University of DONGOLA

Faculty of Medicine and Health Sciences

Department of Community Medicine

Research proposal entitled:

Pattern of Antenatal Care Utilization Among Pregnant Women Attending Dongola Maternal Hospital, Northern State, Sudan 2026

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2026

1. Background

Antenatal care (ANC) is a cornerstone of maternal healthcare, offering opportunities to monitor the health of the mother and fetus, detect complications early, and deliver preventive and nutritional interventions [1]. The World Health Organization recommends a minimum of eight ANC contacts during pregnancy, with the first contact in the first trimester [1]. Maternal health is shaped by wider social, economic, and health-system determinants, and many preventable maternal deaths reflect persistent inequities [2]. Access to timely ANC is also unequal worldwide: early ANC coverage rose from 40.9% in 1990 to 58.6% in 2013, yet in 2013 it was only 24.0% in low-income countries compared with 81.9% in high-income countries [3].

In sub-Saharan Africa, a systematic review of 74 studies found that higher socioeconomic status, urban residence, higher maternal education, employment, and lower parity were associated with better ANC utilization, whereas unplanned pregnancy, greater distance from health facilities, and high service costs were associated with lower utilization [4]. Delayed initiation of ANC is common in the region, with first visits often occurring after the recommended period [5]. The number of visits attended is likewise associated with individual and household characteristics [6].

In Sudan, maternal mortality remains a major concern [7]. Northern State showed a significant decline in maternal mortality between 2009 and 2019, although it was still listed among the states with the highest ratios in 2019 [7]. ANC services in Sudan are underused, and national survey data linked ANC attendance to higher maternal education, greater household wealth, and lower parity [8]. In Kassala, eastern Sudan, most women attended a first ANC visit, but only a small minority reached a fourth visit [9]. Since 2023, armed conflict has fragmented the health system and hindered access to essential services, with serious consequences for antenatal and obstetric care [10]. In Gadarif State, women attended a median of four ANC visits and made their first visit at a median of 13 weeks, and they reported barriers such as lack of privacy, irregular facility operating hours, and transport difficulties [11]. In Merowe locality, Northern State, most postpartum women attended at least four ANC visits, and fewer than four visits were associated with more perinatal deaths [12].

2. Problem Statement

Globally, antenatal care is a key opportunity to detect and manage pregnancy complications, yet access to it is unequal: early ANC coverage in 2013 was only 24.0% in low-income countries compared with 81.9% in high-income countries [3]. In sub-Saharan Africa, only 38.0% of women initiated ANC in time [5]. In Sudan, ANC use remains low and uneven, with national coverage of the first and fourth visits at only 40% and 29% in 2022 [13].

Inadequate ANC leaves pregnancy complications undetected and untreated: in other Sudanese settings lack of ANC was a main risk factor for low birth weight (12.6% of neonates in Medani

Hospital) and stillbirth reached 31.11% among women in Wad Madani with no ANC or poor health [13]. In Merowe, Northern State, perinatal death was 8.7% among women with fewer than four ANC visits compared with 1.8% among those with four or more, while only 25.8% of postpartum women attended eight or more visits [12]. To our knowledge, no study has assessed ANC utilization among pregnant women attending Dongola Maternal Hospital, so the pattern of ANC use among these women, including when they start ANC, how often they attend, and which services they receive, remains unknown.

3. Justification

Dongola is the capital of Northern State [14]. Since the war began, the state has received large numbers of displaced people, mostly from Khartoum: more than 362,000 by August 2023, with at least 15 gathering sites in Dongola town alone, and over 400,000 by March 2024 [14]. More recently, Northern State prepared reception centers in Dongola and other localities for people fleeing Darfur and Kordofan [15]. Pregnant women are among those arriving [16]. Dongola Maternal Hospital is the main maternity hospital in the city, and both residents and displaced families depend on it for maternity care. UNFPA also supported it in 2023 so that its operating room and nursery department could keep working [17].

ANC is important for these women because it is how problems in pregnancy are found and managed early. The WHO recommends at least eight contacts, starting in the first trimester [1]. However, national coverage of the fourth ANC visit was only 25% in 2021 and 29% in 2022 [13]. In Merowe, perinatal death was 8.7% among women with fewer than four visits compared with 1.8% among those with four or more [12]. The war has also disrupted antenatal and obstetric care [10]. Distance and service costs limit ANC use [4].

A hospital carrying this load is where ANC use most needs to be measured. Yet the only recent Northern State study was in Merowe and Karima, and, to our knowledge, no study has described ANC utilization at Dongola Maternal Hospital [12].

4. Research Questions

1. What is the pattern of antenatal care utilization among pregnant women attending Dongola Maternal Hospital?
2. What are the sociodemographic characteristics of pregnant women attending Dongola Maternal Hospital?
3. What are the obstetric characteristics of the study participants?

5. Objectives

5.1 General Objective

To describe the pattern of antenatal care utilization among pregnant women attending Dongola Maternal Hospital.

5.2 Specific Objectives

- To describe the pattern of antenatal care utilization, in terms of gestational age at the first visit, number of visits up to the time of interview, and services received, among pregnant women attending Dongola Maternal Hospital.
- To describe the sociodemographic characteristics of pregnant women attending Dongola Maternal Hospital.
- To describe the obstetric characteristics of the study participants.

6. Literature Review

6.1 Global Evidence

The World Health Organization recommends a minimum of eight ANC contacts during pregnancy, with the first contact in the first trimester [1]. Souza et al. [2] analysed the determinants of maternal health worldwide and described many preventable maternal deaths as the result of social and economic conditions and health-system features, not only of biomedical complications. Moller et al. [3] analysed regional and global levels and trends of early ANC coverage from 1990 to 2013. Early ANC coverage rose from 40.9% to 58.6% over this period, but in 2013 it was only 24.0% in low-income countries compared with 81.9% in high-income countries [3]. These studies show that the timing of the first visit is an important and unequal dimension of ANC utilization, which supports describing when women attending Dongola Maternal Hospital start ANC.

6.2 Regional Evidence (Sub-Saharan Africa)

Okedo-Alex et al. [4] conducted a systematic review to identify determinants of ANC utilization in sub-Saharan Africa. The review included 74 studies from 23 sub-Saharan African countries and examined factors associated with ANC attendance, timing, and frequency of visits [4]. Higher socioeconomic status, urban residence, higher maternal education, employment, lower parity, awareness of danger signs, exposure to mass media, and having an educated partner were associated with better ANC utilization and timely initiation [4]. In contrast, unplanned pregnancy, poor autonomy, lack of partner support, greater distance from health facilities, lack of health insurance, and high service costs were associated with lower ANC utilization [4]. This study supports describing the sociodemographic and obstetric profile of pregnant women using ANC in

Dongola Maternal Hospital, including household income, distance to the facility, and health insurance.

Alem et al. [5] analysed Demographic and Health Surveys from 36 sub-Saharan African countries, including 233,349 women, and found that only 38.0% initiated ANC in time, with country estimates ranging from 14.5% to 68.6%. Higher education, older age, the richest wealth quintile, and media exposure were associated with higher odds of timely initiation, whereas rural residence and a later-wanted pregnancy were associated with lower odds [5]. Gebeyehu et al. [6] used Demographic and Health Survey data from 2008 to 2019 in a multilevel negative binomial regression model and showed that the number of ANC visits varies with individual and household characteristics. Together, these studies show that both the timing and the number of visits differ across women in the region.

6.3 Evidence from Sudan

In Sudan, Mustafa and Mukhtar [8] used data from the 2010 Sudan Household Health Survey, which included 5,730 women aged 15–49 years who had been pregnant during the two years preceding the survey. Receiving ANC was significantly associated with higher maternal education, greater household wealth, and lower parity [8]. The authors concluded that improving female education and the coverage and affordability of health services could help address the underutilization of maternal healthcare services [8]. In Kassala, eastern Sudan, Ali et al. [9] reported that most women attended a first ANC visit, but only a small minority reached a fourth visit, which suggests that the main gap may lie in the number of visits rather than in first contact.

More recent national figures show that coverage of the first and fourth ANC visits was 40% and 29% in 2022, and the war that began in 2023 has further disrupted antenatal services [13]. In a cross-sectional study of 345 pregnant women at Gadarif Hospital for Obstetrics and Gynecology during the war, Ali et al. [11] found a median of four ANC visits and a median gestational age of 13 weeks at the first visit; the reported barriers included lack of privacy, irregular facility operating hours, and transport difficulties. In Northern State, Elhassan et al. [12] studied 267 postpartum women in Merowe locality and Karima, and found that 82.4% attended at least four ANC visits but only 25.8% attended eight or more, with perinatal death of 8.7% among women with fewer than four visits compared with 1.8% among those with four or more.

In summary, studies from sub-Saharan Africa and Sudan describe ANC use in terms of the timing of the first visit and the number of visits, but none was conducted at Dongola Maternal Hospital. The present study therefore describes the pattern of ANC utilization among pregnant women attending this hospital in the same terms, to allow comparison with these studies.

7. Methodology

7.1 Study Design: A descriptive cross-sectional study.

7.2 Study Setting: The study will be conducted at Dongola Maternal Hospital in Dongola, Northern State, Sudan. Dongola is the capital of Northern State [14]. It is a town on the west bank of the Nile about 448 km northwest of Khartoum and an agricultural centre for the surrounding area [18].

7.3 Study Period: The study will be conducted over approximately three months, from September to November 2026.

7.4 Study Population: Pregnant women attending Dongola Maternal Hospital during the study period.

7.5 Inclusion Criteria: Pregnant women attending Dongola Maternal Hospital during the study period who agree to participate and provide informed consent.

7.6 Exclusion Criteria: Women who are critically ill or unable to communicate.

7.7 Sample Size Calculation: The sample size was calculated using the single population proportion formula:

$$n = Z^2 \times p \times q / d^2$$

Where Z = 1.96 for a 95% confidence level, p = 50%, q = 1 − p = 0.50, and d = 5% margin of error.

$$n = (1.96)^2 \times (0.50) \times (0.50) / (0.05)^2 = 384$$

To account for a 5% non-response rate:

$$\text{Adjusted sample size} = 384 / (1 - 0.05) = 404.2 \approx 405$$

Therefore, the final sample size is 405 pregnant women.

7.**8 Sampling Technique:** Consecutive sampling will be used to recruit all eligible pregnant women attending Dongola Maternal Hospital during the study period until the required sample size is reached. The hospital ANC/medical record number will be used to prevent duplicate participation.

7.9 Study Variables

The study variables will include:

1. Sociodemographic Variables

- Age
- Residence
- Marital status
- Educational level

- Occupation
- Household income
- Distance/travel time to facility
- Health insurance

2. Obstetric Variables

- Gravidity
- Parity
- Gestational age
- Previous pregnancy complications
- Previous antenatal care

3. Antenatal Care Utilization Variables

- Gestational age at first ANC visit
- Number of ANC visits up to the time of interview
- Timing and frequency of ANC visits
- Antenatal care services received

7.10 Data Collection: Data will be collected from eligible pregnant women attending Dongola Maternal Hospital using a structured questionnaire designed as a Google Form. The researcher will use a smartphone or tablet to enter the participants' responses based on the information provided by them. The form will include a consent section, and the responses will be automatically saved in Google Sheets and exported for analysis. Pregnancy status will be confirmed from the ANC or medical record.

7.11 Data Analysis: Data will be collected using Google Forms and exported to Microsoft Excel before being analyzed using **SPSS version 26**. Categorical variables will be summarized using frequencies and percentages. Continuous variables will be summarized using means and standard deviations or medians and interquartile ranges, as appropriate. Results will be presented in tables and appropriate charts.

7.12 Ethical Considerations: Ethical approval will be obtained from the Ministry of Health in Northern State through the University of Dongola. Permission to conduct the study will also be obtained from Dongola Maternal Hospital.

Participants will be informed about the purpose of the study and the information required from them. Verbal informed consent will be obtained before participation. Participation will be voluntary, and refusal to participate or withdrawal from the study will not affect the health services they receive.

Confidentiality and privacy will be maintained throughout the study. The information provided by participants will be kept confidential and used only for research purposes. No names or personal identifiers will be recorded, and the collected data will be securely stored and accessible only to the research team.

8. Work Plan and Timeline

Activity	Start	End	2026										
			Sep		Oct				Nov				
			20–24	27–1	4–8	11–15	18–22	25–29	1–5	8–12	15–19	22–26	29–3
1. Preparation of the research proposal *1 week*	20 Sep 2026	24 Sep 2026											
2. Review and finalization of the research proposal *1 week*	27 Sep 2026	1 Oct 2026											
3. Data collection *3 weeks*	**4 Oct 2026**	**22 Oct 2026**											
4. Data organization, coding, and analysis *2 weeks*	25 Oct 2026	5 Nov 2026											
5. Writing results, discussion, and recommendations *2 weeks*	8 Nov 2026	19 Nov 2026											
6. Final review *1 week*	22 Nov 2026	26 Nov 2026											
7. Submission to the Department of Community Medicine *4 days*	27 Nov 2026	30 Nov 2026											

■ Preparation ■ Data collection ■ Analysis and writing ■ Review and submission

Each column shows the dates of one working week (Sunday to Thursday), placed under the month in which that week starts.

9. Budget Outline

Item	Details	Cost (SDG)
Transportation	Travel of the data collectors to and from Dongola Maternal Hospital during the data collection period (4–22 Oct 2026), and transport for supervisor and administrative follow-up.	150,000
Data analysis	Cleaning and coding of the Google Form responses (exported from Google Sheets), analysis using SPSS version 26, and preparation of tables and figures.	200,000
Printing and final research report	Printing, photocopying, and binding of the proposal and the final research report for the Department of Community Medicine and the supervisor.	100,000
Internet data bundles	Mobile internet data for the researchers to enter responses in the Google Form and for syncing/exporting the Google Sheets data during the data collection period.	50,000
Contingency	Reserve for unforeseen expenses during the study.	50,000
Total Budget		**550,000**

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