን የእርስዎ እውነተኛ መልስ ለዚህ ጥናት አላማ በጣም

ጠቃሚ ነው። በተጨማሪም በጥናቱ በመሳተፍዎ ምንም አይነት ችግር ወይም ጉዳት እንደማደርስበወት አረጋግትለወታለዉ። መመለስ ያፈለጉትን ጥያቄ አለመመለስ ይችላሉ። እናም መጠየቁን በፈለጉት ጊዜ ካልተመችዎት ማስቆም ይችላሉ። በመጠይቁ ላይ የእርስዎ እና የልጅዎ ስም አይመዘገብም። እርስዎ የሰጡን መረጃ የሚወለዉ ለጥናቱ አላማ ብቻ ነዉ። ከጥናቱ አጥኝ በስተቀር ለሌላ ተላልፎ አይሰጥም።

ጥናቱን በተመለከተ ጥያቄ ካለዎት ዋና ተመራመሪዉን ዮናስ መንግስቱ በ ስልክ ቁጥር 0912749113 መደወል ወይም በኢሜል አድራሻ yonasmengistu@gmail.com ማነጋገር ይችልሉ:: በተጨምሪም ለአዲስ አበባ ዩኒቨርስቲ የጥናት ስነምግባር ኮሚቴ በ _____ስልክ ቁጥር መደወል ይቻላሉ።

1. አዎ ከሆነ፣ ይቀጥሉ፣ ስለ ምርምሩ ጥቅም፣ በጥናቱ ውስጥ የሚኖረኝን ሚና ተረድቼ በምርምሩ ለመሳተፍ ተስማምቻለሁ። ፊርማ _____፣
2. አይ ከሆነ ያቁሙ።

የመረጃ ሰብሳቢዉ/ዋ ስም እና ፊርማ _____

የተቆጣጣሪዉ/ዋ ስም እና ፊርማ _____

መረጃዉ የተሰበሰበበት ቀን _____የሚስጥር ቁጥር/ኮድ _____

አባሪ VI፡ የአማሪኛ መጠይቅ

ክፍል - 1. የእናቶች ማህበራዊ-ስነ-ህዝብ ባህሪያት

ተ.ቁ	ጥያቄዎች	መልስ	ይዘለል
101.	እድሜ	_____አመት	
102.	መኖሪያ ቦታ	1. ከተማ 2. ገጠር	
103.	የጋብቻ ሁኔታ	1. ያገባች 2. ያላገባች 3. አግብታ የፈታች 4. የሞተበት	
104.	የትምርት ሁኔታ	1. ማንበብ እና መጻፍ የማትችል 2. ማንበብ እና መጻፍ የምተችል 3. የመጀመሪያ ደረጃ ትምህርት 4. የሁለተኛ ደረጃ ትምህርት 5. ዲፕሎማ እና ከዚያ በላይ ያላት	
105.	ሥራ	1. የቤት እመቤት	

		2. የመንግስት ተቀጣሪ 3. የግል ተቀጣሪ 4. ነጋዴ 5. ሌላ (ይግለጹ)_____	
106.	የባል የትምህርት ደረጃ	1. ማንበብ እና መጻፍ የማይችል 2. ማንበብ እና መጻፍ የሚችል 3. የመጀመሪያ ደረጃ ትምህርት 4. የሁለተኛ ደረጃ ትምህርት 5. ዲፕሎማ እና ከዚያ በላይ ያለዉ	
107.	የባለቤትሽ ስራ መነድነዉ	1. የመንግስት ሰራተኛ 2. ነጋዴ 3. የግል ሰራተኛ 1. ሌላ፣ _____ ይግለጹ	
108.	የእርስዎ ቤተሰብ ወርሃዊ አማካይ ገቢ	_____ በኢትዮጲያ ብር ይገለፅ	

ክፍል - 2. የአኗኗር ዘይቤ እና ለረጅም ጊዜ የሚቆይ በሽታ ጋር የተያያዙ መጠየቆች

ተ.ቁ	ጥያቄዎች	መልስ	ይዘለል
201	በአሁኑ እርግዝና አለኮል ጠጥተዉ ያዉቃሉ	1. አዉ 2. የለም	2 ከሆነ ወደ 203 እለፍ
202	ለ201 መልሱ አ**ዎ** ከሆነ፣ **በየምንያክል ጊዜ ነዉ የምትጠጭዉ**	1. **አንዳንዴ/አልፎአልፎ** 2. **በየቀኑ** 3. **በየሳምንቱ**	
203	በአሁኑ እርግዝና ሲጋራ አጭሰዉ ያዉቃሉ	1. አዉ 2. የለም	2 ከሆነ ወደ 205 እለፍ
204	ከእርግዝና በፊት ህመም አለብወት	1. አዉ 2. የለም	2 ከሆነ ወደ 207 እለፍ
205	ለጥያቂ 201 አዉ ከሆነ፣ ምን አይነት ህመም ነዉ(ከአንድ በላይ መልስ ይቻላል)	1. ደም ግፊት 2. የስኪር በሽታ 3. የኩላሊት በሽታ 4. የደም ማነስ 5. ሌላ ይገለፅ _____	
206	የእናቲቱ የላይኛዉ ክንድ መሀል ዙሪያ	1. 23 ሴንቲሜትር እና ከዛ በላይ 2. ከ23 ሴንቲሜትር በታች	
207	የእናቲቱ የደም አይነት	1. ፖዘቲቭ 2. ነጌቲቭ 3. አይታወቅም	
208	የ HIV ምርመራ ዉጤት	1. ኔጌትፍ 2. ፖዘቲፍ 3. አይታወቅም	

209	ኤሞግሎቢን መጠን	1. ≥11g/dl 2. <11 g/dl	

ክፍል - 3. ስለ ፅንስ እና የወሊድ ታሪክን በተመለከተ መጠየቆች

ተ.ቁ	ጥያቄዎች	መልስ	ይዘለል
301.	የአሁኑን እርግዝና ጨምሮ ስንት ጊዜ አርግዘሽ ታውቂያለሽ (ከሰባት ወር በፊትን ሁሉንም)?	_____በቁጥር	
302.	**የበፊቱ እርግዝናሽ ስንት ጊዜ ሆነዉ**	_____በቁጥር	
303.	ከዚህ በፊት ከወለዱ ስንት ጊዜ ሆነዎት	_____በወር	
304.	ከአሁን በፊት በነበረዉ እርግዝና ያጋጠመወት ችግር ነበረ	1. አዎ 2. የለም	2 ከሆነ ወደ 307 እለፍ
305.	ለጥያቂ 305 መልስወት አወ ከሆነ፣ ምን አጋጥምዎት ያወቃል? (ከአንድ በላይ መልስ ይቻላል)	1. 3 አና ከዛ በላይ ለተከታታይ **ጊዜ** ማስወረድ 2. ፅንስ ማህጸን ወስጥ ሙቶ መዉጣት 3. ከተወለደ በሃላ በ7 ቀናት መሞት 4. ሌላ ካለ ይጠቀስ _____	
306.	ያሁኑን እርግዝና	1. አቅደሽበትና ፈልገሽዉ 2. ያልታቀደ ግን የሚፈልግ 3. ያልታቀደ ያልተፈለገ	
307.	በአሁኑ የእርግዝና ወቅት፣ የቅድመ ወሊድ እንክብካቤ/ክትትል አድርገሽ ነበር	1. አወ 2. የለም	2 ከሆነ ወደ 311 እለፍ
308.	ለጥያቄ 308 አወ ከሆነ መለሱ፣ ክትትል ሲጀምሩ እርግዝናዉ ስንተኛ ወር ወይም ሳምንት ነበር	_____ወር _____ሳምንት	
309.	ለጥያቄ 308 አወ ከሆነ መለሱ፣ ስንት ጊዜ ክትትል አደረጉ	በቁጥር _____ አላስታዉስም _____	
310.	በዚህ የእርግዝና ወቅት፣ የቴታነስ መከላከያ ክትባት በክንድሽ ተሰጥቶሽ ያውቃል?	1. አዎ 2. የለም	2 ከሆነ ወደ 313 እለፍ
311.	ለጥያቂ 311 አወ ከሆነ፣ በዚህ እርግዝና ወቅት ቲታነስ መርፌ ለምን ያህል ጊዜ ነው የወሰድሽው?	_____ ጊዜ	
312.	በዚህ እርግዝና ወቅት የ" አይረን እና ፎሊክ አሲድ" (ለደም ማነስ ችግርን ለመከላከል የሚወሰድ) እንክብል መድሃኒት አግኝተሻል/ወስደሻል?	1. አዎ 2. አልወሰድኩም	
313.	መልሱ አወ ከሆነ፣ ለስነት ወር ወሰዱት	_____በወር	

314.	በአሁኑ የእርግዝና ወቅት፣ያአጋጠሽ ችግር ነበር	1. አዎ 2. የለም	2 ከሆነ ወደ 317 እለፍ
315.	ለጥያቂ 315 አወ ከሆነከአጋጠመወት ከሚከተሉት ችግሮች መካከል የትኞቹ አጋጥመወታል? (ከአንድ በላይ መልስ ይቻላል)	1) የደም ግፊት መጨመር (ፕሪኢክላምሺያ/ኢክላምሺያ) 2) በእርግዝና ጊዜ የሚከሰት የስኳር ህመም (ዲያቤቲስ ሜሊተስ) 3) ከምጥ በፊት በእርግዝና ሰአት የደም መፍሰስ (አንቲ ፓርተም ሔሞሬጅ) 4) የእንሽርት ዉሀ መፍሰስ (ምጥ ከመጀመሩ ቀድሞ) 5) ብዙ ማስታወክ/ ሐይፐር ኢሚሲስ ግራቪድሪየም 6) **የፅንሱ እንቅስቃሴ መቀነስ** 7) የእንሽርት ዉሀ **መቀነስ** 8) ሌላ፣ይጠቀስ_____	
316.	በአሁኑ የእርግዝና ወቅት፣ የቅድመ ወሊድ እንክብካቤ ክትትል ስታደርጊ ባለቤትሽ/የትዳር ጓደኛሽ አብሮሽ በህክምና ተቋም ተገኝቶ ነበር?	1. አዎ 2. የለም	

ከመዝገብ የሚወሰዱ መረጃወች ቅፅ

ክፍል ሀ - ስለ ፅንስ እና የወሊድ ታሪክን በተመለከተ የተዘጋጁ ቅፆች

ተ.ቁ	ጥያቄዎች	መልስ	ይዘለል
101.	ምጡ ሲጀምር	1. በራሱ ጊዜ 2. በምጥ ማስጀመሪያ 3. ቀዶ ጥገና (በቀጠሮ)	2 **ወይም** 3 ከሆነ ወደ 103 እለፍ
102.	ምጥ በራሱ ጊዜ ከሆነ የጀመረሽ የመጥ ማፋጠኛ መርፌ ተሰጥቶሽ ነበር;	1) አዎ 2) አልተሰጠኝም	
103.	አሁን ሲወልዱ በምን መነገድ ነዉ የወለዱት?	1. በማህፀን በር (ያለምንም አገዛ) 2. በቀዶ ጥገና (በቀጠሮ) 3. በቀዶ ጥገና (በድንገተኛ) 4. በማህፀን በር (በመሳሪያ ታግዞ) 5. ሌላ፣ ይገለፅ_____	
104.	ቀዶ ጥገና ለምንድነዉ የተሰራዉ	1. የፅንስ መታፈን 2. የምጥ መርፌ አለመስራት 3. ከሆፕሬሽን በኃላ በማህፀን በር	

		መዉለድ አለመሳካት 4. የታቀደ ሁለተኛ ቀዶ ጥገና 5. የአቀማመጥ ችግር 6. ሌላ፣ ይገለፅ_____	
105.	በምጥ ሰአት የህፃኑ አመጣጡ ምን ነበር?	1. በቅንጭላቱ (ቨርቴክስ) 2. በቂጡ 3. በትክሻዉ 4. በፊቱ 5. ሌላ፣ ይገለፅ _____	
106.	ምጡ ከጀመረ እስኪመወለድ ጠቅላላ ስነት ሰአት ሆነ?	_____ሰአት	
107.	በዚህ ምጥ እና ወሊድ ጊዜ ያጋጠመ ችግር ነበር?	1. አወ 2. የለም	2 ከሆነ ወደ ክፍል ለ እለፍ
108.	ለጥያቄ 106 አወ ከሆነ፣ ምን አይነት ችግር ነበር (ከአነድ በላይ መልስ ይቻላል)	1. በምጥ ጌዜ የደም ግፊት መጨመር 2. የተራዘመ ምጥ 3. የተቀረቀረ ምጥ 4. የአቀማመጥ ችግር 5. የምጥ ማስጀመሪያ መርፌ አለመሳካት 6. የማህፀን መከማተር መቀነስ 7. የፅነስ መታፈን 8. እትብት ቀድሞ መምጣት 9. ከወለዱ በኃላ የደም መፍሰስ ብዛት 10. የብለት መተርተር 11. የማህፀን መተርትር 12. የህንግዴ ልጅ መቅረት 13. ኢንፌክሽን 14. ሌላ፣ ይገለፅ _____	

ክፍል ለ - ከጨቅላ ህፃኑ ጋር የተያያዙ መጠየቆች

ተ.ቁ	ጥያቄዎች	መልስ	ይዘለል
201.	ይህ ልጅ ሲወለድ የእርግዝና እድሜዉ ስንት ነበር?	_____በሳምንት	
202.	የጨቅላ ህፃኑ ፆታ	1. ወንድ 2. ሴት	
203.	የጨቅላ ህፃኑ ዉጤት ምንድን ነዉ?	1. በህይወት ያለ 2. የሞተ	1 ከሆነ ወደ 206 እለፍ

204.	ለጥያቄ 203 የሞተ ከሆን፣	1. ሞቶ የተወለደ 2. ከተወለደ በ24ሰአት ወሰጥ የሞተ	
205.	ተወልዶ የሞተ ከሆነ፣ ምክንያቱ (ከአነድ በላይ መልስ ይቻላል)	1. መዉለጃ ሰአቱ ሳይደርስ መወለድ 2. ብክለት (ኢንፌክሽን) 3. መታፈን (በኦክስጅን እጥረት) 4. **የአፈጣተር ችግር** 5. ሌላ፣ ይገለፅ _____	
206.	የጨቅላ ህፃኑ ክብደት ስንት ነዉ	_____በግራም	
207.	የጨቅላ ህፃኑ ክብደት ከእርግዝና እድሜዉ ጋር ሲነፃፃር	1. ለእርግዝና እድሜዉ ያንሳል 2. ለእርግዝና እድሜዉ ትክክለኛ ነዉ 3. ለእርግዝና እድሜዉ ይበዛል	
208.	የመጀመሪያ አንድ ደቂቃ አፕጋር ዉጤት	_____በቁጥር	
209.	ከተወለደ አምስት ደቂቃ ላይ አፕጋር ዉጤት	_____በቁጥር	
210.	የጨቅላ ህፃኑ ላይ የሚታይ የአፈጣጠር ችግር አለበት	1. አወ 2. የለም	2 ከሆነ ወደ 212 እለፍ
211.	ለጥያቄ 210 አወ ከሆነ፣ምን አይነት ችግር ነበር (ከአነድ በላይ መልስ ይቻላል)	1. ቅንጭላት ዉስጥ ዉሀ መብዛት 2. ሙሉ ቅንጭላት አለመፈጠር 3. የአከርካሪ አጥንት በሽታ 4. ሌላ፣ ይገለፅ _____	
212.	ህፃኑ ሲወለድ ቆዳዉ ቢጫ ሆኖ ነበር	1) አወ 2) የለም	
213.	ህፃኑ ወደ ጨቅላ ማሞቂያ እና መቆያ ክፍል ገብቶ ነበር	1. አወ 2. የለም	2 ከሆነ መጨረሻ
214.	ለጥያቄ 214 አወ ከሆነ፣ ምክንያቱ ምነድን ነበር	1. መዉለጃ ሰአቱ ሳይደርስ መወለድ 2. ከኖርማል ክብደት በታቸህ መሆን 3. መታፈን (በኦክስጅን እጥረት) 4. ብክለት 5. የአፈጣጠር ችግር 6. የሰዉነት ቢጫ መሆን 7. የስኳር መጠን መቀነስ 8. የሙቀት መጠን መቀነስ 9. ከማህፀን ዉስጥ ሆኖ መቀጨጭ (IUGR) 10. ጡት መጥባት አለመቻል 11. ሌላ፣ ይገለፅ _____	

አመሰግናለዉ!

Annex VII: Declaration of the Principal Investigator

ADDS ABABA UNIVERSITY,

COLLEGE HEALTH SCIENCES,

SCHOOL OF NURSING AND MIDWIFERY,

DEPARTMENT OF MIDWIFERY.

I, the undersigned, MSc student declare that this thesis entitled “comparison of adverse neonatal outcomes and their associated factors among women with adult and advanced-aged pregnancy at the public hospitals of Addis Ababa City, Ethiopia” is my original work in partial fulfilment of the requirement of the degree of MSc in Maternity and Reproductive Health Nursing and has not been presented in this University. All the resources and materials used for this proposal and all people and institutions who give support, have been fully acknowledged

Principal investigator:

Yonas Mengistu (candidate for MSc in Maternity and Reproductive Health Nursing

_____, _____

Signature Date

This thesis work has been submitted for examination with my approval as an advisor.

Advisors:

1. Leul Deribe (PhD) _____, _____

   Signature Date

2. Addishiwot F. (MSc) _____, _____

   Signature Date

September, 2024

Addis Ababa, Ethiopia

Annex VIII: Examiner Approval Sheet

I undersigned, Examiner have read, evaluated, and attended the thesis done by Yonas Mengistu entitled "comparison of adverse neonatal outcomes and its associated factors among women with adult and advanced aged pregnancy at the public hospitals of Addis Ababa City, Ethiopia”

This is to verify that his thesisl has been accepted in partial fulfillment of the requirements for the Master of degree in MSc in Maternity and Reproductive Health Nursing

Examiners

1. _____, Date_____, Siginture, _____
2. _____, Date _____, Siginture, _____

September, 2024

Addis Ababa, Ethiopia