# UTILIZATION OF EIGHT ANTENATAL CARE CONTACTS AMONG ADOLESCENT AND ADULT WOMEN AT JARAMOGI OGINGA ODINGA TEACHING AND REFERRAL HOSPITAL, KISUMU, KENYA

**BY**

**REUBEN NYONGESA KERE**

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**SCHOOL OF MEDICINE**

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## DECLARATION

### DECLARATION AND APPROVAL

I declare that this thesis is my original work, carried out under the guidance of my supervisors. I have not submitted this thesis elsewhere for an academic award or any other degree.

Sign: …….. Date: ……

**REUBEN NYONGESA KERE**

**MMED/SM/00005/021**

### APPROVAL

This thesis is submitted with our approval as university supervisors.

Sign: …….. Date: ……

**Dr. JACKTON OMOTO** MBChB, MMed Obs/Gyn

Consultant Obstetrician and Gynaecologist and Senior Lecturer, Department of Obstetrics and Gynaecology, Maseno University

Sign: …….. Date: ……

**Dr. PATRICK NYAMOHANGA MARWA** MBChB, MMed.Surg

Consultant General Surgeon and Lecturer, Department of Surgery and Anaesthesiology, Maseno University.

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## DEDICATION

I dedicate this thesis to God for His grace and strength throughout this journey. I also dedicate it to my parents and siblings for their love and support throughout my graduate studies.

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## ABSTRACT

Early antenatal care booking and compliance with eight antenatal care contacts improve positive pregnancy experiences and outcomes. In 2022, Kenya adopted the World Health Organization recommendation for eight antenatal care contacts. According to the Kenya Demographic and Health Survey 2022, 29% of women booked early for antenatal care, but only 4% completed all eight antenatal care contacts. Although the new model offers clear benefits, maintaining adherence remains difficult, as both adolescent and adult women encounter significant barriers to initiating early and completing the eight contacts. Factors influencing the timely initiation and frequency of the eight antenatal care contacts were investigated among adolescent and adult women at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu, Kenya. A comparative cross-sectional analytical study was conducted, and the theoretical framework was guided by Andersen and Newman's Behavioural Model for Health Services Utilization. The conceptual framework was constructed using variables from the literature review and the World Health Organization's 2016 recommendations for antenatal care. All women admitted to the maternity department were used as the target population. Stratified random sampling was used to recruit 73 adolescent and 219 adult women in a 1:3 ratio, resulting in a sample of 292 women, calculated using a formula for two proportions. Data was collected using a questionnaire and the antenatal booklet. Informed consent and data confidentiality were ensured. Data analysis was conducted using the Statistical Package for the Social Sciences version 26. Descriptive statistics were used for predisposing, enabling, and need factors. The Mann-Whitney U test and the chi-square test were used to compare the timing of the first antenatal care contact and the frequency of recommended antenatal care contacts between adolescent and adult women. To identify associated factors, multivariable logistic regression was used. The median and mean ages for adolescent women were 18.0 and 17.82 ± 1.14 years, respectively, and for adult women, 29.0 and 27.69 ± 4.68 years, respectively. Adult women had higher rates of marriage, urban residence, health insurance coverage, and autonomy in antenatal care decision making than adolescent women ($p<0.05$). Both adult and adolescent women booked antenatal care late, with a median of 18.00 weeks IQR 10-22 compared with 20.00 weeks IQR 12-24 ($p = .02$). Both adult and adolescent women had fewer than eight antenatal care contacts, with a median of 5 (IQR 3-6.5), compared to 4 (IQR 3-5.5) ($p = .04$). Only 10.5% of adult women completed eight antenatal care contacts compared with 8.2% of adolescent women. Early antenatal care booking was influenced by receiving antenatal care information from healthcare providers (*AOR* = 1.96; 95% CI [ 1.06, 3.71], $p = .036$). Women with high-risk pregnancies (*AOR* = 2.33, 95% CI [1.47, 3.91], $p = .005$) had more antenatal care contacts than those with low- or moderate-risk pregnancies. This study highlights a major challenge in achieving early antenatal care booking and completing eight antenatal contacts among adolescent and adult women. To improve antenatal care attendance at JOOTRH, we recommend expanding access to services for adolescent and adult women to address widespread late bookings. Building on the positive influence of healthcare provider education and countering misinformation from informal networks, providers should actively participate in community outreach programs. The facility should also establish routine tracking systems and arrange follow-ups by community health workers to sustain engagement and prevent high dropout rates. Finally, Women with low- or moderate-risk pregnancies should be encouraged to complete all eight scheduled contacts for preventive care, even if they have no active physical symptoms.

## TABLE OF CONTENTS

DECLARATION ..... ii

ACKNOWLEDGMENT ..... iii

DEDICATION ..... iv

ABSTRACT ..... v

LIST OF ABBREVIATIONS ..... x

OPERATION DEFINITION OF TERMS ..... xi

LIST OF TABLES ..... xv

LIST OF FIGURES ..... xvi

**CHAPTER ONE:INTRODUCTION ..... 1**

1.1 Background of the study ..... 1

1.2 Statement problem ..... 3

1.4 Null hypotheses ..... 5

1.5 Objectives ..... 5

1.5.2 Specific objectives ..... 5

1.6 Research Questions ..... 6

1.6.3 Factors related to when adolescent and adult women first have contact with antenatal care. ..... 6

**CHAPTER TWO:LITERATURE REVIEW ..... 7**

2.1 Introduction ..... 7

2.2 Timing of the first antenatal care contact ..... 7

2.3 Frequency of recommended antenatal care contacts ..... 8

2.3.1 Global and regional statistics on completing eight antenatal care contacts ..... 8

2.4 Determinants of antenatal care utilization among adolescent and adult women ..... 10

2.5 Summary of the literature review and identified gaps ..... 12

2.6 Theoretical framework ..... 13

2.7 Conceptual framework ..... 14

**CHAPTER THREE:RESEARCH METHODOLOGY ..... 15**

3.1 Study design ..... 15

3.2 Study site and setting ..... 15

3.3 Study population ..... 15

3.4 Selection criteria ..... 15

3.5Sampling method ..... 16

3.6Recruitment of participants ..... 17

3.7 Study procedures ..... 18

3.8Data collection tools and procedures ..... 19

3.9Pilot study ..... 20

3.9.2 Pilot study findings ..... 20

3.11 Data analysis ..... 21

3.12 Data quality assurance ..... 22

3.13 Study strengths, limitations, and delimitations ..... 23

3.14 Ethical considerations ..... 25

**CHAPTER FOUR:RESULTS ..... 26**

4.1 Study flow chart ..... 26

4.2 Predisposing Factors ..... 27

4.3 Enabling Factors ..... 28

4.4 Need Factors ..... 30

4.4.1 Medical and surgical conditions ..... 30

4.4.2 Previous obstetrical and gynaecological conditions ..... 30

4.4.3 Present pregnancy conditions ..... 32

4.4.4 Modified Coopland antenatal risk score based on the need factors ..... 33

4.5 Comparison of when women have their first antenatal care contact. ..... 33

4.5.1 Analysis of the timing of the first antenatal care contact using measures of central tendency and the Mann-Whitney U test. ..... 33

4.5.2 Chi-square test for the timing of the initial antenatal care contact ..... 34

4.6 Comparison of how often the recommended antenatal care contacts occur ..... 34

4.6.1 Analysis of central tendency measures and Mann-Whitney U test for the total recommended antenatal contacts. ..... 34

4.6.2 Analysis of recommended antenatal care contact frequencies using chi-square test ..... 35

4.7 Factors related to when adolescent and adult women have their first antenatal care contact. ..... 35

4.8 Factors related to how often adolescent and adult women attend recommended antenatal care contacts. ..... 37

**CHAPTER FIVE:DISCUSSION ..... 38**

5.1 Predisposing, enabling, and need factors ..... 38

5.2 Comparison of when women have their first antenatal care contact. ..... 42

5.3 Comparison of how often the recommended antenatal care contacts occur ..... 44

5.4 Factors related to when adolescent and adult women have their first antenatal care contact. ..... 45

5.6 Clinical significance of the study results. ..... 48

**CHAPTER SIX:SUMMARY, CONCLUSION, AND RECOMMENDATION ..... 50**

6.2 Conclusion ..... 50

6.2.1 Timing of first antenatal care contact between adolescent and adult women ..... 50

6.2.2 Frequency of recommended antenatal care contacts attended ..... 51

6.2.3 Factors associated with the timing of first antenatal care contact ..... 51

6.2.4 Factors associated with the frequency of recommended antenatal care contacts ..... 51

6.3 Recommendations ..... 51

6.3.1 Timing of first antenatal care contact between adolescent and adult women ..... 51

6.3.2 Frequency of recommended antenatal care contacts attended ..... 52

6.3.3 Factors associated with the timing of first antenatal care contact ..... 52

6.3.4 Factors associated with the frequency of antenatal care contacts ..... 52

**REFERENCES ..... 53**

**APPENDICES ..... 58**

## LIST OF ABBREVIATIONS

**AOR:** Adjusted odds ratio

**ANC:** Antenatal Care

**CI:** Confidence Interval

**FANC**: Focused Antenatal Care

**HIV**: Human Immunodeficiency Virus

**ISERC:** Institutional Scientific and Ethics Review Committee

**JOOTRH**: Jaramogi Oginga Odinga Teaching and Referral Hospital

**KDHS**: Kenya Demographics and Health Survey

**KIHBS:** Kenya Integrated Household Budget Survey

**KNBS:** Kenya National Bureau of Statistics

**LMIC**: Low-middle-income countries

**MCH:** Mother and Child Health

**NACOSTI:** National Commission for Science, Technology and Innovation

**SDGs**: Sustainable Development Goals

**SSA**: Sub-Saharan Africa

**STIs:** Sexually transmitted infections

**UNICEF**: United Nations Children's Fund

**WHO**: World Health Organization

**ODK App:** Open Data Kit application

**SPSS:** Statistical package for social sciences

## OPERATION DEFINITION OF TERMS

**Adolescent:** A woman between the ages of fifteen and nineteen.

**Adolescent woman:** Although the WHO defines adolescence as ages 10–19, this study focuses on those aged 15–19 to align with the Kenya Demographic and Health Survey (KDHS) and health studies in Sub-Saharan Africa (SSA), which commonly use this age range when examining adolescent pregnancy and maternal outcomes.

**Adolescent pregnancy:** A pregnancy happening in a woman between the ages of fifteen and nineteen.

**Adult woman:** A woman between the ages of twenty and forty-nine who has recently given birth.

**Adult pregnancy:** A pregnancy occurring in a woman aged twenty to forty-nine years.

**Antenatal care:** The healthcare a woman receives in an antenatal clinic to monitor fetal-maternal health.

**Antenatal care contact:** A documented, in-person interaction recorded in the Kenya Mother and Child Health Handbook. This record is considered the gold standard for data validity because it is more reliable than remote digital consultations and confirms that antenatal physical assessments and medications were provided.

**Clinical stability of participant:** A woman who is conscious and oriented in person and place, with vital signs within normal range including systolic blood pressure (90 to 139 mmHg), diastolic blood pressure (60 to 89 mmHg), heart rate (60 to 100 beats per minute), temperature (36.1 to 37.2°C), oxygen saturation > 94%, and a respiratory rate (12 to 20 breaths per minute).

**Early ANC initiation:** The initial antenatal care contact within the first 12 weeks of pregnancy.

**Gestational age at first antenatal care contact:** The duration of pregnancy in weeks at the time the woman attended her first antenatal care contact. Gestational age was calculated

starting from the first day of the most recent menstrual period. Women were provided with a physical calendar to help them recall dates, and gestational age was calculated using a pregnancy wheel. This method was chosen because it is a reliable alternative to pregnancy dating among women who book late or cannot afford a first-trimester ultrasound.

**Late booking of antenatal care:** The first antenatal care appointment that happens after the first trimester.

**Partner:** A man who has married the participant and, despite the legal status of the marriage, influences the woman's attendance at antenatal care contacts.

**Participant:** A woman aged fifteen to forty-nine years who has delivered and is eligible to participate in the study.

**Residence:** Where a woman lives, as defined by the 2018 Kenya Urban Institutional Development Strategy, the 2024 Kenya Informal Settlements Improvement Project (KISIP 2), and the Three Delays Model of maternal health.

**Urban Residence:** A gazetted area in Kisumu Central, Kisumu East, or Kisumu West where a woman lives. These geographical areas include Railways, Migosi, Shaurimoyo, Bandani, Nyawita, Kaloleni, Milimani, Kondele, Nyalenda A and B, Kajulu, Kolwa East, Manyatta A and B, Nyalenda A, and Kolwa Central.

**Rural residence:** A place in a peripheral sub-county where a woman lives, such as parts of Seme, Nyakach, or Muhoroni, with travel times exceeding 30 minutes to reach JOOTRH.

**The recommended number of antenatal care contacts:** Eight antenatal appointments a pregnant woman should attend**.**

**Woman:** A female aged fifteen to forty-nine years who has recently given birth and has voluntarily agreed to this study.

**The timing of first antenatal care contact:** The time during pregnancy at which a woman attends her first antenatal appointment, as recorded in her antenatal booklet.

**Frequency of recommended ANC contacts:** The number of times a pregnant woman attends the antenatal clinic, as documented in her antenatal booklet.

**Predisposing factors:** Pre-existing individual characteristics associated with antenatal attendance.

**Maternal age:** A participant's age in years at the time of the study, categorized as adolescent (15-19 years) or adult (20-49 years)

Marital Status: The participant's self-reported marital status when data were collected, categorized as married or single.

**Parity:** The number of deliveries, whether dead or alive, a woman has ever had after 28 weeks of pregnancy.

**Maternal educational level:** A woman's highest level of education attained.

**Religion:** A woman's religious affiliation.

**Marital Status:** The participant's self-reported marital status when data were collected, categorized as married or single.

**Enabling factors:** Resources or environmental factors that influence the pregnant woman's access to and use of ANC services.

**Occupation:** A woman's primary means of livelihood.

**Residence:** A woman's permanent place of living.

**Partner's occupation:** The primary work of the woman's marital partner.

**Partner educational level:** The highest level of education attained by the woman's partner.

**Household income:** The combined total monthly earnings of both the woman and her partner in the household. The Kenya National Bureau of Statistics and the Kenya Integrated Household

Budget Survey categorize household earnings by urban and peri-urban areas: the poor earn less than Ksh 8006, and the lower-middle-income group ranges from Ksh 8006 to Ksh 46355.

**Decision-maker for ANC attendance:** Any person close to the woman who influences her antenatal care attendance.

**Waiting time at the clinic:** The time in hours spent at the antenatal clinic.

**Source of ANC information:** The source from which a woman receives information about antenatal care attendance.

**Healthcare insurance cover:** A paid health policy that caters to a woman's antenatal care services.**Need factors:** Factors that influence a pregnant woman's perception of the importance of attending ANC.

**Pregnancy risk:** A woman's overall score for perinatal complications. We assessed pregnancy risk using the Modified Coopland Antenatal Risk Scoring System.

## LIST OF TABLES

Table 4.1: Predisposing factors……...…….22
Table 4.2:Enabling Factors……..24
Table 4.3:Medical and Surgical Conditions…….25
Table 4.4: Previous Obstetrical and Gynaecological Conditions .....26
Table 4.5: Present Pregnancy Conditions.....27
Table 4.6: Risk Category of the Pregnancy Based on the Need Factors.....28
Table 4.7: Analysis of the timing of first antenatal care contact using measures of central tendency and the Mann-Whitney U test for adolescent women (15-19 years) versus adult women (20-49 years) at JOOTRH……...…….……28
Table 4.8: Chi-square test comparing the timing of the first antenatal care contact between adolescent women (15-19 years) and adult women (20-49 years) at JOOTRH……29
Table 4.9: Measures of central tendency and Mann-Whitney test the overall comparison of the frequency of recommended antenatal contacts……..….29
Table 4.10: Chi-square test comparing the frequency of recommended antenatal contacts between adolescent (15-19 years) and adult women (20-49 years) at JOOTRH……..…….30
Table 4.11: Logistic regression analysis of factors influencing the timing of the initial antenatal care contact among adolescent women (15-19 years) and adult women (20-49 years) at JOOTRH….....31
Table 4.12: Logistic regression analysis of factors associated with the frequency of recommended antenatal care contacts among adolescent women (15-19 years) and adult women (20-49 years) at JOOTRH…….....33
Table A.1: Extraction tool from Mother and Child Health Handbook…….53
Table A.2: Modified Coopland Antenatal Risk Scoring System……..61

## LIST OF FIGURES

Figure 2.1: Theoretical Framework .....11

Figure 2.2: Conceptual Framework .....15

Figure 3.1: Study Flow Chart.....21

Figure A.1: Location of JOOTRH in Kisumu City in Kisumu County, Kenya……...60

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the study

Antenatal care (ANC) is a specialized healthcare provided by healthcare workers at antenatal clinics to pregnant women to protect fetomaternal health (Manyeh et al., 2020). According to the 2016 World Health Organization (WHO) ANC model, every woman who is pregnant is prone to developing complications. The success of a safe and good pregnancy journey depends on early booking and achieving eight ANC contacts (WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience, n.d.). Timely initiation of antenatal care and completing all eight contacts during pregnancy reduces adverse fetomaternal outcomes. Additionally, it helps healthcare providers identify problems early (WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience, n.d.). While the older 2002 focused antenatal care (FANC) defined an appointment to the ANC clinic as an "antenatal visit", the 2016 ANC model changed it to an "antenatal care contact" to promote positive experiences for women (WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience, n.d.). When pregnant women attend ANC optimally, they receive essential health education, STI and HIV screening, and improved hemoglobin levels through timely iron-folate supplementation (Burayu & Degefa, 2024).

The new ANC model also lowers perinatal mortality (WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience, n.d.). If antenatal care attendance, including early booking, reaches 90% in Sub-Saharan Africa (SSA), it would prevent 160,000 newborn deaths annually (Sserwanja et al., 2022). However, in SSA, 45% of women fail to initiate care

as recommended, contributing to 14 million women having pregnancy-related complications annually(Andegiorgish et al., 2022).

About 9% of women in SSA attend all eight ANC contacts, despite most countries in the region having launched the updated WHO ANC guidelines within the past ten years (Aboagye et al., 2025). Kenya has some of the region's highest late-booking rates, at 72.2%, with a median time to first ANC contact of four months (Kase et al., 2025). Early ANC booking is the strongest predictor of achieving eight ANC contacts in Ethiopia, with women who book early more likely to meet this target [AOR = 29.09] (W. Y. Sisay et al., 2025).

Younger women aged 15–24 years in SSA have higher odds of booking ANC late compared with older women [AOR = 1.12] (Mare et al., 2025). Similarly, in Rwanda, women aged 15–19 years are less likely to complete eight contacts [aOR = 0.64] (Sserwanja et al., 2022). In The Gambia, adolescent women do not attain the eight ANC contacts because they lack pregnancy experience and feel stigmatized (Daniels-Donkor et al., 2024). In Uganda, older women achieve eight ANC contacts, but most of them have false confidence from previous pregnancies, especially grand multiparous women, making them have 63% lower odds of compliance (Lee et al., 2024).

In SSA, women with school attendance are more than five times as likely to complete the recommended eight ANC contacts (Aboagye et al., 2025). In Uganda, health insurance provides women with financial empowerment, increasing the likelihood that they will attend at least 8 ANC contacts and making them twice as likely to do so (Lee et al., 2024). While media exposure encourages early booking and achieving eight ANC contacts, internet use specifically increases the odds of reaching eight ANC contacts in Rwanda (Sserwanja et al., 2022). Interestingly, in Kenya, rural women may start ANC earlier due to improved outreach

programs by antenatal care providers [AHR=1.22] (Kase et al., 2025). However, women in urban areas of SSA typically have higher overall odds of completing the recommended eight ANC contacts [AOR=1.71] (Mare et al., 2024).

A significant knowledge gap currently exists about how these determinants affect utilization of ANC contacts in tertiary health hospitals. Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) is the primary maternal care center in Kisumu and Western Kenya. However, there is a lack of research comparing the factors affecting early ANC booking and the completion of the recommended number of antenatal care contacts among adolescent and adult women at this hospital. Most existing research treats pregnant women as a single group, but the factors affecting the booking and antenatal care contacts probably vary greatly between the two groups. By investigating these determinants at JOOTRH, this study aims to provide evidence-based information to improve ANC utilization among adolescent and adult women.

### 1.2 Statement problem

Between the 2016 WHO guidelines on ANC and Kenyan ANC practices, significant differences exist. The 2022 Kenya Demographic and Health Survey (KDHS) found that only 4% of women had eight ANC contacts, whereas another study indicated that fewer than 1% completed all eight contacts (*Kenya Demographic and Health Survey, 2022*, 2023; Shibeshi et al., 2025). Compared with other countries in Eastern Africa, Kenya has the highest late-booking rate at 72.2%, with first contact delayed until the fourth month of pregnancy (Kase et al., 2025).

Younger women aged 15–24 years book later than older women (Mare et al., 2025). Inconsistencies exist in the utilization patterns of ANC attendances, with the 2022 KDHS showing that women aged 35 to 49 years book earlier than those who are 15 to 24 years [AHR:

0.83], confirming that age influences antenatal care attendance in complex ways throughout the reproductive ages (Kase et al., 2025). Due to lower educational levels, lack of prior ANC experience, and societal stigma, adolescent women are often excluded from the full clinical benefits of the current ANC model (Daniels-Donkor et al., 2024; Sserwanja et al., 2022).

Within the Kisumu region, most existing research has been conducted under the old ANC model. This has led to a lack of evidence on the determinants of early booking and of the eight ANC contacts among adolescent and adult women under the new model. The lack of age-specific data at referral hospitals such as JOOTRH means antenatal care efforts are broad and fail to target the factors that prevent adolescent and adult women from adhering to the new ANC model.

### 1.3 Justification

The new 2016 ANC model plays an important role in attaining Sustainable Development Goal (SDG) 3, therefore improving pregnancy outcomes and reducing maternal and neonatal mortality rates. Although Kenya launched this new ANC model in 2022, its utilization remains low.

This study is important because it goes beyond overall antenatal care utilization data to examine age-specific factors influencing ANC use. We use a comparative cross-sectional analysis at JOOTRH to identify the specific predisposing, enabling, and need factors that affect adolescents and adults differently.

The results provide evidence to healthcare providers and policymakers in Kisumu County and across Western Kenya to develop age-appropriate ANC contact strategies. It also closes the gap between antenatal care policy and practice, ensuring that the 2016 antenatal care guidelines lead to better pregnancy outcomes in the region.

## 1.4 Null hypotheses

### 1.4.1 Null hypothesis 1

There is no difference in the timing of the first antenatal care contact between adolescent and adult women.

### 1.4.2 Null hypothesis 2

There is no difference in the frequency of the recommended antenatal care contacts between adolescent and adult women.

## 1.5 Objectives

### 1.5.1 Broad objective

**To investigate factors influencing the utilization of eight antenatal care contacts among adolescent and adult women at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu, Kenya.**

### 1.5.2 Specific objectives

1. To compare the timing of the first antenatal care contact between adolescent and adult women.
2. To compare the frequency of the recommended antenatal care contacts attended between adolescent and adult women.
3. To determine the factors associated with the timing of the first antenatal care contact among adolescent and adult women.
4. To determine the factors associated with the frequency of the recommended antenatal care contacts attended among adolescent and adult women.

## 1.6 Research Questions

### 1.6.1 Timing of first antenatal care contact

1. How does the median gestational age at the first antenatal care contact compare between adolescent and adult women?

### 1.6.2 Frequency of the antenatal care contacts attended

1. What is the difference in the mean number of the recommended antenatal care contacts attended between adolescent and adult women?

### 1.6.3 Factors related to when adolescent and adult women first have contact with antenatal care.

1. What are the factors associated with the timing of the first antenatal care contact between adolescent and adult women?

### 1.6.4 Factors related to how often adolescent and adult women attend recommended antenatal care contacts.

1. What are the factors that influence the total number of ANC contacts attended by adolescent and adult women?

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

Optimal usage of prenatal attendance is important for improving pregnancy outcomes and reducing both maternal and fetal mortality among pregnant adolescents and adult women (Hlongwane et al., 2021). Good antenatal health care prevents most pregnancy-related deaths by detecting issues early (Boah et al., 2024). Women in SSA are not fully adhering to the new WHO ANC model (Tessema et al., 2022). Early ANC booking and achieving eight ANC contacts are influenced by the woman's age, parity, level of education, place of residence, occupation, religion, and pregnancy history (Tikmani et al., 2019).

## 2.2 Timing of the first antenatal care contact

Early prenatal attendance is important for ensuring optimal health outcomes during pregnancy and for timely diagnosis and treatment of any complications that might arise (Abdo et al., 2023). However, many women present for their first antenatal contact with a pregnancy that is already compromised or in danger (Ambaye et al., 2023).

Starting ANC early enables the identification and prevention of pre-existing medical and obstetric conditions (Ambaye et al., 2023). Early booking helps prevent, diagnose, and treat sexually transmitted infections, and lowers the risk of a mother transmitting HIV to her fetus. (Ngambi et al., 2022). Similarly, it improves haemoglobin levels through diet, malaria prevention and treatment, and iron and folate supplementation (Alhassan et al., 2024). However, late booking increases the risk of poor perinatal outcomes, including poor intrauterine fetal growth and intrapartum death of neonates (Anaba et al., 2022).

Late initiation of ANC ranges from 27.5% in developed countries to 88% in developing countries (Arefaynie et al., 2022). In Ethiopia, most women book late and also do not complete the eight ANC contacts (Yunitasari et al., 2023). The timing of a woman's first prenatal contact after the first trimester is affected by her education, socioeconomic background, family support, and prior ANC experience (Yehualashet et al., 2022).

### 2.3 Frequency of recommended antenatal care contacts

The World Health Organization recommended a new antenatal care model in 2016, with eight ANC contacts, to reduce perinatal mortality and improve the pregnancy experience (WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience, n.d.). This model replaced the previous FANC model, which had only four "visits". The new model emphasizes more frequent appointments, changing the terminology from 'visits' to 'contacts' to promote high-quality interaction between the woman and the healthcare provider. The recommended schedule's first contact occurs within the first 12 weeks of pregnancy, followed by two contacts between weeks 13 and 27 and five contacts between weeks 28 and 40, with delivery expected by week 41 (WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience, n.d.). In SSA, uptake of this new antenatal care model is low, with most countries reporting completion rates below 10% (Aboagye et al., 2025; Tessema et al., 2022).

#### 2.3.1 Global and regional statistics on completing eight antenatal care contacts

In SSA, completion rates for eight ANC contacts are from 8.9% to 9.9% (Aboagye et al., 2025; Mare et al., 2024). While regional variation exists, countries such as Sierra Leone and Ghana have higher prevalence of 26.1% and 38.4% respectively, with Burkina Faso recording rates below 1% (Mare et al., 2024; Shibeshi et al., 2025). In East Africa, compliance rates range from 0.8% to 10.4% in Kenya and Ethiopia, respectively, indicating a persistent gap between

the new ANC model and national antenatal practices across the region (Mare et al., 2024; Wakjira et al., 2025).

### 2.3.2 Determinants of completing eight antenatal care contacts

Adolescent women (aged 15–19) have a lower prevalence of the recommended number of antenatal care contacts than adult women, particularly those aged 35–39 (Aboagye et al., 2025). Level of education and household income influence compliance with achieving full antenatal care contacts. Women with high educational attainment are more likely to complete all the antenatal care contacts and tend to have the autonomy to prioritize ANC clinic appointments. However, residing in rural areas and lacking health insurance significantly reduces the odds of completing eight ANC contacts due to transportation costs and financial challenges (Shibeshi et al., 2025).

Women who start prenatal care within the first twelve weeks of pregnancy are more likely to complete all eight ANC contacts (G. Sisay & Mulat, 2023). Additionally, women with prior pregnancy complications or pre-existing medical conditions have a higher perceived risk of pregnancy, which results in them complying with achieving eight ANC contacts, likely due to a heightened perception of risk. Higher parity is associated with fewer antenatal care contacts, as multiparous women rely on prior knowledge of antenatal care attendance or become overwhelmed by increased child-care burdens, at the expense of attending antenatal clinics (Leeet al., 2024; Mare et al., 2024).

Adult women might have financial stability and autonomy in deciding whether to attend clinics. However, adolescents experience social stigma and negative experiences with healthcare providers that result in poor compliance with eight ANC contacts (Golestani et al., 2025).

### 2.4 Determinants of antenatal care utilization among adolescent and adult women

Based on Andersen and Newman's Behavioural Model (ANBM) for Health Services Utilization, we categorize these factors into predisposing, enabling, and need factors (K. S. Andersen et al., 2005; R. M. Andersen, 2008).

#### 2.4.1 Predisposing Factors

Predisposing factors are socio-demographic characteristics that influence one's behaviour and therefore affect one's appointments with ANC contacts (K. S. Andersen et al., 2005; R. M. Andersen, 2008). Maternal age is an important predisposing factor, as the health needs and behaviours of adolescent and adult women vary. Due to several social and economic factors, adolescent women book late and attend fewer ANC contacts than recommended (Andegiorgish et al., 2022).

Marital status affects attendance at ANC, with married women being in a better position because they have a better social support system. However, single women face stigma and lack support (Kareem et al., 2021). Parity also influences ANC utilization, with multiparous women being more self-efficacious, which makes them less likely to book early and attend adequate ANC contacts. In contrast, primigravida women book ANC early because of the uncertainty they feel and the need for regular updates on the progress of their pregnancy (Manyeh et al., 2020). Education increases knowledge and awareness of antenatal care attendance, and such women tend to make informed health decisions throughout pregnancy (Ahmed et al., 2024).

### 2.4.2 Enabling Factors

Enabling factors are personal and societal resources that enable or limit antenatal care attendance (K. S. Andersen et al., 2005; R. M. Andersen, 2008). Because of their financial stability and access to antenatal care, employed women or those with higher incomes book ANC early and achieve the recommended number of antenatal care contacts (Ngowi et al., 2023). Additionally, women residing in urban areas have better access to antenatal clinics than those residing in rural areas, who occasionally face transportation challenges (Abdiwali et al., 2024).

Household decision-makers significantly influence the decision to attend ANC, and, in most cases, the husband or other household members make it (Al-Mutawtah et al., 2023). Women who receive better emotional support in their social networks attend more ANC contacts (Kareem et al., 2021). Also, increased antenatal attendance is observed among women who are aware of the benefits of ANC and consider themselves vulnerable to pregnancy complications (Andegiorgish et al., 2022). Longer distances to antenatal care clinics, occasionally observed in rural areas, and increased waiting times at antenatal clinics, cause most women to book late and attend fewer antenatal care contacts (Andegiorgish et al., 2022).

### 2.4.3 Need factors

Need factors refer to either perceived or evaluated pregnancy risks for antenatal attendance (K. S. Andersen et al., 2005; R. M. Andersen, 2008). Awareness of pregnancy danger signs empowers women to recognize potential antenatal complications and risks, increasing the likelihood of early booking and achieving full antenatal care contacts to monitor their feto-maternal health (Anis et al., 2022). Women with planned pregnancies book early and achieve full attendance at antenatal care, whereas those who do not intend to become pregnant do not (Andegiorgish et al., 2022). Women who believe that early booking and attending eight ANC

contacts are beneficial for good perinatal outcomes tend to adhere to the WHO ANC model (Comfort et al., 2022).

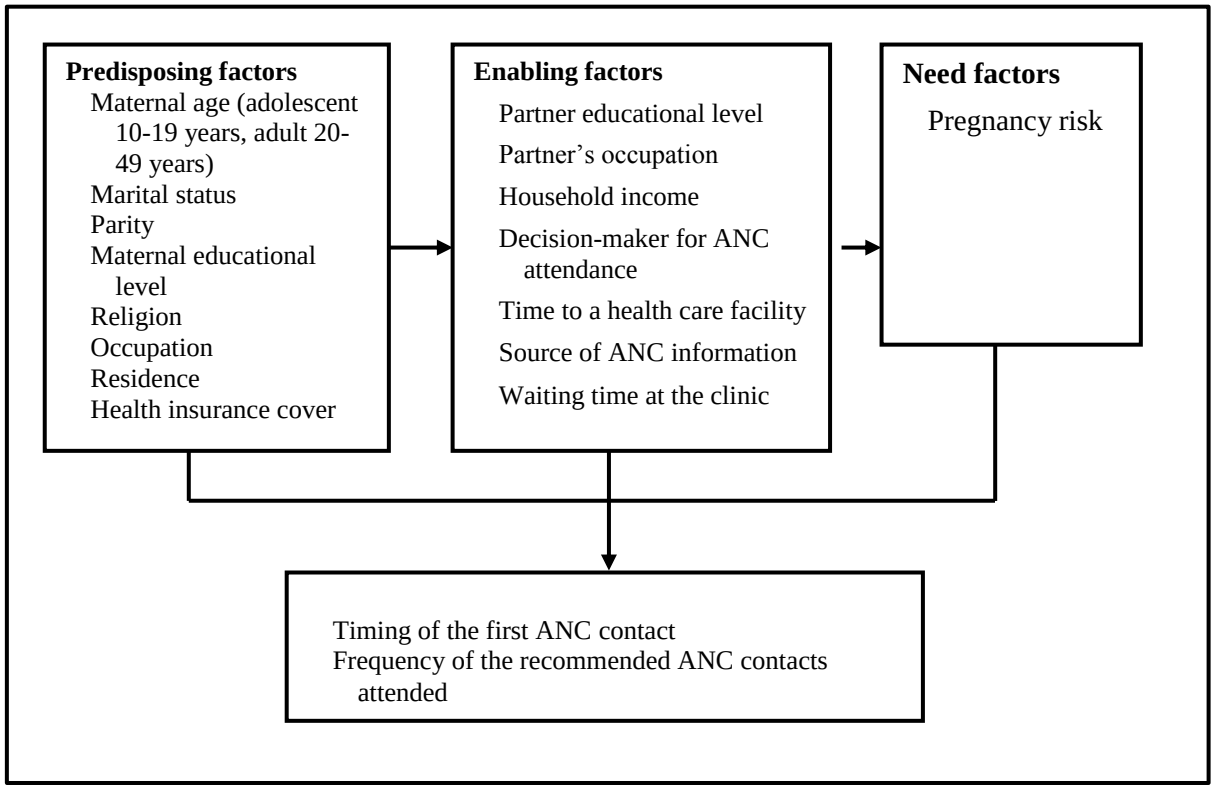
### 2.5 Summary of the literature review and identified gaps

This literature review explains the determinants of early booking and attendance at full antenatal care contacts among adolescent and adult women. Despite the recognized benefits of optimal use of antenatal care contacts in improving pregnancy outcomes, the literature review identifies gaps in implementation in SSA, where adherence to the new ANC model remains poor. The underutilization of antenatal care attendance is attributable to socio-demographic factors, obstetric history, social support networks, and barriers to healthcare access.

Few studies have compared ANC initiation and completion rates between adolescent and adult pregnant women, particularly in the context of the 2016 WHO antenatal care guidelines, which recommend at least eight ANC contacts. While existing studies focus mostly on SSA, Kenya, particularly in Kisumu County, has made little progress in maternal health. This gap highlights the need for localized research into the predisposing, enabling, and need factors influencing early booking and the achievement of the eight ANC contacts among adolescent and adult women.

## 2.6 Theoretical framework

Based on Andersen and Newman's Behavioural Model (ANBM) of Health Services Utilization (K. S. Andersen et al., 2005; R. M. Andersen, 2008), a theoretical framework was adopted to understand the factors influencing early booking and frequency of eight ANC contacts among adolescent and adult women (Figure 2.1).



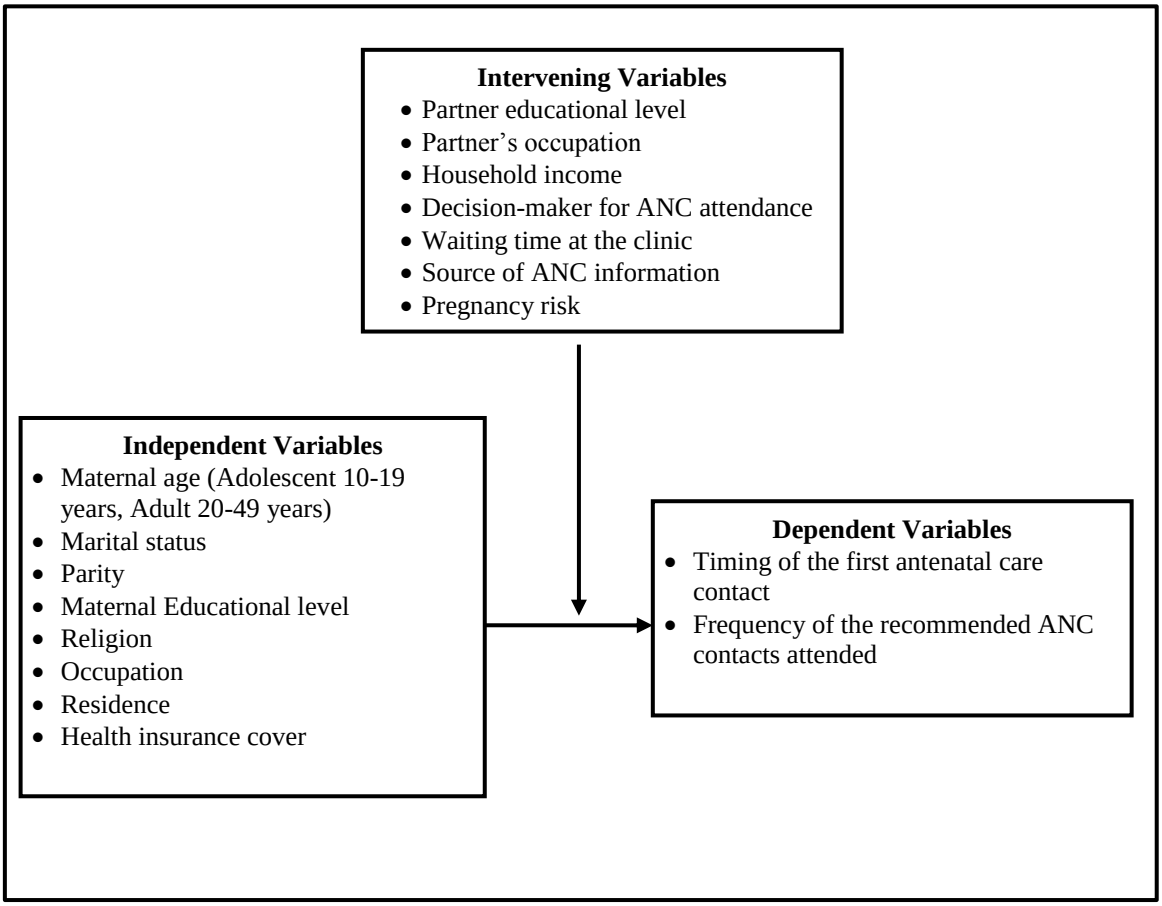

**Adoptin Figure 2.1:** ***Theoretical framework (Andersen & Newman, 2005; Andersen, 2008)***

g the ANBM of Health Services Utilization goes beyond demographics and ANC use by including predisposing, enabling, and need factors. This theoretical framework helps identify and understand the differences in ANC use between adolescent and adult women.

## 2.7 Conceptual framework

To understand the factors influencing ANC utilization among adolescent and adult women, this study used a conceptual framework comprising independent, intervening, and dependent variables (Figure 2.2).

Figure 2.2:*Conceptual framework*



# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Study design

A comparative cross-sectional analytical design was used to investigate differences in early ANC booking and the frequency of eight ANC contacts between adolescents (15-19 years) and adult women (20-49 years) attending JOOTRH.

## 3.2 Study site and setting

The study was conducted from April 14, 2025, to July 18, 2025, at JOOTRH in Kisumu, Kenya. Its maternity department admits an average of 450 women per month.

Because JOOTRH is a national referral and teaching hospital, a broad patient population attends the maternity department, allowing a more generalizable investigation of early prenatal booking and completion of the eight ANC contacts. The maternity department was selected as the study setting because women there are closer to delivery, which ensured clearer recall of their ANC attendance.

## 3.3 Study population

The target population was all women admitted to the maternity department at JOOTRH.

## 3.4 Selection criteria

### 3.4.1 Inclusion criteria

1. Maternal age: adolescent women aged 15 to 19 years and adult women aged 20 to 49 years.
2. Admitted to the maternity department.
3. Women who were 24 hours post-delivery.

4. Women with an antenatal booklet documenting their antenatal appointments.
5. Voluntary agreement to provide informed consent.

### 3.4.2 Exclusion criteria

1. Clinically unstable women.
2. Women whose self-reported LNMP showed a discrepancy when we cross-referenced with the dates recorded in the antenatal booklet.

## 3.5 Sampling method

### 3.5.1 Sample size

The sample size was calculated to achieve sufficient statistical power to detect significant differences in ANC utilization between adolescent and adult women. The main outcomes measured were the gestational age at first ANC contact and the total number of recommended ANC contacts attended. The Lwanga and Lemeshow formula was used to compare proportions between two groups of adolescent and adult women (Lwanga & Lemeshow, 1991).

$$n = \frac{(Z\alpha/2 + Z\beta)^2 * (p1(1-p1) + p2(1-p2))}{(p1 - p2)^2}$$

Where:

- n: Minimum sample size per group (before adjusting for ratio).
- Zα/2: Standard normal deviate for 95% confidence level (1.96).
- Zβ: Standard normal deviate for 80% power (0.84).
- p1: Proportion of adolescents booking ANC early (0.194).
- p2: Proportion of adults booking ANC early (0.375).

The minimum sample size was calculated using the two-population proportion formula to detect an 18.1% difference in early ANC initiation. The proportions of women booking early for ANC were assigned as 19.4% (P1) for adolescents and 37.5% (P2) for adults. These figures were based on findings by Fagbamigbe et al. (2021) and Adedini et al. (2022), respectively.

Using 80% statistical power and a 95% confidence level (1.96), the minimum sample size was calculated to be 264. Thereafter, this was increased by 10% to 292 to account for potential attrition, nonresponse, and incomplete questionnaires.

### 3.5.2 Stratification and ratio

The women were stratified into 73 adolescents (15-19 years) and 219 adults (20-49 years). A 1:3 ratio of adolescent to adult women was used, based on admission trends in the maternity department over the preceding six months, from October 2024 to March 2025. Following the stratification, an online random number generator was randomly used to ensure proportional representation.

### 3.5.3 Randomization and generation of sampling numbers

These steps were followed to eliminate selection bias during the stratified random sampling:

1. Each morning, using the admission register in the maternity department, a list of all eligible women was compiled, and each was assigned a unique serial number.
2. Using an online application at https://www.randomizer.org, a sequence of numbers within the range of that day's assigned serial numbers was generated.
3. Women were recruited using the assigned serial numbers that matched the generated random numbers. Eligible women were recruited until the daily recruitment target for each maternal stratum was reached.

## 3.6 Recruitment of participants

Only women who were at least 24 hours post-delivery and clinically stable were invited to participate in the study. A woman's clinical stability was confirmed by reviewing vital signs in the nursing observation charts and consulting the ward nurse-in-charge to ensure that no urgent clinical interventions were underway. Then, the study objectives and eligibility criteria were

explained, and for each eligible woman, the study questionnaire and data extraction tool were completed using the online application OnaData at https://ona.io/home/. Confidentiality was maintained for each eligible woman, and she was informed that she could withdraw from the study at any time.

### 3.7 Study procedures

No invasive procedures were performed during this study. All potential participants were screened for eligibility. Afterward, data were collected for all the eligible women using a data extraction form and the antenatal booklet. While an obstetric ultrasound within the first 12 weeks of pregnancy is the gold standard for pregnancy dating, its usefulness was limited in this study population due to late ANC booking and most women's inability to afford an obstetric ultrasound. Last normal menstrual period-based dating, when cross-checked with clinical records in the MCH handbook, aligns closely with ultrasound dating, with a difference of only 0.2 to 2.8 days, and offers a suitable measure of gestational age when first-trimester ultrasound is unavailable (Macaulay et al., 2019). The literature was reviewed to guide the questionnaire's design and identify variables relevant to the study's objectives and research questions.

### Measurement of study variables

The Andersen Behavioral Model of Health Services Use was used to categorize variables into outcome and independent variables.

**Independent variables: Predisposing factors:** Age, Marital status, Parity, Maternal educational level, Religion. **Enabling factors:** Occupation, Residence, Decision-maker for ANC attendance, Waiting time at the clinic, Partner's educational level, Health insurance cover, Source of ANC information. **Need factors:** Pregnancy risk.

**Outcome variables:** The timing of the first antenatal care contact and the frequency of the recommended ANC contacts attended.

### 3.8 Data collection tools and procedures

Data for this study were collected using two main tools: the antenatal booklet and a questionnaire.

#### 3.8.1: Mother and child health handbook

With the woman's consent, the antenatal booklet was reviewed on Pages 7 and 10 to extract data on ANC utilization, particularly the gestational age in weeks at the time of first antenatal care contact (booking) and the frequency (total number) of the ANC contacts attended throughout the pregnancy.

#### 3.8.2 Development of the questionnaire

The literature review was conducted to inform the design of a questionnaire, which was created in Kiswahili and English. It included ***predisposing factors*** such as age, marital status, parity, and education level. It also included ***enabling factors*** such as occupation, residence, decision-maker for ANC attendance, and waiting time at the clinic. The ***need factors,*** such as pregnancy risk, were included. The questionnaire was categorized using the Modified Coopland antenatal risk scoring system (Biradar et al., 2024).

### 3.9 Pilot study

#### 3.9.1 Pilot study sample size

A pilot test was conducted with a 5% sample from both adults and adolescents (n=15; 11 adults and 4 adolescents) to identify unclear questions, refine the questionnaire's response options, and improve the extraction tool.

#### 3.9.2 Pilot study findings

The pilot study findings were not included in the thesis results.

Some participants found the term "ANC Contact" confusing, as it was used interchangeably with "ANC Visit". Based on this, additional training was provided to research assistants, clarifying that contacts include any clinical interaction related to ANC.

The section on the Modified Coopland Risk Score was moved to the end of the questionnaire to facilitate better rapport-building before asking about antenatal clinical history.

The average completion time for each woman was 15 minutes, which is considered suitable and unlikely to cause fatigue.

Inconsistencies emerged between self-reported LNMP and the antenatal booklet, prompting a redefinition of the exclusion criteria.

It was found that approaching participants within 12 to 24 hours post-delivery was difficult, so the operational definition of a woman’s clinical stability was revised, and the time threshold was set at 24 hours.

### 3.10 Data management

Before data collection began, two research assistants received training to ensure they understood the study protocol, data collection procedures, and ethical considerations.

Data was verified for completeness, quality, and ethical compliance prior to entry into a password-protected database.

To protect the women's anonymity during analysis and reporting, a data-coding system was used that linked women to their data**.**

Data access was limited to members of the study team

### 3.11 Data analysis

Using the Open Data Kit (ODK) mobile application, data was collected and uploaded to the OnaData server.

Afterward, it was cleaned, and IBM SPSS Statistics (Version 26.0) was used for analysis.

#### 3.11.1 Descriptive statistics

Descriptive statistics summarized the predisposing, enabling, and need factors among the participants. Frequencies and percentages were used for categorical variables. Measures of central tendency and the Mann-Whitney test were used for continuous variables such as gestational age and number of contacts.

- **To test null hypothesis 1:** The first antenatal care contact was analyzed both as a categorical variable (Early initiation $\leq 12$ weeks versus Late initiation $> 12$ weeks) using the Chi-square test, and as a continuous variable (gestational age in weeks) using

the Mann-Whitney U test. This allowed comparison of the proportion of women who booked early and the median gestational age at initiation between adolescent and adult women.

- **To test null hypothesis 2:** The number of recommended ANC contacts was analyzed by comparing the proportions of women achieving eight contacts using the Chi-square test. Additionally, the Mann-Whitney U test was used to compare the median number of total ANC contacts between the two age groups, given the expected non-normal distribution of ANC contact utilization.

### 3.11.2 Multivariable analysis for associated factors

To examine the independent associations of predisposing, enabling, and need factors with the two primary outcomes of timing and frequency, a multivariable logistic regression model was used. The goodness of fit of the models was assessed, and associations among the variables were tested using a multicollinearity test. The variance inflation factors ranged from 1.09 to 2.43, below the threshold of 5, and AORs were reported with 95% CI.

### 3.11.3 Significance level

For all statistical tests, a p-value less than 0.05 was considered statistically significant.

## 3.12 Data quality assurance

Pilot testing of the questionnaire identified and addressed potential sources of inconsistent data. Training for research assistants minimized interviewer bias. An online tool was used to create a digital copy of the questionnaire, automatically aggregate responses on a centralized platform, reduce manual entry errors, and thereby improve data accuracy and completeness. The data was reviewed after collection to ensure it was correct.

### 3.13 Study strengths, limitations, and delimitations

#### 3.13.1 Study strengths

1. Instead of grouping all pregnant women, the study compared adolescent women and adult women to fill a gap in maternal ANC attendance.
2. This study analyzed data using the updated 2016 WHO antenatal care model, which recommends eight ANC contacts to ensure timely evidence, rather than the outdated FANC model.
3. The study's conceptual framework was based on Andersen and Newman's Behavioural Model for Health Services Utilization, a well-established academic framework that categorizes variables into predisposing, enabling, and need factors.
4. The study used stratified random sampling with a 1:3 ratio based on admission trends, and an online randomizer to generate unique daily sequence numbers and ensure proportional representation.
5. By selecting participants from the maternity department at least 24 hours after delivery, the women in the study were close to their delivery date, ensuring accurate recall of their ANC attendance.
6. The women's reported LNMP was cross-checked with the one documented on pages 7 and 10 of the antenatal booklets. Discrepancies were used as an exclusion criterion to ensure data accuracy.
7. Using the ODK mobile application to fill out the questionnaires and the data extraction tool reduced manual data-entry errors associated with paper questionnaires.
8. To accurately measure the need factors, the study used a validated clinical tool, the Modified Coopland Antenatal Risk Scoring System, to classify pregnancies into low, moderate, and high-risk categories.

### 3.13.2 Study limitations

1. The cross-sectional comparative study design prevented us from establishing cause-and-effect relationships.
2. Reliance on the LNMP as the primary method for calculating gestational age at first ANC contact is a limitation. The LNMP-based dating is prone to error in clinical practice. To improve data reliability, the woman's recalled LNMP was verified against the date documented in the antenatal booklet.
3. Using the Andersen and Newman Behavioral Model (ANBM) for Health Services Utilization as the theoretical framework presents the following challenges.

i. The ANBM fails to distinguish predisposing obstetric history from current antenatal clinical need, leading to a misleading classification of first-time mothers. In this study, "need" was largely determined by past obstetric complications, such as prior C-sections or stillbirths. As a result, primigravid women were classified as "low risk" simply because they had no obstetric history.

ii. The model assumes that predisposing, enabling, and need factors contribute equally to utilization of eight antenatal care contacts. However, the study shows an imbalance in enabling factors, including 100% adolescent unemployment, 26% lack of insurance, and 78.1% rural residence, which completely suppresses antenatal clinical needs, despite identical baseline risk distributions between groups ($p$=0.612).

iii. The model also relies on a linear pathway and cannot account for social feedback loops. In this study, 87.7% of adolescents relied on family and friends, rather than healthcare providers. This demonstrates how external social systems can continually undermine adolescents' decision-making autonomy and shape their health beliefs long before they seek antenatal care.

### 3.13.3 Study delimitation and recommendation for future research

1. This study compared the timing of first ANC contact and the frequency of recommended antenatal care contacts between adolescent and adult women.

2. Future research should examine the timing of all recommended antenatal care contacts to understand the antenatal care experience for both adolescent and adult women.

3. Future longitudinal cohort studies should explore how various factors during pregnancy influence ANC initiation and frequency among adolescent and adult women.

## 3.14 Ethical considerations

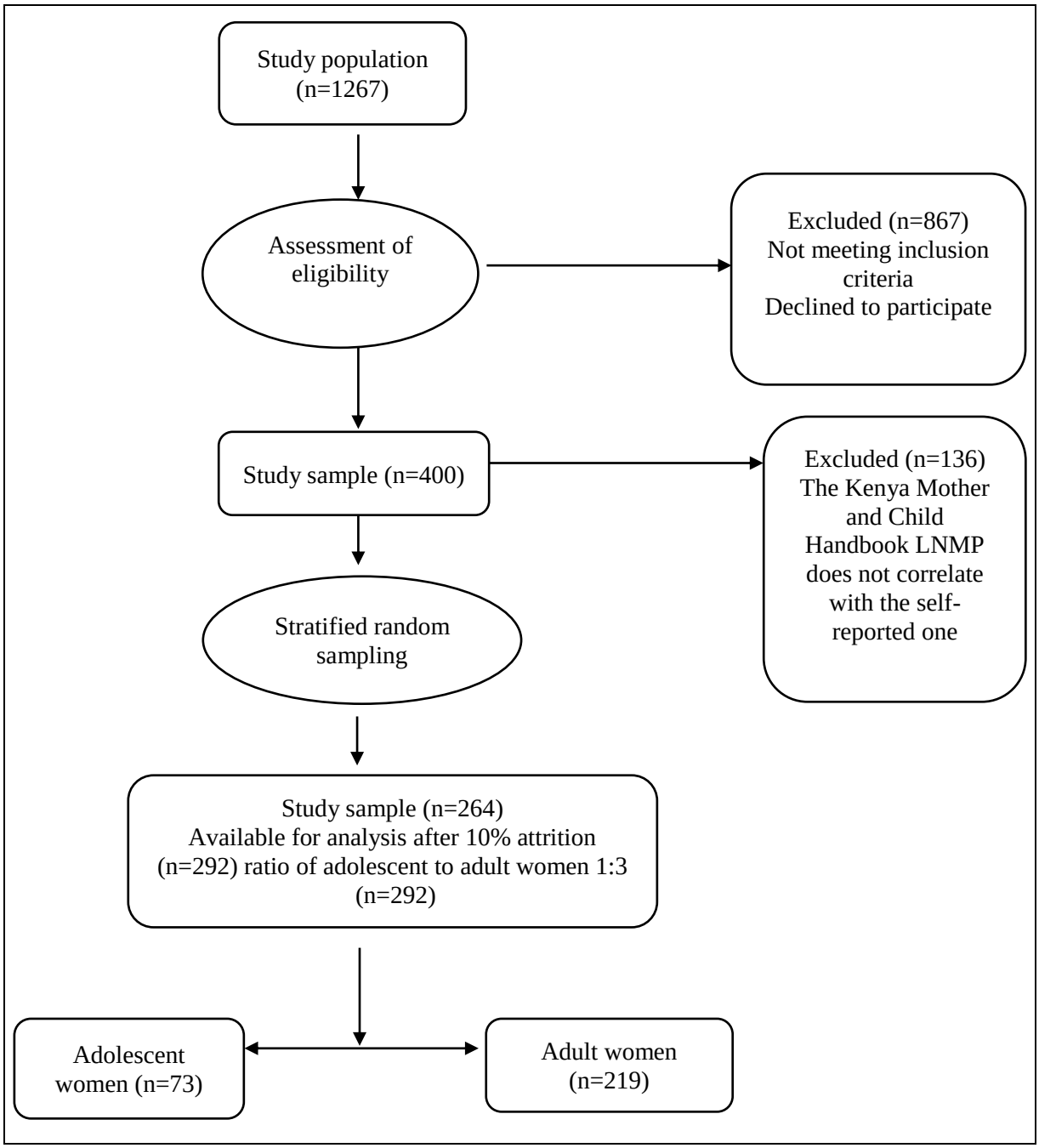
The Declaration of Helsinki guidelines were followed (Wen et al., 2025). Initial approval was received from the Maseno University School of Graduate Studies (Appendix VII), and ethical approval number ***ISERC/JOOTRH/129/24*** was granted by the JOOTRH Institutional Review Board (Appendix VIII). Approval was also obtained from the JOOTRH administration (Appendix IX), and a research permit was issued on **9th April, 2025,** with license number ***NACOSTI/P/25/417736,*** from the National Commission for Science, Technology and Innovation (NACOSTI) (Appendix X). Informed consent was obtained from eligible women after the study objectives were explained. In Kenya, the law permits adolescent women who have delivered to provide valid consent to participate in research (Guidelines for Conducting Adolescent HIV Sexual and Reproductive Health Research in Kenya, n.d.). To ensure everyone felt comfortable and secure, all information was kept confidential and anonymous during the study. Data access was restricted to the authorized study team only.

# CHAPTER FOUR

# RESULTS

## 4.1 Study flow chart

**Figure 4.1***Flowchart of participants' enrollment in the study conducted between April 14, : 2025, and July 18, 2025.*



### 4.2 Predisposing Factors

Participants' predisposing factors were examined. The study population included 292 participants: 73 (25%) adolescent women (aged 15-19 years) and 219 (75%) adult women (aged 20-49 years). The median and mean ages of adolescent women were 18.0 and 17.82 years, respectively, with a standard deviation of 1.14 years. For adult women, the mean ages were 29.0 and 27.69 years, with a standard deviation of ±4.68.

As shown in Table 4.1, predisposing factors, including marital status, parity, and educational level, were significantly associated with maternal age.

A large majority of adult women (77.2%) were married, compared with only 27.4% of adolescent women, a statistically significant difference ($p$ <.001).

Parity also differed significantly between the two maternal age groups *( $p$* < .001). Only 20.5% of adolescent women had two pregnancies, compared to 32.0% of adult women. None of the adolescent women had more than 2 pregnancies, whereas 32.6% of adult women had 3 or more.

Education levels also varied significantly ($p$ < .001). 27.4% of adolescent women were in post-secondary education, while 50.2% of adult women had completed post-secondary education.

Religious affiliation was predominantly Christian across both groups, and no significant association between religion and maternal age was found ($p$ = .634).

**Table 4.1:*Predisposing Factors among Adolescent Women (15-19 Years) and Adult Women (20-49 Years) at JOOTRH*.**

| Independent variable | Category | Adolescent women N (%) | Adult women N (%) | Total N=292 | P value |
|---|---|---|---|---|---|
| Marital Status | Single | 51(69.9) | 46(21.0) | 97(33.2) | <0.001 |
| | Married | 20(27.4) | 169(77.1) | 189(64.8) | |
| | Divorced/separated | 2(2.7) | 3(1.4) | 5(1.7) | |
| | Widowed | 0(0.0) | 1(0.5) | 1(0.3) | |
| Parity | 1 | 58(79.5) | 54(24.7) | 112(38.3) | <0.001 |
| | 2 | 15(20.5) | 70(31.9) | 85(29.1) | |
| | 3 | 0(0.0) | 44(20.1) | 44(15.1) | |
| | 4 | 0(0.0) | 28(12.8) | 28(9.6) | |
| | 5+ | 0(0.0) | 23(10.5) | 23(7.9) | |
| Level of education | Primary school | 13(17.8) | 55(25.1) | 68(23.3) | <0.001 |
| | Secondary school | 40(54.8) | 54(24.7) | 94(32.2) | |
| | Post-secondary school | 20(27.4) | 110(50.2) | 130(44.5) | |
| Religion | Christian | 72(98.6) | 214(97.7) | 286(97.9) | 0.634 |
| | Muslim | 1(1.4) | 5(2.3) | 6(2.1) | |

### 4.3 Enabling Factors

Table 4.2 shows that most enabling factors differed significantly between the two maternal age groups.

***Occupation:*** None of the adolescent women were employed (0.0%), while only 7.8% of adult women were employed ($p<.001$).

***Partner's occupation:*** No significant association was found for partner's occupation ($p=.298$). The majority of partners in both groups were unemployed, with 80.0% among adolescent women and 68.6% among adult women.

***Household income***. Most adolescents (95%) and adult women (76.9%) reported being in the poor income bracket ($p = .156$).

***Residence:*** Place of residence differed significantly between the two groups ($p$<0.001). Amongst adolescent women, 21.9% lived in urban areas, whereas 49.8% of adult women lived in urban areas.

***ANC attendance decision-maker:*** 53.9% of adult women made their own decisions on attending ANC, compared to 30.1% of adolescent women ($p$ < .001).

***Health insurance:*** Coverage differed significantly ( $p$ = .001). 26% of adolescent women had no insurance coverage compared to 9.1% of adult women.

***ANC information source:*** A significant difference was observed in how women learned about ANC ($p$ < .001). 11.0% of adolescent women received information from healthcare providers compared to 44.7% of adult women.

**Table 4.2:*Enabling Factors among Adolescent Women (15-19 Years) and Adult Women (20-49 Years) at JOOTRH.***

| Independent Variable | Category | Adolescent Women N (%) | Adult Women N (%) | Total N=292 | P value |
|---|---|---|---|---|---|
| Current occupation | Employed | 0 (0.0) | 17 (7.8) | 17 (5.8) | <0.001 |
| | Unemployed | 73 (100.0) | 202 (92.2) | 275 (94.2) | |
| Occupation of partner | Employed | 4 (20.0) | 53 (31.4) | 57 (30.2) | 0.298 |
| | Unemployed | 16 (80.0) | 116 (68.6) | 132 (69.8) | |
| Monthly household income | Poor | 19 (95.0) | 130 (76.9) | 149 (78.8) | 0.156 |
| | Middle | 1 (5.0) | 39 (23.1) | 40 (21.2) | |
| Residence | Urban | 16 (21.9) | 109 (49.8) | 125 (42.8) | <0.001 |
| | Rural | 57 (78.1) | 110 (50.2) | 167 (57.2) | |
| ANC Attendance decision marker | Self | 22(30.1) | 118 (53.9) | 140 (47.9) | <0.001 |
| | Partner | 6(8.2) | 68 (31.1) | 74 (25.3) | |
| | Family members | 41(56.2) | 32 (14.6) | 73(25.0) | |
| | Friends | 4 (5.5) | 1 (0.4) | 5 (1.8) | |
| Waiting time at the ANC clinic | 0–1 hr. | 34 (46.6) | 94 (42.9) | 128 (43.8) | 0.437 |
| | 2–3 hrs. | 38 (52.1) | 115 (52.5) | 153 (52.4) | |
| | 4+ hrs. | 1 (1.4) | 10 (4.6) | 11 (3.8) | |
| Partner's Educational Level | No formal | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0.348 |
| | Primary | 3 (15.0) | 30 (17.8) | 33 (17.5) | |
| | Secondary | 4 (20.0) | 22 (13.0) | 26 (13.7) | |
| | Postsecondary | 13 (65.0) | 116 (69.2) | 129 (68.8) | |
| Health insurance type | Government | 53 (72.6) | 191 (87.2) | 244 (83.6) | 0.001 |
| | Private | 1 (1.4) | 8 (3.7) | 9 (3.1) | |
| | None | 19 (26.0) | 20 (9.1) | 39 (13.4) | |
| ANC information source | Healthcare provider | 8 (11.0) | 98 (44.7) | 106 (36.3) | <0.001 |
| | Media | 1 (1.4) | 12 (5.5) | 13 (4.5) | |
| | Others | 64 (87.7) | 109 (49.8) | 173 (59.2) | |

**Note: ANC=Antenatal care**

## 4.4 Need Factors

### 4.4.1 Medical and surgical conditions

There were no significant differences in the occurrence of most medical and surgical conditions, including chronic hypertension, pre-gestational diabetes, chronic renal disease, heart disease, and gynaecological surgery, between adolescent and adult women (Table 4.3).

**Table 4.3:*Medical and Surgical Conditions among Adolescent Women (15-19 Years) and Adult Women (20-49 Years) at JOOTRH.***

| Independent Variable | Category | Adolescent Women N (%) | Adult women N (%) | Total N=292 | P value |
|---|---|---|---|---|---|
| Chronic hypertension | | | | | |
| | No | 67(91.8) | 200(91.3) | 267(91.4) | 0.904 |
| | Yes | 6(8.2) | 19(8.7) | 25(8.6) | |
| Pre-gestational diabetes | | | | | |
| | No | 72(98.6) | 217(99.1) | 289(99.0) | 0.738 |
| | Yes | 1(1.4) | 2(0.9) | 3(1.0) | |
| Chronic renal disease | | | | | |
| | No | 73(100.0) | 218(99.5) | 291(99.7) | 0.563 |
| | Yes | 0(0.0) | 1(0.5) | 1(0.3) | |
| Heart disease | | | | | |
| | No | 72(98.6) | 217(99.1) | 289(99.0) | 0.160 |
| | NYHA 1-2 | 1(1.4) | 0(0.0) | 1(0.3) | |
| | NYHA 3-4 | 0(0) | 2(0.9) | 2(0.7) | |
| Previous gynaecological surgery | | | | | |
| | No | 73(100.0) | 210(95.9) | 283(96.9) | 0.079 |
| | Yes | 0(0.0) | 9(4.1) | 9(3.1) | |
| Other significant medical conditions, e.g. TB, Epilepsy, Autoimmune | No/Mild | 67(91.8) | 208(95.0) | 275(94.2) | 0.527 |
| | Moderate | 5(6.8) | 10(4.6) | 15(5.1) | |
| | Severe | 1(1.4) | 1(0.5) | 2(0.7) | |

Note: TB=Tuberculosis

### 4.4.2 Previous obstetrical and gynaecological conditions

Table 4.4 illustrates the distribution of previous obstetrical and gynaecological conditions among adolescent and adult women. Only adolescent women who were para 2 (n=13) and para

3 or higher (n=2) at the time of the study (total n=15) were included. For adult women, we also included those who were para 2 (n=61) and more (n=97) (Total n=158). A significant association was found between maternal age and several prior obstetrical and gynaecological conditions, which were more common among adult women. These included an infant weighing less than 2.5 kg or more than 4 kg, previous caesarean section, history of stillbirth or neonatal death, and occurrence of prolonged or difficult labour.

**Table 4.4:*Previous Obstetrical and Gynaecological Conditions among Adolescent (15-19 Years) and Adult Women (20-49 Years) at JOOTRH.***

| Independent Variable | Category | Adolescent Women N (%) | Adult women N (%) | Total N=173 | P value |
|---|---|---|---|---|---|
| Infertility | | | | | |
| | No | 15(100.0) | 157(99.4) | 172(99.4) | 0.413 |
| | Yes | 0(0.0) | 1(0.9) | 1(0.6) | |
| 2 or more first-trimester abortions | | | | | |
| | No | 14(93.3) | 152(96.2) | 166(96.0) | 0.328 |
| | Yes | 1(6.7) | 6(3.8) | 7(4.0) | |
| Second-trimester abortions | | | | | |
| | No | 13(86.7) | 150(94.9) | 163(94.2) | 0.413 |
| | Yes | 2(13.3) | 8(5.1) | 10(5.8) | |
| Child birth <2.5kg or >4kg | | | | | |
| | No | 13(86.7) | 129(81.6) | 142(82.1) | 0.001 |
| | Yes | 2(13.3) | 29(18.4) | 31(17.9) | |
| Previous caesarean section | | | | | |
| | No | 11(73.3) | 126(79.7) | 137(79.2) | 0.003 |
| | Yes | 4(26.7) | 32(20.3) | 36(20.8) | |
| PPH or manual removal of placenta | | | | | |
| | No | 14(93.3) | 146(92.4) | 160(92.5) | 0.061 |
| | Yes | 1(6.7) | 12(7.6) | 13(7.5) | |
| Previous stillbirth or neonatal death | | | | | |
| | No | 14(93.3) | 143(90.5) | 157(90.8) | 0.021 |
| | Yes | 1(6.7) | 15(9.5) | 16(9.2) | |
| Prolonged/difficult labour | | | | | |
| No | No | 15(100.0) | 149(94.3) | 164(94.8) | 0.041 |
| Yes | Yes | 0(0.0) | 9(5.7) | 9(5.2) | |
| Gestational hypertension/preeclampsia | | | | | |
| | No | 13(86.7) | 143(90.5) | 156(90.2) | 0.060 |
| | Yes | 2(13.3) | 15(9.5) | 17(9.8) | |
| Eclampsia | | | | | |
| | No | 15(100.0) | 158(100.0) | 173(100.0) | - |
| | Yes | 0(0.0) | 0(0.0) | | |
| Gestational diabetes | | | | | |
| | No | 14(93.3) | 157(99.4) | 171(98.1) | 0.413 |
| | Yes | 1(6.7) | 1(0.6) | 2(1.2) | |

Note: KG= Kilogramme, PPH = Postpartum hemorrhage

### 4.4.3 Present pregnancy conditions

Table 4.5 shows that the occurrence of different conditions during the current pregnancy did not differ significantly between adolescent and adult women.

**Table 4.5 :*Present Pregnancy Conditions among Adolescent Women (15-19 Years) and Adult Women (20-49 Years) at JOOTRH.***

| Independent Variable | Category | Adolescent Women N (%) | Adult women N (%) | Total N=292 | P value |
|---|---|---|---|---|---|
| Bleeding before 20 weeks | No | 72(98.6) | 212(96.8) | 284(97.3) | 0.408 |
| | Yes | 1(1.4) | 7(3.2) | 8(2.7) | |
| Anaemia | Hb>10 | 47(64.4) | 167(76.3) | 214(73.3) | 0.120 |
| | Hb 6-10 | 25(34.2) | 51(23.3) | 76(26.0) | |
| | Hb<6 | 1(1.4) | 1(0.5) | 2(0.7) | |
| Rhesus isoimmunization | No | 70(95.9) | 213(97.3) | 283(96.9) | 0.558 |
| | Yes | 3(4.1) | 6(2.7) | 9(3.1) | |
| Malpresentation at term | No | 71(97.3) | 211(96.3) | 282(96.6) | 0.710 |
| | Yes | 2(2.7) | 8(3.7) | 10(3.4) | |
| Multiple pregnancy | No | 67(91.8) | 209(95.4) | 276(94.5) | 0.235 |
| | Yes | 6(8.2) | 10(4.6) | 16(5.5) | |
| Hypertension | No | 56(76.7) | 167(76.3) | 223(76.4) | 0.937 |
| | Yes | 17(23.3) | 52(23.7) | | |
| Eclampsia | No | 73(100.0) | 214(97.7) | 287(98.3) | 0.193 |
| | Yes | 0(0.0) | 5(2.3) | | |
| Gestational DM | No | 72(98.6) | 218(99.5) | 290(99.3) | 0.413 |
| | Yes | 1(1.4) | 1(0.5) | 2(0.7) | |
| Placenta previa | No | 71(97.3) | 207(94.5) | 278(95.2) | 0.343 |
| | Yes | 2(2.7) | 12(5.5) | 14(4.8) | |
| Term prom | No | 65(89.0) | 207(94.5) | 272(93.2) | 0.108 |
| | Yes | 8(11.0) | 12(5.5) | 20(6.8) | |
| Preterm prom | No | 63(86.3) | 203(92.7) | 266(91.1) | 0.097 |
| | Yes | 10(13.7) | 16(7.3) | 26(8.9) | |
| Polyhydramnios | No | 71(97.3) | 211(96.3) | 282(96.6) | 0.710 |
| | Yes | 2(2.7) | 8(3.7) | 10(3.4) | |
| Oligohydramnios | No | 68(93.2) | 213(97.3) | 281(96.2) | 0.110 |
| | Yes | 5(6.8) | 6(2.7) | 11(3.8) | |
| IUGR | No | 72(98.6) | 217(99.1) | 289(99.0) | 0.738 |
| | Yes | 1(1.4) | 2(0.9) | 3(1.0) | |
| Abnormal Doppler | No | 73(100.00 | 216(98.6) | 289(99.0) | 0.315 |
| | Yes | 0(0.0) | 3(1.40 | 3(1.0) | |

**Note: DM=Diabetes Mellitus, IUGR=Intrauterine growth restriction**

### 4.4.4 Modified Coopland antenatal risk score based on the need factors

The distribution of antenatal risk categories did not differ significantly between adolescent and adult women (p = .612) (Table 4.6).

**Table 4.6 |:*Risk category of pregnancy according to the Modified Coopland Antenatal Risk Scoring System comparing adolescent women (15-19 years) and adult women (20-49 years) at JOOTRH.***

| Independent variable | Category | Adolescent Women N (%) | Adult women N (%) | Total N=292 | P value |
|---|---|---|---|---|---|
| Risk category | High risk | 20(27.8) | 67(30.5) | 87(29.8) | 0.612 |
| | Moderate risk | 29(40.3) | 90(40.9) | 119(40.7) | |
| | Low risk | 23(31.9) | 63(28.6) | 86(29.5) | |

## 4.5 Comparison of when women have their first antenatal care contact.

### 4.5.1 Analysis of the timing of the first antenatal care contact using measures of central tendency and the Mann-Whitney U test.

The timing of the initial ANC contact differed notably between the two age groups (*p* = .017) (Table 4.7). Adult women initiated ANC earlier, with a median of 18.00 weeks (IQR 10.0–22.0), compared to adolescent women, who had a median of 20.00 weeks (IQR 12.0–24.0).

**Table 4.7:*Analysis of the timing of first antenatal care contact using measures of central tendency and the Mann-Whitney U test for adolescent women (15-19 years) versus adult women (20-49 years) at JOOTRH.***

| Independent variable | Category | Number (%) | Median | IQR | P value |
|---|---|---|---|---|---|
| Timing of First ANC contact | Adolescent women (15-19 years) | 73 (25) | 20.00 | 12.0 – 24.0 | 0.017 |
| | Adult women (20-49 years) | 219 (75) | 18.00 | 10.0 – 22.0 | |

### 4.5.2 Chi-square test for the timing of the initial antenatal care contact

Most adult women (37%) initiated their first ANC contact early (within 12 weeks), compared with 26% of adolescent women. This difference was not statistically significant ($p$ = .087) (Table 4.8). Overall, most women in both maternal age groups initiated ANC after the first trimester.

**Table 4.8:** ***Chi-square test comparing the timing of the first antenatal care contact between adolescent women (15-19 years) and adult women (20-49 years) at JOOTRH.***

| Variable | Category | Adolescent women N (%) | Adult women N (%) | Total N=292 | P value |
|---|---|---|---|---|---|
| Timing of first antenatal care contact | Early ≤ 12 weeks | 19(26%) | 81(37%) | 100(34.2%) | 0.087 |
| | Late >12 weeks | 54(74%) | 138(63%) | 192(65.8%) | |

### 4.6 Comparison of how often the recommended antenatal care contacts occur

### 4.6.1 Analysis of central tendency measures and Mann-Whitney U test for the total recommended antenatal contacts.

The two groups showed a significant difference in their total ANC contact distribution ($p$ = .049). Adult women had a higher median number of total ANC contacts (5.00, IQR: 3.0–6.00) than adolescent women (4.00, IQR: 3.0–5.5) (Table 4.9).

**Table 4.9:*****Analysis of central tendency measures and the Mann-Whitney U test for the total recommended antenatal contacts among adolescent (15-19 years) and adult women (20-49 years) at JOOTRH.***

| Independent variable | Category | Number (%) | Median | IQR | P value |
|---|---|---|---|---|---|
| Frequency of ANC contacts | Adolescent women (15-49 years) | 73 (25) | 4.00 | 3.0 – 5.5 | 0.049 |
| | Adult women (20-49 years) | 219 (75) | 5.00 | 3.0 – 6.0 | |

### 4.6.2 Analysis of recommended antenatal care contact frequencies using chi-square test

The frequency of ANC contacts did not differ significantly between the two maternal age groups ($p$ = .468) (Table 4.10). The distribution of contacts (1-4, 5-7, or 8+) showed that 10.5% of adult women completed 8+ contacts, compared with 8.2% of adolescent women.

**Table 4.10:** ***Chi-square test comparing the frequency of recommended antenatal contacts between adolescent (15-19 years) and adult women (20-49 years) at JOOTRH***.

| Independent variable | Category | Adolescent women N (%) | Adult women N (%) | Total N=292 | P value |
|---|---|---|---|---|---|
| Frequency of recommended antenatal care contacts | 1-4 | 39(53.4) | 99(45.2) | 138(47.3) | 0.468 |
| | 5-7 | 28(38.4) | 97(44.3) | 125(42.8) | |
| | 8+ | 6(8.2) | 23(10.5) | 29(9.9) | |

4.7 Factors related to when adolescent and adult women have their first antenatal care contact.

Women who received ANC information from healthcare providers (*AOR* = 1.96, 95% CI [1.06, 3.71], $p$ = .036) were more likely to book early ANC than those who obtained the information from the media or other sources (Table 4.11).

**Table 4.11:*Logistic regression analysis of factors influencing the timing of the initial antenatal care contact among adolescent women (15-19 years) and adult women (20-49 years) at JOOTRH.***

| Independent variable | Category | AOR | 95% CI | P value |
|---|---|---|---|---|
| Age | Adult Women (Ref.) | | | |
| | Adolescent women | 0.97 | (0.72-1.37) | 0.141 |
| Marital Status | Single (Ref.) | | | |
| | Married | 1.11 | (0.48- 2.63) | 0.802 |
| | Divorced | 1.09 | (0.11-2.49) | 0.944 |
| | Widowed | 0.92 | (0.25-3.16) | 0.986 |
| Parity | 1(Ref.) | | | |
| | 2 | 0.81 | (0.42-1.57) | 0.539 |
| | 3 | 0.74 | (0.36-1.54) | 0.423 |
| | 4 | 0.69 | (0.28-1.69) | 0.420 |
| | 5+ | 0.53 | (0.20-1.41) | 0.203 |
| Education | Primary (Ref.) | | | |
| | Secondary | 1.06 | (0.47-2.34) | 0.893 |
| | Post-secondary education | 1.08 | (0.46-2.49) | 0.860 |
| Occupation | Employed (Ref.) | | | |
| | Unemployed | 1.23 | (0.37-4.02) | 0.731 |
| | Student | 0.95 | (0.54-1.87) | 0.247 |
| Residence | Urban (Ref.) | | | |
| | Rural | 1.11 | (0.58-2.10) | 0.749 |
| ANC Attendance decision maker | Self (Ref.) | | | |
| | Partner | 0.63 | (0.19-2.24) | 0.466 |
| | Others | 1.16 | (0.65-2.06) | 0.615 |
| Risk Category | High (Ref.) | | | |
| | Low | 0.98 | (0.49-1.96) | 0.952 |
| | Moderate | 0.99 | (0.48-2.07) | 0.987 |
| Health Insurance type | Government (Ref.) | | | |
| | Private | 0.91 | (0.20-4.34) | 0.903 |
| | None | 1.14 | (0.50-2.75) | 0.758 |
| Partner Occupation | Employed (Ref.) | | | |
| | Unemployed | 0.98 | (0.32-2.74) | 0.964 |
| | Student | 1.43 | (0.32-6.15) | 0.629 |
| Source of Information about ANC | Others (Ref.) | | | |
| | Media | 1.40 | (0.36-4.98) | 0.611 |
| | Healthcare provider | 1.96 | (1.06-3.71) | 0.036 |
| Income | Poor (Ref.) | | | |
| | Middle | 0.48 | (0.15-1.45) | 0.202 |
| Distance | No problem (Ref.) | | | |
| | Big problem | 1.29 | (0.71-2.38) | 0.409 |

Note: Ref. =Reference category, AOR=Adjusted Odds Ratio, CI=Confidence Interval

### 4.8 Factors related to how often adolescent and adult women attend recommended antenatal care contacts.

Women with high-risk pregnancies (*AOR* = 2.33, 95% CI [1.47, 3.91], *p* = .005) were more likely to attend the recommended number of ANC contacts than women with low- or moderate-risk pregnancies (see Table 4.12).

**Table 4.12:*Logistic regression analysis of factors associated with the frequency of recommended antenatal care contacts among adolescent women (15-19 years) and adult women (20-49 years) at JOOTRH.***

| Independent variable | Category | AOR | 95% CI | P value |
|---|---|---|---|---|
| Age | Adult women (Ref.) | | | |
| | Adolescent women | 0.85 | ( 0 . 7 1 - 1 . 4 0 ) | 0.276 |
| Marital Status | Single (Ref.) | | | |
| | Married | 2.07 | ( 0 . 9 0 - 4 . 9 2 ) | 0.082 |
| | Divorced | 1.96 | ( 0 . 0 5 - 8 . 0 8 ) | 0.697 |
| Parity | 1(Ref.) | | | |
| | 2 | 0.82 | ( 0 . 3 7 - 1 . 8 3 ) | 0.633 |
| | 3 | 0.61 | ( 0 . 2 5 - 1 . 5 4 ) | 0.298 |
| | 4 | 0.45 | ( 0 . 1 6 - 1 . 2 5 ) | 0.125 |
| | 5+ | 0.38 | ( 0 . 1 2 - 1 . 2 1 ) | 0.103 |
| Education | Primary (Ref.) | | | |
| | Secondary | 0.80 | ( 0 . 3 5 - 1 . 8 7 ) | 0.613 |
| | Post-secondary | 0.67 | ( 0 . 2 7 - 1 . 6 5 ) | 0.386 |
| Occupation | Employed (Ref.) | | | |
| | Unemployed | 0.24 | ( 0 . 0 1 - 1 . 8 4 ) | 0.236 |
| | Student | 0.21 | ( 0 . 0 1 - 2 . 1 3 ) | 0.235 |
| Residence | Urban (Ref.) | | | |
| | Rural | 1.48 | ( 0 . 7 3 - 3 . 0 6 ) | 0.283 |
| ANC Attendance decision maker | Self (Ref.) | | | |
| | Partner | 1.61 | ( 0 . 3 9 - 7 . 3 0 ) | 0.515 |
| | Others | 1.19 | ( 0 . 6 3 - 2 . 2 4 ) | 0.597 |
| Risk Category | Low risk (Ref.) | | | |
| | Moderate risk | 1.27 | ( 0 . 5 1 - 1 . 4 6 ) | 0.251 |
| | High risk | 2.33 | ( 1 . 4 7 - 3 . 9 1 ) | 0.005 |
| Health insurance type | Government type (Ref.) | | | |
| | Private | 1.07 | ( 0 . 1 4 - 8 . 0 7 ) | 0.947 |
| | None | 0.64 | ( 0 . 2 7 - 1 . 4 8 ) | 0.297 |
| Partner Occupation | Employed (Ref.) | | | |
| | Unemployed | 1.08 | ( 0 . 3 1 - 3 . 8 6 ) | 0.907 |
| | Student | 0.51 | ( 0 . 1 2 - 2 . 2 7 ) | 0.375 |
| Information about ANC | Others (Ref.) | | | |
| | Media | 0.75 | ( 0 . 2 4 - 1 . 5 1 ) | 0.384 |
| | Healthcare providers | 0.71 | ( 0 . 3 4 - 1 . 4 6 ) | 0.349 |
| Income | Poor (Ref.) | | | |
| | Middle | 1.17 | ( 0 . 3 1 - 4 . 7 2 ) | 0.817 |
| Distance | No problem (Ref.) | | | |
| | Big problem | 0.95 | ( 0 . 4 8 - 1 . 8 9 ) | 0.894 |

**Note: Ref. =Reference category, AOR=Adjusted Odds Ratio, CI=Confidence Interval**

# CHAPTER FIVE

# DISCUSSION

The study uses the ANBM model (Andersen & Newman, 2005; Andersen, 2008). This model explained how predisposing, enabling, and need factors affected early booking and completion of the eight ANC contacts among adolescent and adult women at JOOTRH.

## 5.1 Predisposing, enabling, and need factors

### Predisposing factors

A clear difference in marital status emerged between the two study cohorts: adult women were substantially more likely to be married than adolescents. In Ghana, marriage increases the likelihood of booking early for antenatal care (ANC) and of completing eight ANC contacts (Anaba et al., 2022). Similarly, in Ethiopia, married women often begin ANC earlier because their legal marital status allows them to disclose their pregnancy without fear of ridicule or shame. By contrast, adolescents often face social stigma, which may make them hesitant to attend ANC (Alem et al., 2022).

Consistent with the participants' demographic profile, adult women had higher overall parity, whereas adolescent women had not yet reached higher parity thresholds. Adult women in Ethiopia may benefit from prior ANC experience, making them more likely than adolescents attending ANC for the first time to book early or complete eight ANC contacts (Tekelab et al., 2019). Similarly, primigravid women in East Africa often delay booking ANC because they may not recognize early signs of pregnancy (Endalamew et al., 2025). In Uganda, women with moderate parity are more likely to book early and complete eight ANC contacts than grand multiparous women with five or more children, suggesting that high parity remains a barrier to

adequate ANC attendance (Lee et al., 2024). However, parity appears to have the opposite effect in the Gambia, where multiparous women book later than women who have given birth once (Daniels-Donkor et al., 2024). In Kenya, multiparous women may delay booking because past experience increases their confidence in managing pregnancy or makes them feel less need for early intervention (Kase et al., 2025). Their childcare and domestic responsibilities may also make it harder to prioritize antenatal care (Kase et al., 2025).

Regarding educational background, adult women in the study had higher levels of postsecondary education than adolescent women. In sub-Saharan African countries such as Nigeria, Guinea, Mali, and Zambia, educated women recognize the benefits of antenatal care and often book appointments early, completing all eight recommended contacts (Belay et al., 2024; Kareem et al., 2021). Adolescents in Indonesia may have less education, which can limit their understanding of antenatal care and its benefits, leading them to book later (Anis et al., 2022).

Christianity was the predominant religion in both maternal age groups, with no significant association between religious affiliation and maternal age. Therefore, religious affiliation was not a key factor distinguishing ANC attendance in this study population.

**Enabling factors**

Partner occupation did not differ significantly between the two groups, although unemployment was high among partners of both adolescent and adult women. The widespread lack of household income compounds economic strain, limiting women's ability to pay for ANC-related expenses and ultimately undermining attendance (Abdi et al., 2024). In Kenya, women’s financial autonomy is essential for covering out-of-pocket costs for prescribed

medications and transportation to healthcare facilities (Kase et al., 2025). Without financial independence, adolescents across East Africa remain reliant on others, significantly delaying their first ANC visit and reducing adherence to subsequent visits (Endalamew et al., 2025). The extent of adolescents' financial dependence at JOOTRH highlights how secondary out-of-pocket costs associated with seeking care can limit access, even when ANC services are described as "free."

Adolescents were significantly more likely than adult women to be uninsured. In Ethiopia, lack of health insurance directly contributes to late ANC booking (Alem et al., 2022). Although strong social support networks among women in Zambia may sometimes ease the financial burden of attending ANC (Young et al., 2024), severe poverty and lack of formal health coverage generally outweigh the benefits of informal support from family and friends (Al-Mutawtah et al., 2023). In Uganda, health insurance substantially increases the likelihood of early booking and completing the recommended eight ANC contacts (Lee et al., 2024). Similarly, across sub-Saharan Africa, women without insurance consistently begin antenatal care later (Mare et al., 2024).

A significantly higher proportion of adolescent women lived in rural areas than adult women. Rural women face structural barriers to accessing antenatal care, including longer travel distances and higher transportation costs to reach clinics (Macharia et al., 2022). As observed in Lebanon, rural residence combined with adolescents' financial dependence is a primary driver of delayed ANC initiation and fewer overall contacts (Alam et al., 2025).

Adult women had greater autonomy in healthcare decision-making than adolescent women, who were much less likely to decide independently to seek prenatal care. In Nigeria, most women lack the authority to make healthcare decisions independently and depend on informal

networks for reproductive health information. Moreover, only a small minority of adolescents receive direct counselling from healthcare providers about the benefits of timely ANC attendance (Imo, 2022). As evidence from Uganda highlights, family and social networks can offer emotional support but lack the clinical expertise to stress the importance of early booking (Comfort et al., 2022). This is further supported by findings that women are less likely to complete the recommended number of antenatal contacts when healthcare professionals are not their primary source of health information (Sserwanja, Mutisya, & Musaba, 2022).

**Need factors**

Medical and surgical conditions during the index pregnancy were similar across maternal age groups, with no significant differences. Evidence from a multicountry study in sub-Saharan Africa and research in Kakamega, Kenya, suggests that risks or complications in previous pregnancies heightened women's awareness of the importance of timely antenatal care (Arsenault et al., 2024; Cooper et al., 2025). In contrast, adolescent women, who are predominantly primigravida, may have no history of obstetric complications, which can reduce their sense of urgency about initiating and attending ANC routinely and early (Arsenault et al., 2024; Cooper et al., 2025).

In settings such as India, adult women often have higher parity and more complex obstetric histories (Biradar et al., 2024). Studies in Ethiopia and India show that prior adverse pregnancy outcomes increase women’s perceived personal risk, motivating them to adhere to recommended contact schedules (Biradar et al., 2024; Sserwanja, Nuwabaine, et al., 2022). In addition, Ethiopian women with a history of poor perinatal outcomes are substantially more likely to complete all eight recommended ANC contacts (W. Y. Sisay et al., 2025).

However, prior pregnancy experience does not consistently increase utilization. In Rwanda, multiparous women may consider themselves at lower risk after uncomplicated past deliveries or face childcare-related time constraints, making it harder to complete all eight contacts (Sserwanja, Nuwabaine, et al., 2022). Similarly, evidence from Malaysia shows that adult women attend more regularly because they perceive greater healthcare needs, whereas adolescents may view themselves as low risk if they have had no previous pregnancy complications (Yeoh et al., 2016). In Kenya, particularly in Migori and Kakamega Counties, prior antenatal exposure among adult women is consistently associated with regular, timely booking (Alhassan et al., 2024; Cooper et al., 2025).

### 5.2 Comparison of when women have their first antenatal care contact.

Adult women in the study began antenatal care (ANC) earlier in pregnancy than adolescent women. However, delayed booking was common in both age groups. The finding that most women, regardless of age, begin care late in pregnancy contrasts with World Health Organization guidelines, which recommend the first antenatal contact during the first trimester (WHO, 2016). Although late booking was more prevalent in this cohort than the sub-Saharan African pooled averages reported by Mare et al. (2025), it closely reflects broader trends in Kenya and Uganda.

The pronounced delay among adolescent women is consistent with findings from South Africa, where many young mothers begin care after the first trimester (Smith et al., 2023), and with sub-Saharan African regional data showing that younger age groups consistently have higher odds of delayed initiation of antenatal care (Mare et al., 2025). However, these findings differ from those in some regional settings, including Uganda, where a notable proportion of adolescents initiate care during the first trimester (Kayemba et al., 2023). Adult women in this study also booked later than the East African regional average (Endalamew et al., 2025).

Nevertheless, their first-trimester initiation rates compare favorably with national estimates in Kenya (Kenya Demographic and Health Survey, 2022, 2023) and align with trends reported in other sub-Saharan African countries, including South Africa and Nigeria (Igumbor et al., 2024).

The earlier initiation observed among adult women mirrors patterns in Malawi, where greater decision-making autonomy, relative financial stability, and prior experience with pregnancy complications encourage earlier healthcare seeking (Mwenebanda et al., 2024). Across sub-Saharan Africa, primigravid women often book earlier because of heightened concern about unknown pregnancy outcomes (Abdo et al., 2023), while multiparous women frequently delay care (Mare et al., 2025; Phiri et al., 2025). In East Africa, particularly in Kenya, multiparous women routinely delay ANC booking because previous uncomplicated pregnancies foster confidence, while domestic duties and childcare demands can also limit their ability to seek timely care (Endalamew et al., 2025; Kase et al., 2025).

Equally, most adolescent women are primigravida, and their lack of prior pregnancy experience can delay care initiation because they may not recognize early signs of pregnancy or understand the clinical value of early booking (Baykemagn et al., 2025; Mare et al., 2025). Additionally, adolescent girls across sub-Saharan Africa, particularly in settings such as The Gambia, face pervasive social stigma, ridicule, and pressure to keep unintended pregnancies secret, creating psychological barriers to early facility attendance (Alem et al., 2022; Daniels-Donkor et al., 2024). In Uganda, adolescents also face limited financial independence and personal autonomy, which can constrain their decisions about when to initiate care and their ability to maintain routine contacts (Sserwanja, Mutisya, Nuwabaine, et al., 2022).

Beyond individual and social factors, structural determinants play a major role in when ANC begins. Across sub-Saharan Africa, lack of health insurance consistently predicts delayed ANC

booking, creating financial barriers even where clinical services are officially free (Mare et al., 2025). Education improves health literacy and helps women recognize the benefits of early clinical contact (Alem et al., 2022; Tessema et al., 2022). Physical access also matters: in Ethiopia, long distances to health facilities substantially increase the risk of delayed care (Misikir & Ezo, 2025). Addressing these structural barriers calls for approaches tailored to local communities. For example, evidence from Uganda shows that community-based interventions offering peer support and flexible scheduling can significantly increase early ANC booking among adolescents (Wafula et al., 2022).

### 5.3 Comparison of how often the recommended antenatal care contacts occur

Although the total number of contacts did not differ significantly between the two maternal age groups, adult women showed greater continuity and consistency in attending antenatal care (ANC) throughout pregnancy. They were more likely to meet or exceed higher contact thresholds, including the World Health Organization's recommended minimum of eight contacts, while adolescent women were disproportionately represented among those with fewer total visits.

These patterns are consistent with sub-Saharan African population data showing that older maternal age groups consistently have higher rates of eight or more ANC contacts than adolescent groups (Aboagye et al., 2025; Mare et al., 2024). Nationally, low completion of the full eight-contact model remains widespread, reflecting findings from the Kenya Demographic and Health Survey (Kenya Demographic and Health Survey, 2022) and pooled estimates for sub-Saharan Africa (Aboagye et al., 2025; Mare et al., 2024; Shibeshi et al., 2025). Wide variation in contact completion across developing regions, from very low coverage in Rwanda to moderate-to-high attainment in Ethiopia, Uganda, Sierra Leone, Gabon, Ghana, and Jordan,

highlights how local health system structures and regional policies shape sustained care retention (Aboagye et al., 2025; Lee et al., 2024; Tegegne et al., 2024; Zeleke et al., 2025).

The decline in contact frequency among adolescent women after their initial booking reflects findings from Uganda and Indonesia, where persistent social stigma, insufficient social support, and a lack of adolescent-friendly healthcare systems hinder continued attendance (Anis et al., 2022; Kayemba et al., 2023). Across sub-Saharan Africa, inconsistent social support networks often make it difficult for young women to maintain routine clinical contacts throughout pregnancy (Odusina et al., 2021).

In contrast, adult women in settings such as Malawi demonstrate greater continuity of care, supported by greater financial independence, more decision-making autonomy, and fewer mobility barriers to regular clinic visits (Mwenebanda et al., 2024). In Ethiopia, prior antenatal care experience in previous pregnancies also positively influences adherence to regular appointments in current pregnancies (Yehualashet et al., 2022).

Importantly, retaining adolescents is achievable. Evidence from Ghana shows that with dedicated follow-up programs and tailored care models, adolescent women attend antenatal care at rates equal to or higher than adult women (Anaba et al., 2022). This highlights the need for targeted, youth-centered interventions to sustain engagement throughout antenatal care.

5.4 Factors related to when adolescent and adult women have their first antenatal care contact.

The source of antenatal care information emerged as a significant independent predictor of timely care initiation. Women who received information directly from healthcare providers were substantially more likely to begin antenatal care during the first trimester than those who relied on informal or non-clinical sources. This finding is consistent with evidence from the Netherlands, where direct guidance from healthcare professionals is strongly associated with

early antenatal care (Vogels-Broeke et al., 2022). Studies in the United Kingdom and Uganda similarly show that health messaging from credible, trusted clinical personnel significantly increases the likelihood of early initiation (Larkai et al., 2025; Mubangizi et al., 2022). Conversely, as observed in The Gambia, unsatisfactory communication with providers or substandard care during previous clinical contacts can markedly reduce women's motivation to seek care early in subsequent pregnancies (Daniels-Donkor et al., 2024).

In contrast, adolescent women in this study relied mainly on informal sources of information, including family members and peers, contributing to widespread delays in seeking care. This reliance reflects a persistent barrier across sub-Saharan Africa, where late booking remains a major structural challenge (Mare et al., 2025). Although social networks in settings such as Uganda provide important emotional and social support, they often lack the clinical authority needed to encourage timely healthcare-seeking (Comfort et al., 2022). Evidence from Malawi suggests that the quality and specificity of antenatal messaging, particularly explanations of the clinical benefits of booking in the first trimester, play a much greater role in prompting early initiation than the mere presence of general social support (Lungu et al., 2023). Without targeted education from healthcare professionals, women may not understand the preventive value of early booking. For example, evidence from Rwanda indicates that without provider-led guidance on the 12-week booking milestone, women often prioritize competing daily survival needs over timely initiation of ANC (Sserwanja, Nuwabaine, et al., 2022).

### 5.5 Factors related to how often adolescent and adult women attend recommended antenatal care contacts.

Pregnancy risk category emerged as the primary independent predictor of the frequency of antenatal care contact. Women with high-risk pregnancies had significantly greater odds of

completing the recommended number of contacts than women in the low- or moderate-risk categories. Although active medical and surgical conditions in the index pregnancy did not differ significantly by maternal age group, adult women had a higher incidence of previous obstetric complications, including prior cesarean deliveries, low birth weight or macrosomia, stillbirth or neonatal mortality, and prolonged or difficult labor. These findings suggest that adult women, who are predominantly multiparous, often have more complex reproductive histories, a pattern well documented in settings such as India (Biradar et al., 2024).

Previous adverse pregnancy outcomes increase a woman's perception of clinical risk, strongly motivating her to follow routine antenatal care schedules (Wakjira et al., 2025). In Kenya, particularly in Migori and Kakamega counties, adult women with a history of pregnancy complications attend more often, while younger primigravid women without such complications tend to consider themselves at low risk (Alhassan et al., 2024; Cooper et al., 2025).

In this study, many young women were classified as low risk mainly because they had no documented obstetric history. Across diverse settings, including Kenya, Ethiopia, South Africa, and India, primigravid adolescents often lack the heightened perception of risk associated with previous complications. This can reduce their sense of urgency and, ultimately, lead to fewer antenatal contacts (Arsenault et al., 2024; Cooper et al., 2025).

Although being classified as high-risk generally encourages care use, serious complications such as anemia, infections, or preeclampsia may create physical or financial burdens that paradoxically make it harder for women to complete all recommended contacts. This pattern is reflected in findings from Lao PDR (Nagatani et al., 2023), Tanzania (Eliufoo et al., 2024), and Benin (Ekholuenetale et al., 2020). Conversely, in Rwanda, multiparous women may miss antenatal contacts because uneventful previous pregnancies create a false sense of security, or because domestic and childcare responsibilities make regular appointments difficult to attend (Sserwanja, Nuwabaine, et al., 2022).

### 5.6 Clinical significance of the study results.

The findings from this study at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) have important implications for refining clinical practice, shaping county and national health policy, and strengthening the operational implementation of the World Health Organization (WHO) 2016 Antenatal Care (ANC) model in Kisumu County and Western Kenya.

The evidence indicates that direct guidance from healthcare professionals is a significant independent predictor of early entry into antenatal care and exerts a greater influence than informal communication. In clinical practice, this means that every healthcare touchpoint, including routine outpatient visits, adolescent health services, and family planning

consultations, should be used systematically to counsel women to start ANC promptly. Since limited decision-making autonomy and financial dependency are associated with delayed attendance among adolescents, clinical protocols should extend beyond individual counseling to include family-centered care. Engaging key household support networks during clinical encounters can help address barriers to autonomy and encourage young women to seek care in a timely manner.

Although women with high-risk pregnancies were more likely to complete the recommended number of contacts, using clinical risk status to guide attendance may leave gaps in continuity of care for women at low or moderate risk. Healthcare providers should take a comprehensive approach to promoting wellness, emphasizing to clinicians and patients that completing all eight contacts benefits every pregnancy, regardless of baseline risk. To support routine attendance among women at low or moderate risk, healthcare facilities should establish structured tracking and follow-up systems that help retain women throughout the antenatal period.

**The similar clinical risk profiles across maternal age groups show that age alone is an unreliable indicator of antenatal clinical need. To avoid age-based generalizations and ensure equitable, risk-appropriate care, JOOTRH and regional facilities should routinely use objective assessment tools, such as the modified Coopland antenatal risk-scoring system, at the initial booking visit. Standardized risk stratification helps clinicians develop personalized care pathways and allocate specialized resources according to verified medical risk rather than age category alone.**

# CHAPTER SIX

# SUMMARY, CONCLUSION, AND RECOMMENDATION

## 6.1 SUMMARY OF FINDINGS

The study assessed the timing and frequency of ANC contacts among 73 adolescent and 219 adult women at JOOTRH. Adult women began ANC significantly earlier than adolescent women, with a median gestational age at booking of 18.00 weeks compared with 20.00 weeks ($p$ = .017). However, late booking after 12 weeks was common in both groups, affecting 63% of adults and 74% of adolescents. Adult women also attended more ANC contacts, with a median of 5.00 compared with 4.00 among adolescents ($p$ = .049). Adherence to the recommended eight antenatal care contacts was low across both age groups, with only 11% of adults and 8% of adolescents meeting the threshold. Multivariable logistic regression showed that women who received ANC information from healthcare providers (*AOR* = 1.96, 95% CI [1.06, 3.71], $p$ = .036) were more likely to book early ANC than those who obtained the information from the media or other sources. Additionally, women with high-risk pregnancies (*AOR* = 2.33, 95% CI [1.47, 3.91], $p$ = .005) were more likely to attend the recommended number of ANC contacts than women with low- or moderate-risk pregnancies. Therefore, the study led to the rejection of both null hypotheses.

## 6.2 CONCLUSION

### 6.2.1 Timing of first antenatal care contact between adolescent and adult women

Adult women at JOOTRH begin antenatal care earlier than adolescent women. However, booking after the first trimester remains a widespread challenge in both age groups.

### 6.2.2 Frequency of recommended antenatal care contacts attended

Adult women have more antenatal care contacts than adolescent women at JOOTRH. However, retention is poor in both groups, and only a small minority of women complete the recommended schedule of eight contacts.

### 6.2.3 Factors associated with the timing of first antenatal care contact

Receiving antenatal education directly from healthcare providers is the only factor that significantly increases the likelihood that a woman will book within the first trimester.

### 6.2.4 Factors associated with the frequency of recommended antenatal care contacts

Women with a documented high-risk pregnancy are significantly more likely to achieve eight antenatal care contacts, while low and moderate-risk women are more likely to fall short of the recommended target.

## 6.3 RECOMMENDATIONS

### 6.3.1 Timing of first antenatal care contact between adolescent and adult women

Given the high rate of late bookings, JOOTRH should consider mechanisms for improving access to antenatal care services for both adolescent and adult women.

### 6.3.2 Frequency of recommended antenatal care contacts attended

The facility should consider implementing measures to keep pregnant women engaged after their initial booking. Routine tracking systems, combined with follow-ups from community health workers, could help reduce missed ANC contacts, particularly among adolescents, who are especially vulnerable to dropping out.

### 6.3.3 Factors associated with the timing of first antenatal care contact

To build on the positive impact of healthcare provider-led ANC health education, JOOTRH should consider enhancing it within the community.

### 6.3.4 Factors associated with the frequency of antenatal care contacts

Women with low- or moderate-risk pregnancies should be encouraged to complete all eight scheduled contacts for preventive care, even if they have no active physical symptoms.

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# APPENDICES

## Appendix I: Consent form

**Study Title: Utilization of Eight Antenatal Care Contacts Among Adolescent and Adult Women at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu, Kenya: A Comparative Analytical Cross-Sectional Study.**

**Principal Investigator:** Dr. Reuben Nyongesa Kere, Resident in the Department of Obstetrics & Gynaecology at the School of Medicine, Maseno University, Kisumu, Kenya.

**We encourage you to take part in the study outlined above.**

If you choose to participate, we will give you a questionnaire that takes about 15 minutes to complete. The questionnaire will ask you questions about the following: predisposing factors, enabling factors, need factors, and ANC utilization.

**Risks, Benefits of Participation, and Confidentiality of Information.**

Participating in this study poses no known risks. Your involvement is completely voluntary. You may choose to decline participation or withdraw from the study at any point without facing any repercussions.

Your information will stay confidential; your name will not be included in any reports or publications.

**Questions and concerns?** Feel free to ask the principal investigator if you have any questions. **Dr. Reuben Nyongesa Kere, 0726596752 / 0780580208**

By signing below, you confirm that you have read, understood, and agree to participate in this study.

**Participant signature: ……... Date: …….**

**Principal investigator / Research assistant signature: …… Date: …….**

Kiambatisho II: Fomu Ya Ridhaa

**Kichwa cha somo: Utumiaji wa Ziara Nane za Utunzaji katika Ujauzito kati ya Kina Mama Vijana na Wazima Wanaohudhuria Mafundisho na Hospitali ya Rufaa ya Jaramogi Oginga Odinga, Kisumu Kenya: Utafiti Ulinganishi wa Sehemu Mtambuka.**

**Mpelelezi Mkuu:** Dk. Reuben Nyongesa Kere, Mkazi, Idara ya Uzazi Na Magonjwa ya Wanawake, Shule ya Tiba, Chuo Kikuu cha Maseno, Kisumu, Kenya.

**Unaalikwa kushiriki katika utafiti hapo juu**

Ukikubali kushiriki, utaombwa kushiriki katika mahojiano ya ana kwa ana ambayo yatachukua takriban dakika 15 ambapo dodoso litasimamiwa. Hojaji itakuuliza maswali kuhusu yafuatayo: mambo ya awali, mambo wezeshi, mambo ya haja na matumizi ya ANC.

**Hatari, Faida za Ushiriki na Usiri wa Habari**

Hakuna hatari zinazojulikana zinazohusiana na kushiriki katika utafiti huu. Kushiriki kwako ni kwa hiari kabisa. Una haki ya kukataa kushiriki au kujiondoa kwenye utafiti wakati wowote bila matokeo yoyote.

Taarifa zako zote zitawekwa siri. Jina lako halitatumika katika ripoti au machapisho yoyote.

**Maswali na wasiwasi?** Tafadhali usisite kumuuliza mpelelezi mkuu Reuben Nyongesa Kere, **0726596752/0780580208**

Kwa kutia sahihi hapa chini unaonyesha kuwa umesoma na kuelewa fomu hii ya idhini na unakubali kushirki katika utafiti huu.

**Sahihi ya mshiriki: ……. Tarehe: ……**

**Sahihi ya Mpepelezi Mkuu/Msaidizi wa Utafiti: …… Tarehe: ……**

**Appendix III: Extraction Tool from Mother and Child Health Handbook**

**Participant Study Unique ID Number…….**

**Table A.3**

*Extraction tool from Mother and Child Health Handbook*

| Contacts | Gestation in Weeks | Recommended Gestation in Weeks | Frequency of Antenatal Care Contacts |
|---|---|---|---|
| 1 (First Antenatal Care Contact) | | 12 weeks | 1st Trimester<br>(1 ANC Contact Within 12 Weeks)<br>Early<br>Late |
| 2 | | 20 weeks | 2nd Trimester |
| 3 | | 26 weeks | (2 ANC Contacts)<br>1<br>2 |
| 4 | | 30 weeks | 3rd Trimester |
| 5 | | 34 weeks | (5 ANC Contacts) |
| 6 | | 36 weeks | 1 |
| 7 | | 38 weeks | 2 |
| 8 | | 40 weeks | 3<br>4<br>5 |

**Appendix IV: Questionnaire**

**Study Title: Utilization of Eight Antenatal Care Contacts Among Adolescent and Adult Women at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu, Kenya: A Comparative Analytical Cross-Sectional Study.**

Participant Study Unique ID: ……. Date: ……

**Introduction:**

We thank you for participating in this study. This questionnaire is anonymous, and we will keep your responses confidential.

**Part 1. Predisposing factors (Sociodemographic factors)**

1. Please indicate your age
    1. Adolescent women (15-19 years)
    2. Adult women (20-49 years)
2. What is your current marital status?
    1. Single
    2. Married
    3. Divorced/separated
    4. Widowed
    5. Living with a partner (unmarried)
3. How many pregnancies have you had, including this one?
    1. 1-2
    2. 3-4
    3. 5+
4. What is the maximum level of education you have achieved?
    1. No formal education
    2. Primary school
    3. Secondary school
    4. Post-secondary education
5. Which religion do you identify with?
    1. Christianity
    2. Islam
    3. Others(specify)

**Part 2. Enabling factors**

6. What is your current job or profession?
    1. Employed
    2. Unemployed
    3. Student
7. What does your partner do for a living?
    1. Employed
    2. Unemployed
    3. Student
8. What is the household's monthly income?

1. Poor
2. Middle
3. Rich

9. Where do you currently live?
    1. Urban
    2. Rural

10. Who has typically been deciding for you to attend ANC contacts during your pregnancy?
    1. Self
    2. Partner
    3. Others (specify)

11. On average, how long do you typically wait at the clinic for your ANC contact?
    1. 0-1 hour
    2. 2-3 hours
    3. 4+ hours

12. What is the highest educational qualification your partner has achieved?
    1. No formal education
    2. Primary school
    3. Secondary school
    4. Post-secondary education

13. Which type of health insurance coverage did you have for this latest pregnancy?
    1. Public health insurance provided by the government
    2. Private health insurance
    3. None

14. What is your primary source of information about ANC?
    1. Healthcare provider
    2. Media
    3. Others (Family/friends/community health care workers)

**Part 3. Need factors**

15. Did you encounter any health issues during this pregnancy? (To be evaluated with the Modified Coopland Antenatal Risk Scoring System in Appendix VI)
    1. Low risk (1-2)
    2. Moderate risk (3-4)
    3. High risk (5+)

**We thank you for your time and participation.**

Kiambatisho V: Dodoso

**Kichwa cha Utafiti**: Tofauti Katika Utumiaji WA Ziara Nane Za Utunzaji Katika Ujauzito Kati Ya Kina Mama Vijana Na Wazima Wanaohudhuria Mafunzo Na Hospitali Ya Rufaa Ya Jaramogi Oginga Odinga, Kisumu, Kenya: Utafiti Ulinganishi Wa Sehemu Mtambuka.

**Kitambulisho Cha Kipekee Cha Utafiti WA Mshiriki: …... Tarehe: …**

Utangulizi:

Asante kwa kushiriki katika utafiti huu. Hojaji hii haijulikani na majibu yako yatakuwa siri.

**Sehemu ya 1: Sababu za kutabiri**

1. Tafadhali onyesha umri wako:
    1. Akina mama vijana (15-19)
    2. Mama watu wazima (20-49)
2. Hali yako ya ndoa kwa sasa iko aje?
    1. Mtu mmoja
    2. Ndoa
    3. Kuachwa / Kutengwa
    4. Mjane
    5. Kuishi na mwenzi (bila kuolewa)
3. Je, umepata mimba ngapi ikiwa pamoja na hii?
    1. 1-2
    2. 3-4
    3. 5+
4. Ni kiwango gani cha juu cha elimu ulichomaliza?
    1. Hakuna
    2. Shule ya msingi
    3. Shule ya Sekondari
    4. Elimu ya juu
5. Wewe ni mtu wa dini gani?
    1. Mkristo
    2. Muislamu
    3. Nyingine (taja)

**Sehemu 2: Vipengele vinavyowezesha**

6. Una kazi gani kwa sasa?
    1. Kuajiriwa kwa muda wote
    2. Wasio na kazi
    3. Mwanafunzi
7. Mpenzi wako ako na kazi gani?
    1. Kuajiriwa kwa muda wote
    2. Wasio na kazi
    3. Mwanafunzi
8. Mapato ya kila mwezi ya kaya ni nini?
    1. Maskini
    2. Kati
    3. Tajiri

9. Unaishi wapi kwa sasa?
    1. Mjini
    2. Vijijini
10. Ni nani ambaye kwa kawaida amekuwa akiamua uhudhurie anwani za ANC kuwa wewe ni mjamzito wako?
    1. Binafsi
    2. Mshirika
    3. Wengine
11. Je, kwa kawaida huwa unasubiri muda gani kwenye kliniki kwa ziara yako ya ANC?
    1. Saa 0-1
    2. Saa 2-3
    3. Saa 4+
12. Je, mpenzi wako amemaliza elimu ya kiwango gani cha juu zaidi?
    1. Hakuna
    2. Shule ya msingi
    3. Shule ya Sekondari
    4. Elimu ya juu
13. Je, ni aina gani ya bima ya afya uliyokuwa nayo kwa ujauzito huu wa hivi punde?
    1. Bima ya afya ya serikali
    2. Bima ya afya ya kibinafsi
    3. Hakuna
14. Chanzo chako kikuu cha habari kuhusu ANC ni kipi?
    1. Mtoa huduma za matibabu
    2. Vyombo vya habari
    3. Wengine

**Sehemu ya 3: Haja ya mambo**

15. Je, ulikumbana na matatizo yoyote ya kiafya wakati wa ujauzito huu? (Itatathiminiwa kwa kurejelea mfumo wa alama za hatari katika ujauzito wa Modified Coopland katika kiambatisho VI)
    1. Hakuna hatari
    2. Hatari ndogo (1-2)
    3. Hatari ya wastani (3-4)
    4. Hatari kubwa (5+)

**Asante kwa muda wako na ushiriki**

**Appendix VI: The location of Jaramogi Oginga Odinga Teaching and Referral Hospital in Kisumu City, Kisumu County, Kenya.**



**Appendix VII: Modified Coopland Antenatal Risk Scoring System**

**We used a modified Coopland antenatal risk scoring system (Biradar et al., 2024) to assess the influence of identified health complications during pregnancy on the frequency of antenatal care contacts.**

| Parameter | | | Score | Parameter | | | Score |
|---|---|---|---|---|---|---|---|
| Risk factor | Age | <18 | 2 | Present pregnancy conditions | Bleeding before 20 weeks of gestation | | 1 |
| | | 18-35 | 0 | | Bleeding after 20 weeks of gestation | | 3 |
| | | >35 | 2 | | Anaemia | Hb 6-10 g% | 1 |
| | Parity | 0 | 1 | | | Hb <6 g% | 2 |
| | | 1-4 | 0 | | Rh isoimmunisation | | 3 |
| | | ≥5 | 2 | | Malpresentation at term | | 3 |
| Medical/ surgical conditions | Chronic hypertension | | 2 | | Multiple pregnancy | | 3 |
| | Pregestational diabetes mellitus | | 2 | | Hypertension | | 2 |
| | Chronic renal disease | | 2 | | Eclampsia | | 3 |
| | Heart disease (NYHA- III or IV) | | 3 | | Gestational diabetes | | 2 |
| | Heart disease (NYHA I or II) | | 1 | | Placenta praevia | | 2 |
| | Previous gynaecological surgery | | 2 | | PROM | | 2 |
| | Other significant medical illnesses- TB, asthma, epilepsy, autoimmune disease | | 1-3 based on severity | | PPROM | | 3 |
| Past obstetric history | History of infertility | | 1 | | Polyhydramnios (amniotic fluid index >24) | | 2 |
| | History of 2 or more first trimester abortions | | 1 | | Oligohydramnios (amniotic fluid index < 5) | | 2 |
| | History of second trimester abortions | | 2 | | IUGR (foetal weight <10$^{th}$ centile for gestational age) | | 3 |
| | Previous child birth weight <2.5 kg or >4 kg | | 1 | | Abnormal Doppler | | 3 |
| | Previous caesarean section | | 1 | Modified Coopland's score | | | |
| | History of PPH or manual removal of placenta | | 1 | | | | |
| | Previous still birth or neonatal death | | 3 | | | | |
| | Prolonged/difficult labour | | 2 | | | | |
| | Gestational hypertension/preeclampsia | | 2 | Total score | Low risk | | 0-3 |
| | Eclampsia | | 3 | | Moderate risk | | 4-6 |
| | Gestational diabetes | | 2 | | High risk | | ≥7 |

**APPENDIX VIII: Approval from the Maseno University School of Graduate Studies**

**MASENO UNIVERSITY**

**SCHOOL OF GRADUATE STUDIES**

***Office of the Dean***

**Our Ref:** MMED/SM/00005/2021

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
FAX: 254-057-351153/351221
Email: sgs@maseno.ac.ke

Date: 4th December, 2024

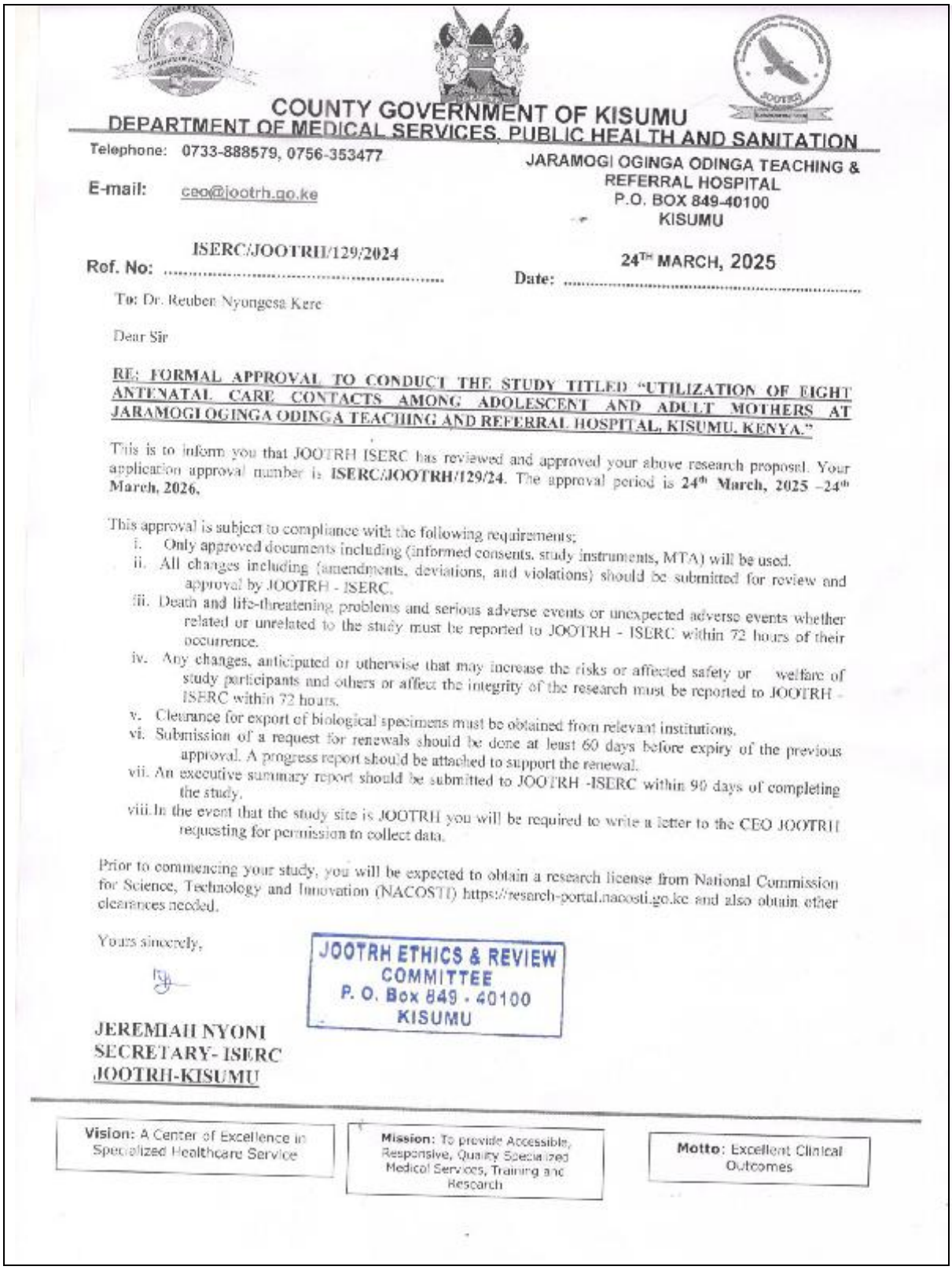
**TO WHOM IT MAY CONCERN**

**RE: PROPOSAL APPROVAL FOR REUBEN NYONGESA KERE — MMED/SM/00005/2021**

The above named is registered in the programme of Master of Medicine in Obstetrics and Gynaecology in the School of Medicine, Maseno University. This is to confirm that his research proposal titled **"Utilization of Eight Antenatal Care Contacts among Adolescent and Adult Mothers at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu, Kenya"** has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required beforehand.

Dr. Patrick Onyango
**DEAN, SCHOOL OF GRADUATE STUDIES**

## APPENDIX IX: Approval from JOOTRH ISERC



COUNTY GOVERNMENT OF KISUMU
DEPARTMENT OF MEDICAL SERVICES, PUBLIC HEALTH AND SANITATION

Telephone: 0733-888579, 0756-353477
E-mail: ceo@jootrh.go.ke

JARAMOGI OGINGA ODINGA TEACHING & REFERRAL HOSPITAL
P.O. BOX 849-40100
KISUMU

Ref. No: ISERC/JOOTRH/129/2024
Date: 24TH MARCH, 2025

To: Dr. Reuben Nyongesa Kere

Dear Sir

RE: FORMAL APPROVAL TO CONDUCT THE STUDY TITLED "UTILIZATION OF EIGHT ANTENATAL CARE CONTACTS AMONG ADOLESCENT AND ADULT MOTHERS AT JARAMOGI OGINGA ODINGA TEACHING AND REFERRAL HOSPITAL, KISUMU, KENYA."

This is to inform you that JOOTRH ISERC has reviewed and approved your above research proposal. Your application approval number is **ISERC/JOOTRH/129/24**. The approval period is **24th March, 2025 –24th March, 2026.**

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) should be submitted for review and approval by JOOTRH - ISERC.
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to JOOTRH - ISERC within 72 hours of their occurrence.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to JOOTRH - ISERC within 72 hours.
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewals should be done at least 60 days before expiry of the previous approval. A progress report should be attached to support the renewal.
vii. An executive summary report should be submitted to JOOTRH -ISERC within 90 days of completing the study.
viii. In the event that the study site is JOOTRH you will be required to write a letter to the CEO JOOTRH requesting for permission to collect data.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely,

JOOTRH ETHICS & REVIEW COMMITTEE
P. O. Box 849 - 40100
KISUMU

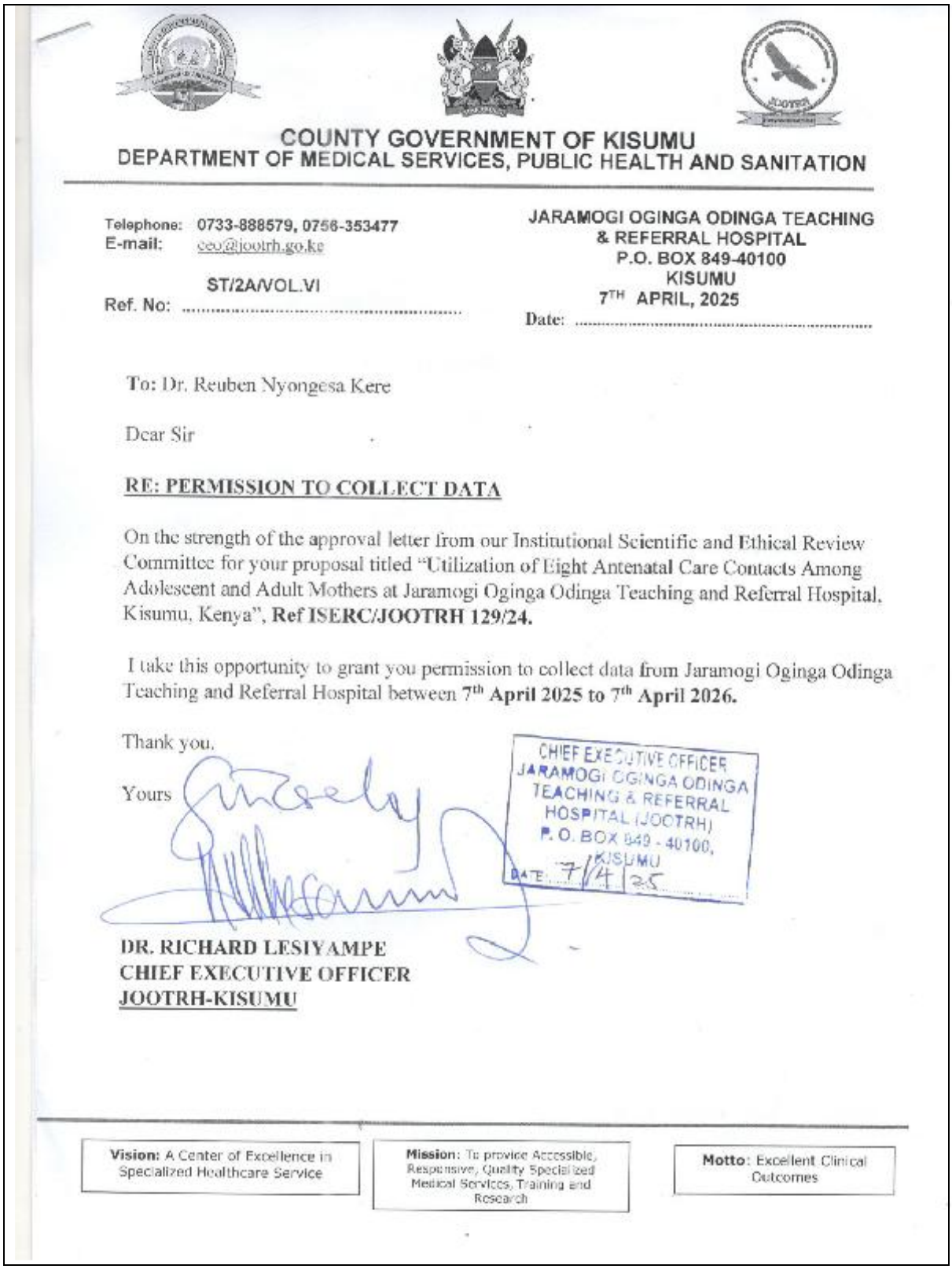
JEREMIAH NYONI
SECRETARY- ISERC
JOOTRH-KISUMU

**Vision:** A Center of Excellence in Specialized Healthcare Service

**Mission:** To provide Accessible, Responsive, Quality Specialized Medical Services, Training and Research

**Motto:** Excellent Clinical Outcomes

APPENDIX X: Approval from JOOTRH administration



COUNTY GOVERNMENT OF KISUMU
DEPARTMENT OF MEDICAL SERVICES, PUBLIC HEALTH AND SANITATION

Telephone: 0733-888579, 0756-353477
E-mail: ceo@jootrh.go.ke

JARAMOGI OGINGA ODINGA TEACHING
& REFERRAL HOSPITAL
P.O. BOX 849-40100
KISUMU

ST/2A/VOL.VI
Ref. No: .....

7TH APRIL, 2025
Date: .....

To: Dr. Reuben Nyongesa Kere

Dear Sir

**RE: PERMISSION TO COLLECT DATA**

On the strength of the approval letter from our Institutional Scientific and Ethical Review Committee for your proposal titled "Utilization of Eight Antenatal Care Contacts Among Adolescent and Adult Mothers at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu, Kenya", **Ref ISERC/JOOTRH 129/24.**

I take this opportunity to grant you permission to collect data from Jaramogi Oginga Odinga Teaching and Referral Hospital between 7th **April 2025 to** 7th **April 2026.**

Thank you.

Yours

CHIEF EXECUTIVE OFFICER
JARAMOGI OGINGA ODINGA
TEACHING & REFERRAL
HOSPITAL (JOOTRH)
P. O. BOX 849 - 40100,
KISUMU
DATE: 7/4/25

**DR. RICHARD LESIYAMPE**
**CHIEF EXECUTIVE OFFICER**
**JOOTRH-KISUMU**

**Vision:** A Center of Excellence in Specialized Healthcare Service

**Mission:** To provide Accessible, Responsive, Quality Specialized Medical Services, Training and Research

**Motto:** Excellent Clinical Outcomes

## APPENDIX XI: Research permit from NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 487606

Date of Issue: 09/April/2025

### RESEARCH LICENSE



This is to Certify that Dr.. Reuben Nyongesa Kere of Maseno University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kisumu on the topic: UTILIZATION OF EIGHT ANTENATAL CARE CONTACTS AMONG ADOLESCENT AND ADULT MOTHERS AT JARAMOGI OGINGA ODINGA TEACHING AND REFERRAL HOSPITAL, KISUMU, KENYA for the period ending : 09/April/2026.

License No: NACOSTI/P/25/417736

487606

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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See overleaf for conditions