ARSI UNIVERSITY

COLLEGE OF HEALTH SCIENCES DEPARTMENT OF MIDWIFERY

ARRIVAL TO HEALTH PROFESIONAL VISIT TIME AND ITS PREDICTORS AMOUNG LABORING MOTHERS AT ASELLA TEACHING AND REFERRAL HOSPITAL, ETHIOPIA, 2025G.C

BY

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ACRONYM AND ABBREVIATIONS

ATRH	Asella Teaching and Referral Hospital
AWHONN	Association of Women's Health Obstetric and Neonatal Nurses
ENAP	Every Newborn Action Plan
LMICs	low- and middle-income countries
MMR	Maternal Mortality Ratio
SDGs	Sustainable Development Goals
WHO	World Health Organization

ABSTRACT

Background: Arrival-to-health-professional-visit time is critical in reducing maternal and neonatal mortality, as delays in this process can lead to severe complications such as hemorrhage, neonatal asphyxia, and sepsis. In Ethiopia, maternal deaths are primarily caused by hemorrhage, hypertensive disorders, abortion, and sepsis—conditions that can be prevented with timely access to obstetric care. Delays in care from arrival to health professional visit contribute significantly to maternal deaths, which could be reduced by up to 98% with timely care. This study aims to address the data gap regarding the time from a laboring mother's arrival to the initial health professional visit and to identify factors causing delays at Asella Teaching and Referral Hospital (ATRH).

Objective: To assess the time from arrival to health professional visit and identify its predictors among laboring mothers at Asella Teaching and Referral Hospital in Arsi Zone, Ethiopia, in 2024.

Methods: This institutional-based prospective cohort study was conducted from October 5 to November 15, 2024. Data were collected through direct observation and medical records, with pre-testing at Bokoji Hospital. SPSS version 26 was used for data analysis. Kaplan-Meier survival analysis was used to estimate survival functions, and the Log-rank test compared differences in wait times across groups. Cox proportional hazards regression adjusted for potential confounders, and multicollinearity was assessed using the variance inflation factor.

Results: Out of 670 study participants, approximately 36.4% were seen within 10 minutes after arrival. The restricted mean arrival-to-health-professional-visit time was 26.7 minutes (95% CI: 24.94–28.51). Waiting for a bed (AOR = 0.63, 95% CI: 0.50–0.96), availability of essential resources (AOR = 0.358, 95% CI: 0.242–0.531), and availability of staff (AOR = 1.97, 95% CI: 1.34–2.88) were statistically significant predictors of delayed arrival-to-health-professional-visit times.

Conclusion and Recommendation: A small proportion of mothers were seen within the recommended time frame. Delays due to waiting for a bed, limited essential resources, and insufficient staff were significant predictors of extended arrival times. Addressing these issues can help reduce delays and improve timely care for laboring mothers.

Keywords: Arrival time, health professional visit, obstetric triage, predictors of delay.

1. INTRODUCTION

Arrival-to-health-professional-visit time is critical in reducing maternal and neonatal mortality, as delays in this process can lead to severe complications such as hemorrhage, neonatal asphyxia, and sepsis [1, 2, 3]. Global each year, approximately 295,000 women die from pregnancy-related causes, with 95% of these deaths occurring in low- and middle-income countries (LMICs), including Ethiopia. [4,5]. This underscores a critical global health crisis, emphasizing the urgent need to address delays in obstetric care to meet international health targets, including the Sustainable Development Goals (SDGs), which aim to reduce maternal mortality to 70 per 100,000 live births by 2030. Ethiopia faces significant barriers to achieving this target due to systemic challenges such as overcrowding, limited resources, and inadequate triage systems [6].

Timely access to emergency obstetric care can prevent up to 98% of maternal deaths through appropriate interventions [7]. Ethiopia's maternal mortality ratio (MMR) of 412 per 100,000 live births is significantly higher than the global average of 211 per 100,000, highlighting the severe disparity in maternal health outcomes [8, 9]. The leading causes of maternal deaths in Ethiopia, including hemorrhage, hypertensive disorders, abortion, and sepsis, are preventable with timely obstetric care from arrival to health professional visit [1, 9]. Despite global efforts like the Every Newborn Action Plan and SDG targets, Ethiopia continues to face significant barriers, including overcrowding, insufficient resources, and delays in triage assessments, which impede progress in reducing maternal deaths [10, 11, 12].

This study aims to assess the time between a laboring mother's arrival at Asella Teaching and Referral Hospital and the subsequent visit by a health professional, while also identifying the causes of delays. Understanding these delays will inform strategies to improve the timeliness of care, thus enhancing maternal and neonatal outcomes. Delays in triage and health professional visits are known to significantly increase the risk of maternal hemorrhage and neonatal sepsis [13, 14]. Optimizing triage systems and resource allocation can significantly improve care outcomes, as demonstrated in settings like Uganda [15] and other countries worldwide [16, 17, 18]. Studies from Nigeria and other low-resource settings have shown that delays contribute to a 40% increase in maternal and neonatal morbidity due to delayed care, underlining the urgency of addressing this issue [19, 20, 21, 22]. Proposed interventions, such as increasing staffing levels

and improving resource allocation, have shown promise in reducing delays and improving care [23, 24].

In high-resource settings, initial assessment times are typically around 30 minutes, whereas in lower-resource settings, wait times often exceed 40 minutes [25, 26]. These delays contribute to higher rates of complications such as preterm births, infections, and emergency cesarean sections. Prolonged wait times have been associated with poorer outcomes in places like Ghana, Addis Ababa, and other Ethiopian hospitals, highlighting the need for systemic improvements in obstetric care delivery [27, 28, 29, 30]. Even in Tokyo, where wait times are reduced, more emergency interventions are performed, emphasizing the importance of optimizing triage systems [31].

At Asella Teaching and Referral Hospital, no comprehensive data exists on the timing of health professional visits. This study aims to fill this gap, investigating the timing of visits and identifying factors contributing to delays in care. Previous studies from the Arsi Zone indicate an average delay of 42.3 minutes, which highlights the importance of addressing delays at this institution. Factors such as maternal age, education, and prenatal care have been identified as contributing to these delays [32, 33, 34, 35, 36]. The World Health Organization underscores the importance of addressing waiting times and improving resource allocation to enhance maternal and neonatal health outcomes [37]. Optimizing triage systems and resource management can play a crucial role in reducing maternal and neonatal deaths in Ethiopia and other resource-limited settings [38, 39, 40, 41, 42].

1.2 Statement of the Problem

Delays health-professional-visit time can lead to serious complications, such as maternal hemorrhage, pre-eclampsia, and neonatal issues like birth asphyxia and sepsis [1, 2, 3]. Globally, approximately 295,000 women die annually from pregnancy-related causes, with 95% of these deaths occurring in low- and middle-income countries (LMICs), including Ethiopia, While the Sustainable Development Goals (SDGs) aim to reduce maternal deaths to 70 per 100,000 live births by 2030, Ethiopia faces significant barriers to achieving this target [4, 5, 6].

In high-resource settings like New York City and Mumbai, the median wait time for obstetric care is about 30-35 minutes, with longer wait times linked to higher rates of maternal hemorrhage and neonatal complications [22, 30]. However, in lower-resource settings such as Accra, Ghana, and Tanzania, delays are even more severe, highlighting the need for urgent improvements in these regions. In Ethiopia, delays in care are a major issue. Studies show that in Addis Ababa, a median wait time of 40 minutes is associated with increased neonatal complications and maternal issues like postpartum hemorrhage [25]. Other regions in Ethiopia, such as Arsi Zone, report delays of up to 9 hours, and in Gurage Zone, over 34% of laboring women experience delays of more than an hour, resulting in complications for many [36, 42]. These delays are far beyond the recommended 10-minute triage assessment time set by the Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN) [13].

Factors such as overcrowding, high patient volumes, and insufficient resources are key contributors to these delays, posing significant risks to maternal and neonatal health. On days with more than 30 patients, the median triage time can extend to 83 minutes, compared to just 33 minutes on less busy days [24]. These delays are particularly exacerbated during night shifts and weekends when staffing levels are reduced and resources are scarce, further increasing the risk of complications like maternal hemorrhage, pre-eclampsia, and neonatal sepsis [2, 35]. Although Ethiopia has made efforts to improve maternal health through initiatives such as the Health Sector Transformation Plan (HSTP), the country still faces alarmingly high maternal mortality, with a maternal mortality ratio of 412 deaths per 100,000 live births—much higher than the global average [10]. At Asella Teaching and Referral Hospital (ATRH), overcrowding, resource shortages, and delayed triage processes contribute to long waiting times, underscoring the urgent

need for further research and interventions to address these challenges and improve outcomes for both mothers and newborns [7, 25].

1.3 Justification of the Study

This study addresses a knowledge gap by providing detailed data on arrival-to-health professional visit times and identifying delays in care among laboring mothers at Asella Teaching and Referral Hospital (ATRH).

It aligns with best practices, including the AWHONN recommendation for a 10-minute assessment upon arrival. Improving triage processes can significantly reduce maternal and neonatal morbidity and mortality by ensuring timely interventions and optimizing resource utilization.

The study will help identify areas for intervention to improve care and provide valuable insights for health planners, administrators, policymakers, and healthcare facilities, facilitating the development of necessary structures and management capabilities.

Ultimately, the research aims to create a robust platform for delivering quality maternity care and contributes to global health goals, such as SDG 3, by reducing maternal mortality and promoting well-being.

- # LITERATURE REVIEW

2.1 Global Perspective on Prolonged Waiting to Triage

Delays in triage from patient arrival to the initial visit significantly impact maternal health and vary by location. Globally, the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) recommends that triage should begin within 10 minutes [13].

Tokyo reports a median wait time of 15 minutes, which is close to the guideline, though there is a slight increase in respiratory issues observed [32]. London has a mean wait of 45 minutes, linked to a 30% rise in emergency cesarean sections [23].In both New York City and Mumbai, wait times reach 30 and 35 minutes, respectively, this results in higher rates of maternal hemorrhage and postpartum infections [22, 30]. In Nairobi, the median wait is 25 minutes, contributing to a 25% increase in severe complications [31, 24].

In Accra, Ghana, the median wait time from arrival to initial assessment by a labor ward midwife is 40 minutes (with an interquartile range of 15-100 minutes), and this delay is associated with a 20% increase in maternal health issues. Only 22% of women are evaluated within 10 minutes of arrival, and 41% within 30 minutes. However, 7% of women were not evaluated within 3 hours, and some waited over a day. Additionally, only 62% of women had a plan of care documented in their charts [24].

In Nigeria, average wait times of 40 minutes contribute to increased maternal morbidity, similar to findings in Sidama, Ethiopia, and Lagos [39, 17]. In Tanzania and the Arsi Zone, wait times can exceed 60 minutes, and in some cases, delays extend up to 9 hours, leading to severe outcomes such as maternal hemorrhage, increased morbidity, and mortality [35, 36]. These global studies highlight that delays beyond the recommended 10-minute guideline are associated with significant increases in maternal health complications.

Locally, in Ethiopia, prolonged wait times for triage and care are also a pressing issue. In Addis Ababa, the median wait time is 15 minutes, which is near the recommended standard, but delays still exist, especially in busy healthcare facilities [32]. In South Gondar Zone, a median wait time of 25 minutes is recorded, which is associated with a rise in severe complications among mothers [31]. The Arsi Zone also experiences average wait times of 30 minutes, contributing to higher

rates of maternal hemorrhage and infections [22, 30]. In Gurage Zone, Southern Ethiopia, 34.8% of women in labor wait over an hour for care, often with significant complications reported [42].

In Sidama and Gurage Zone, wait times regularly exceed 60 minutes, with some areas reporting even longer delays, which have been linked to adverse maternal health outcomes such as hemorrhage and increased morbidity and mortality [35, 36]. These findings are consistent with global trends, emphasizing that delays in triage beyond the 10-minute window are harmful to maternal health. The lack of adequate resources, insufficient staffing, and overcrowding are major contributing factors to these prolonged wait times, particularly in rural regions.

2.2 Factors influencing arrival to initial visit

Timeliness in obstetric triage is influenced through a selection of factors, consisting of affected person traits, socio-demographic elements, device-degree variables, facility-related troubles, and health company associated factors. Understanding those elements is important for enhancing triage performance and patient results at Asella Teaching Referral.

2.2.1 Socio - Demographic Factors

2.2.1.1 Age

Globally, younger mothers experience shorter waiting times during labor compared to older mothers, with variations of 10 to 20 mints. [38]. In the South Gondar Zone of Ethiopia, older mothers wait approximately 20% longer than younger mothers in urban settings, the majority of participants are in the 25-29 age range (42.3%), while younger mothers (15-19) make up only 3.7%, and those aged 20-24 account for 24.9%.[37]. Research shows that age significantly affects waiting times, especially for mothers over 35, who may wait 20-30 mints longer due to the need for comprehensive assessments related to age-associated risks. [38].

2.2.1. 2 Education

Higher education is associated with shorter waiting times globally, averaging a difference of about 10 mints compared to individuals with lower education levels. [38]. In the South Gondar Zone, 14.9% of laboring mothers have no formal education, 41.7% completed primary school, 31.5% have secondary education, and 11.8% attended college or above. Mothers with lower

educational attainment may wait 20-30% longer than those with higher education. [41]. Educated mothers tend to be better organized for their visits, arriving with necessary documentation and questions, which reduces their waiting times by approximately 10-15 mints. In contrast, less educated mothers often require more extensive counseling, leading to longer wait times. [41].

2.3 System-Level Factors

2.3.1 Time of Day

The analysis of waiting and triage times based on shift reveals significant disparities. During the morning shift, 325 patients (32%) experienced a median wait time of 37 mints (IQR: 11–84) and a triage time of 41 mints (IQR: 13–200), with a significant p-value of 0.0001 for wait times, indicating that morning hours may offer more efficient processing. Conversely, the night shift included 390 patients (38%) who faced longer wait times, averaging 55 mints (IQR: 15–135) and a triage time of 70 mints (IQR: 15–293). The trend of increased delays at night is often attributed to lower staffing levels and resource availability, which poses higher risks for mothers and neonates [24]. These findings highlight the importance of staffing and resource allocation and the need for further research on their impact on patient outcomes.

2.3.2 Day of the Week

The analysis of waiting and triage times based on the day of the week indicates that weekdays tend to have shorter wait and triage times compared to weekends. On weekdays, 662 patients (72%) had a median wait time of 40 mints (IQR: 14–192) and a triage time of 40 mints (IQR: 12–227). In contrast, weekends (263 patients, 28%) showed increased waiting times, averaging 45 mints (IQR: 15–111) for wait times and 65 mints (IQR: 20–298) for triage times. The significant difference in triage times was highlighted by a p-value of 0.0071, reflecting operational challenges, including lower staffing levels and higher patient volumes during weekends, which can impact care delivery efficiency [24].

2.3.3 Patient volumes

Daily patient volume significantly affects wait and triage times. On days with fewer than 10 patients, the median wait time averaged 50 mints (IQR: 19–92), with a triage time of 45 mints, for 80 patients (9%).

As patient numbers increased to 10–19, the median wait time decreased to 40 mints (IQR: 15–102) for 554 patients (60%). However, on days with more than 30 patients (81 patients, 9%), median triage times rose significantly to 83 mints (IQR: 10– 361), with a p-value of 0.0285, indicating that high patient volumes can lead to increased delays in care [24].

2.3.4 Risk facture

Risk factors significantly influence waiting and triage times, with high-risk cases receiving priority. Among the other risk factors, 529 patients (57%) experienced a median wait time of 45 mints (IQR: 15–110) and a triage time of 60 mints (IQR: 15–310), with a p-value of 0.0299 indicating statistical significance. In cases of sepsis (65 patients, 7%), the wait time decreased to 35 mints (IQR: 10–70) with a triage time of 51 mints (IQR: 18–182). Similarly, hypertensive disorders of pregnancy (HDoP) (285 patients, 31%) had wait times of 32 mints (IQR: 12–80) and triage times of 34 mints (IQR: 11–171). Notably, cases of obstetric hemorrhage (44 patients, 5%) had median wait and triage times of 37 mints (IQR: 10–66) and 24 mints (IQR: 12–185), respectively. [24].

2.3.5 Labor statues

Labor status markedly impacts waiting and triage times. Women in the latent phase (489 patients, 56%) faced longer median wait times of 44 mints (IQR: 15–108) and triage times of 85 mints (IQR: 20–336). In contrast, those in the first stage (275 patients, 31%) had a median wait time of 35 mints (IQR: 10–83) and a triage time of 24 mints (IQR: 10–65). The second stage (42 patients, 5%) showed quicker assessments, with wait times of 30 mints (IQR: 12–79) and triage times of 10 mints (IQR: 5–32). Non-laboring patients (69 patients, 8%) experienced delays, with wait times averaging 38 mints (IQR: 15–90) and median triage times of 60 mints (IQR: 15–365). These findings emphasize the need for improved management of latent labor and non-laboring patients while ensuring prompt attention for those in active labor, with a significant p-value of 0.0279 for differences across labor stages [24]

2.4 Health provider relate factor

2.4.1 Negligence

Provider negligence significantly contributes to extend waiting times in various regions. In Sidama, Ethiopia, 17% of delays (n=27) were attributed to provider negligence, with median wait times of 15 mints [39]. In the Arsi Zone, 18.2% of delays (n=36) were linked to careless staff attitudes, resulting in median wait times of 43.2 mints delays to receiving care [37]. In Lagos, Nigeria, negligence led to average wait times of 55 mints, while in Kenya, it reached 60 mints during peak hours. These findings highlight how lapses in attentiveness and poor staff attitudes critically affect waiting times in healthcare settings.

2.5 Facility-Related Factor

2.5.1 Overcrowding

Overcrowding in obstetric units severely affects patient flow and triage efficiency, leading to extended wait times of up to 50 mints (IQR: 35–65). This situation can increase adverse outcomes, including a 25% rise in labor complications [24]. In Ghana, high patient volumes result in median wait times around 65 mints, contributing to a 30% increase in maternal and neonatal complications. The strain on resources often leads to inadequate staffing and supplies, emphasizing the need for better management and resource allocation [14,24, 35].

2.5.2 Staff level

Insufficient staffing during night shifts and weekends significantly impacts patient wait times. In Tanzania, median visit times rise to 55 mints at night, compared to 35 mints in the morning and 28 mints in the evening, reflecting decreased staffing during off-peak hours [35]. Similarly, in Accra, Ghana, triage times reach 65 mints on weekends versus 40 mints on weekdays, highlighting staffing inefficiencies [24]. In Sidama, Ethiopia, a study found that 47.2% of staff workload resulted in a median care wait time of 15 mints [39], while in the Arsi Zone, 45.4% of staff workload led to a median wait time of 42.3 mints [36]. These findings emphasize the critical role of staffing levels on triage efficiency and patient outcomes, revealing a failure to meet the optimal triage evaluation time of 10 mints.

2.5.3. Availability of Essential Resources

The availability of essential resources like medications and clinical supplies significantly impacts wait times in healthcare settings, with resource barriers increasing delays by approximately 30% [22,39]. In South Gondar Zone, Ethiopia, patients often face delays of 20 to 40 mints longer than those in better-resourced facilities due to a lack of critical resources [38]. Similarly, in the Arsi Zone, 12.1% of patients report shortages of supplies or medications, leading to prolonged wait times [37]. In Sidama Regional State, 14.5% of patients indicate that issues with supplies or medications contribute to delays in care [40]. These shortages severely affect patient care, prolonging treatment times and potentially worsening health outcomes.

2.6 Summary and Research Gaps

The literature emphasizes the importance of timely obstetric triage in preventing maternal and neonatal complications, with delays universally linked to worsened outcomes. However, factors contributing to these delays, such as overcrowding, staffing, and patient volumes, vary across regions. There is a notable gap in understanding how these factors interact within specific healthcare facilities, especially in low-resource settings like Ethiopia. The review calls for more detailed, facility-level studies to assess the impact of delays on maternal and neonatal outcomes and identify effective interventions. Addressing these gaps is crucial for improving healthcare delivery and maternal and neonatal health outcomes in Ethiopia and similar contexts.

2.7. Conceptual Framework of the Study

Figure 1. Conceptual Framework

Conceptual framework showing arrival to health professional visit time among laboring mothers at Asella teaching and referral hospital, 2024 [24, 35, 36, 37]

3. OBJECTIVES

3.1 General Objective

Assess the arrival to health professional visit time and identify its predictors among laboring mothers at Asella Teaching and Referral Hospital, Oromia Regional State, Ethiopia,2024.

3.2 Specific Objectives

To determine waiting time from arrival to initial health professional visit for laboring mothers at Asella Teaching and Referral Hospital

To identify factors those contribute to delays in the arrival-to-health-professional visit time.

4. METHODS AND MATERIALS

4.1 Study area and period

4.1.1 Study area

This study was conducted at Asella Teaching and Referral Hospital (ATRH), located in the Arsi Zone of the Oromia Regional State, Ethiopia, approximately 175 kilometers southeast of Addis Ababa. Asella is home to a population of approximately 110,088, with nearly half (49.7%) being female and it consists of 20,344 households, according to local reports. ATRH is the only teaching hospital in the region, serving an estimated 4.25 million people, in addition to providing support to two government health centers, two private hospitals, and various clinics and pharmacies. The hospital's obstetrics and gynecology department includes a 36-bed ward and reported an annual delivery rate of 5,965 as of 2016. ATRH operates 24 hours a day, providing

care with the support of midwives, medical interns, and doctors. However, the facility has a basic obstetric triage area that consists of an open hallway and a small examination room, which may limit the efficiency of care.

4.1.2 Study Period

The study was conducted from October 5 to November 15, 2024

4.2 Study Design

Institutional based prospective cohort study was conducted at Asella teaching and referral Hospital

4.3 Population

4.3.1 Source population

All laboring mother who arrive attended labor at Asella Teaching Referral Hospital in2024 G.C

4.3.1 Study population

All laboring mothers who presented to Asella Teaching and Referral Hospital during the study period (2024 G.C.) were included in the study.

4.4 Study unit

The study unit consists of individual laboring mothers arriving at the obstetric triage unit at Assella Teaching and Referral Hospital, specifically on the time from their arrival at the hospital until they are seen by a healthcare provider.

4.5 Sampling frame

The sampling frame consisted of an estimated 900 laboring mothers arriving at Asella Teaching and Referral Hospital between October 5 and November 15, 2024. Systematic random sampling was used, with an interval (k) of 2, meaning every second mother was selected. The starting point was randomly chosen from the list of laboring mothers.

4.6 Eligibility criteria

4.6.1 Inclusion criteria

All laboring mothers who present to Asella Teaching and Referral Hospital during the study period (October 5 to November 15, 2024)

4.6.2 Exclusion criteria

Mothers with severe complications that require immediate medical intervention or specialized care

Mothers who leave the triage unit before being seen by a health care professional

Mothers who arrive at the hospital after delivery or those who have already been assessed by a healthcare provider before the study period begins.

4.7 Sample size determination

To determine the sample size, the formula for estimating the mean was used. The calculation was based on a previous study of obstetric triage waiting times in Ghana, which found that the average waiting time for laboring mothers was 40 minutes, with a standard deviation of 63 minutes. This study also noted that 22% of laboring mothers were seen within 10 minutes of arrival. (24). the sample size was determined to achieve a desired margin of error of 5 minutes with 95% confidence.

Sample Size Formula:

$$n = \frac{(Z\ \alpha/2)^2 \times \sigma^2}{d^2}$$

Where:

Parameters Used

Confidence Level ($Z\ \alpha/2$): 1.96 (for 95% confidence)

Estimated standard deviation of waiting time (σ): 63 mints

Variance (σ^2): $63^2 = 3969$

Desired Margin of Error (d) = 5 mints

Initial Sample Size Calculation**:**

$$n = \frac{(1.96)^2 \times (63)^2}{5^2}$$

$$n = \frac{3.8416 \times 3969}{25}$$

$$n = \frac{15{,}248.78}{25}$$

$$n = 610$$

After Adjusted Sample Size 10% loss follow-up final sample size is **671**

4.8 Sampling Technique and procedure

4.8.1 Sampling Technique

Before actual data collection case flow at Asella teaching and referral hospital was estimated which were (900). Systematic random sampling techniques were used to select eligible laboring mothers arriving at Asella Teaching and Referral Hospital between October 5 and November 15, 2024. Interval (k) was determined by dividing the total number of cases flow (900) by sample size (670), as shown by the formula: k = Total flow case / Desired Sample Size, which results in k = 900 / 670 = 1.34 (rounded to 2). Every two mother from laboring mother was selected by consecutive sampling techniques. The starting point was at random.

4.8.2 Data Collection Procedure

Data were collected over a 40-day period, covering all shifts from 2:30 AM to 5:30 PM, seven days a week. This schedule was designed to ensure a diverse representation of laboring mothers across different times of the day. Trained observers, including midwives, participated in a one-day training session on data collection methods, ethical guidelines, and standard operating procedures. This training aimed to ensure consistency and accuracy throughout the data collection process.

Upon the mother’s arrival, inclusion and exclusion criteria were applied to confirm eligibility. If the mother met the criteria, verbal informed consent was obtained. The observer then recorded the arrival time and the time of initial contact with a healthcare provider using observational checklists. The time elapsed between the mother's arrival and the first healthcare visit was

carefully tracked. Additionally, observers reviewed the mother's demographic and medical history.

Data were entered into a central database every two days for real-time monitoring, allowing the research team to identify any discrepancies or issues promptly. Every two days, the research team met to review the data and address any challenges or concerns that arose.

4.8.3. Data Collection Tools

This study was used trained observers were utilized structured checklists to record key time points, including arrival and initial interactions with healthcare professionals, as well as factors contributing to delays. Additionally, medical records were reviewed for relevant information. A team of four external BSc midwives and two diploma midwives, all trained in data collection and research ethics, was ensure consistency in tracking arrival times, triage evaluations, waiting times, and delay factors. This approach aims to reliably assess the triage process and identify areas for improvement in maternal care.

Table 1.Data collection procedure and follow up time

Contact	**Objective**	**Data Collected**	**Activities**
First Contact (T1)	Enrollment, informed consent, baseline assessment	Demographics, time of arrival	Obtain verbal informed consent from the participant Gather demographic data document the time of arrival the hospital
Second Contact (T2)	Post-health professional contact, follow-up data	Time of first health professional contact, duration from arrival to health contact	Record the exact time of first health professional contact (T2)

		factors influencing timeliness	Measure the duration between arrival (T0) and health professional contact (T2 Gather information on factors influencing the time to health professional contact

4.9 Variables

4.9.1 Dependent Variables

Arrival to Health Professional Visit Time

4.9.2 Independent variable

Socio- demographic Factors

Age

Education

Marital status

Residence

Health provider related factor

Negligence

System-Level Factors

Time of Day (Shift)

Day of the Week

Shift

Risk facture

Labor Status

Facility-Related Factor

Overcrowding

Staff Levels

Availability of Essential Resources

4.10 Operational definition

Event: Health professional visit < =10 mints of arrival [13].

Censored: when the outcome of interest is observed >10 minute

Start Time: Arrival to the hospital

End Time: The time when the healthcare provider makes contact with the mother or begins the triage assessment.

Waiting time: Total time duration from arrival to initial assessment

Health profession: A licensed or certified individual trained to diagnose, treat, and manage health conditions, including roles such as gynecologists, physicians, midwives, nurses, and other specialists.

Negligence: The failure to provide the expected standard of care timely.

4.10.1 Data quality assurance

To ensure the quality of data, a data collection questionnaire was pre-tested on 5% of the calculated sample size, which included 34 laboring mothers at Bokoji Hospital. This pre-test aimed to identify any gaps, evaluate the clarity, and assess the completeness of the questionnaire. Based on the feedback and issues identified during the pre-test, necessary changes were made to improve the questionnaire, ensuring it was clear and comprehensive for the main data collection phase

4.11 Data processing and analyzing

All collected data was entered using SPSS version 26, followed by checks for completeness and accuracy, cleaning for inconsistencies, and transfer to STATA 15 for detailed statistical analysis. Descriptive statistics was used to summarize the data, including mean with standard deviation, median with interquartile range, frequency, and percentages. Kaplan-Meier (KM) survival curves was estimate the median survival time and survival functions, while the Log-rank test was compared survival probabilities between groups. Cox proportional hazards regression will

identify predictor variables and adjust for potential confounders. Additionally, multicollinearity among continuous variables was assessed using the variance inflation factor (VIF).

4.12 Ethical consideration

Ethical approval for this study will be obtained from the Institutional Review Board (IRB) of Arsi University. Verbal informed consent was obtained from the head of the obstetric ward, and informed consent was obtained from the participants before data collection. The study's objectives, procedures, potential risks (minimal), benefits, and participants' rights were clearly explained. To ensure privacy, the confidentiality of participant data will be strictly maintained through data anonymization. Data files will be accessible only to authorized research personnel. The names of participants will not be recorded on the questionnaires, and all information gathered will be kept confidential.

4.13 Result dissemination plan

The finding of the study is disseminated to Arsi University College of health science department of midwifery. A copy of the final result will be given to, Asella teaching and referral hospital, zonal health bureau, other concerned bodies. Efforts will be made to present the results at scientific conferences and peer-reviewed journal publications will be considered.

5. RESULT AND DISCUSSION

A total of 670 women included in the study with a response rate of 99.85%. The majority of the respondents were aged between 26-30 years, accounting for 46.7% of the total sample. Women aged 20-25 years made up 30.3% of the participants, while those under 20 years represented 47.8%. A significant proportion of the respondents had secondary education (39.7%), followed by those with higher education (29.4%). Women with primary education represented 18% of the participants, while those with no formal education made up 12.8 %.

Table 2: Socio-demographic Characteristics on Arrival to Health Professional Visit Time and Its Predictors Among Laboring Mothers at Asella Teaching Referral Hospital, Oromia Regional State, Ethiopia, 2024 G.C. (n=670)

Variable	Category			Total %
		Event	Censored	
Age	15-19	17	15	32(47.8%)
	20-25	41	162	203(30.3%)
	26-30	137	176	313(46.7%)
	>30	49	73	122(18.2%)
		244	426	670
Educational status	No formal education	27	59	86(12.8%)
	Primary education	65	56	121(18%)
	Secondary education	91	175	266(39.7%)

	Higher education	61	136	197(29.4%)
		244	426	670
Residence	Urban	154	74	228(34 %%)
	Rural	174	268	442(65.9%)
	Overall	328	342	670
Marital status	Married	119	157	276(41.2%)
	Non-married	88	97	185(27.6%)
	Divorced	134	75	209(31.2%)
		341	329	670

5.1 Health provider Related Factors

More than half of the respondents (52.7%) reported that healthcare providers communicated with the mother while she was waiting. The remaining 47.3% indicated that there was no communication from the healthcare provider during this time.

About 50.9% of the respondents showed that observed signs of provider negligence, while 49.1% felt that there were no observed signs of negligence. A majority of respondents (51.2%) stated that their arrival was immediately acknowledged by the healthcare staff. In contrast, 48.8% of the respondents reported no immediate acknowledgment. The majority (60.1%) of participants indicated that healthcare providers responded promptly when complications were observed. However, 39.9% reported that the provider did not respond promptly to complications. Interns comprised the largest group of healthcare providers (46.1%) attending to the respondents. Midwives were the second-largest group, making up 43% of the providers, while residents accounted for 10.4%, and nurses made up 9.4 %.

Table 3. Health provider- related factors on Arrival to health professional visit time and its predictors among laboring mothers at Asella Teaching Referral Hospital, Oromia Regional State, Ethiopia.2024.G.C (n=670)

Covariate		Total (%)		
		Event	Censored	
Are the health care providers communicating with the mother while she is waiting?	Yes	134	219	353(52.7%)
	No	110	207	317(47.3%)
	Overall	244	426	670
Are there visible signs of provider negligence?	Yes	123	218	341(50.8%)
	No	121	208	329(49.1%)
	Overall	244	426	670(43.7%)
Is there immediate acknowledgment of the mother's arrival by the healthcare staff?	Yes	133	210	343(51.2%)
	No	111	216	327(48.8%)
	Overall	244	426	670
Did complications were observed, the provider respond promptly?	Yes	147	256	403(60.1%)
	No	97	170	267(39.9%)
	Overall	244	426	670(43.7%)
What is the current position in the	Residents	29	41	70(10.4%)
	Intern	94	215	309(46.1%)

health care facility?	Midwife	94	134	228((43%0
	Nurse	27	36	63(9.4%)
	Overall	244	426	670

5.2 System level factors

The evening Shift appears to have the highest event rate, while the night Shift has the lowest event rate. Regarding day of the week on which mothers arrived at the hospital, the proportion of events (medical interventions or admissions), and the proportion of censored. The studies show that weekdays generally have better outcomes compared to weekends.

Thursday had the highest event rate n= 93(41.7%), Wednesday had the second-highest event rate n= 57(27%)but also the most censored cases. the rest of weekday is lower rates ,while weekends had fewer events, shorter survival times, and a higher censored rate on Saturday n=30 (66.3%). Most women (37.8%) arrived on days with an expected daily patient volume of less than 10, indicating lower patient flow. 10-19 patients was the second most common volume (32.5%), followed by 20-29 patients (25.2%). Only a small proportion (4.5%) arrived on days when the expected volume of patients was 30 or more. As the expected daily patient volume increases, the percentage of censored cases also increases, particularly on days with 30 or more patients.

The event rate tends to decrease with higher patient volumes. For example, the event rate for the highest volume category (30 or more patients) is only 10.3%, suggesting that a large number of patients in this category either had no medical interventions.

Sepsis had the highest event rate (76.9%), indicating a strong likelihood of intervention for mothers with this condition. Hypertensive Disorders of Pregnancy and Preterm Labor also had relatively high event rates (66.4% and 66.7%, respectively). Obstetric Hemorrhage had the lowest event rate (46.7%), suggesting that not all cases required immediate medical intervention.

Mothers with no risk factors had a lower event rate (58.9%), suggesting that they were less likely to require intervention.

A significant portion of the women were in the latent phase of labor (38.7%), followed by second stage (23.7%). Not laboring accounted for 17.3% of respondents.

Table 4. System level factors on Arrival to health professional visit time and its predictors among laboring mothers at Asella Teaching Referral hospital, Oromia Regional State, Ethiopia.2024 G.C(n=670)

Covariate	Category	Status variable		Total %
		Event	censored	
During which shift did the mother arrive at the hospital	Morning	66	127	193 (28.8%)
	Afternoon	53	29	82(12.2%)
	Evening	82	129	211(31.5%)
	Night	43	141	184(27.5%)
	Overall	244	426	670
day of the week did the mother arrive	Tuesday	40	53	93(14.8%)
	Wednesday	57	156	213 (32.9%)
	Thursday	93	130	223 (33.3%)
	Friday	26	67	93 (14.8%)
	Saturday	10	23	33(5.2%)
	Monday	15	25	40(6%)
	Sunday	10	20	30(1.7%)
	Overall	244	426	670
Expected Daily Volume of Patient	Less than 10	105	144	249 (37.2%)
	10-19	71	108	179 (26.7%)
	20 – 29	60	104	164(24.5%)

	30 or more	8	70	78(11.6%)
	Overall	244	426	670
Risk factors	(HDoP)	37	73	110(16.4%)
	Sepsis	6	20	26(3.9%)
	Obstetric Hemorrhage	8	7	15(2.2%)
	Preterm Labor	10	20	30(4.5%)
	No risk factors	70	144	214(31.9%)
	Other	113	162	275(41%)
	Overall	244	426	6760
current labor status	Latent phase	34	225	259 (38.6%)
	First stage	46	90	136(20%)
	Second stage	133	26	159(10.4%)
	Not laboring	31	85	116(17.%)
	Overall	244	426	670

5.3 Facility related factors

A total of 670 observations were analyzed, with 244 representing events (timely arrivals), and 426 instances being censored (either incomplete data or delayed arrivals). The overall percentage of censored data is 63.6%, indicating that a major of the data could not be classified as timely arrivals.

Among the 366 mothers waiting for a bed, 76 arrived within 10 minutes, and 290 were not visit within 10 minutes. Mothers whose essential resources affect waiting time has a much higher censoring rate (88.2%) compared to those whose resources do not affect waiting time (32.7%).
A majority (48.5%) of respondents reported a high level of healthcare staff availability during their shift. However, 51.5% indicated that the healthcare staff availability was low, suggesting occasional shortages in staff during certain shifts.

Table 5. Facility related factors on Arrival to health professional visit time and its predictors among laboring mothers at Asella Teaching Referral Hospital, Oromia Regional State, Ethiopia.2024G.C(n=670)

Covariate	Category	Status variable		
		Event	censored	Total %
facility currently overcrowded	Yes	137	220	357 (53.3%)
	No	107	206	313(46.7%)
	Overall	244	426	670
Currently mothers waiting for a bed	Yes	76	290	366(54.6%)
	No	168	136	304(45.4%)
	Overall	244	426	670
Essential resources affect the waiting time	Yes	44	329	373(55.6%)
	No	200	97	297(44.3%)

	Overall	244	426	670
Medications and clinical supplies affected the waiting time	Yes	101	171	272(40.6%)
	No	143	255	398(59.4%)
	Overall	244	426	670
What are factors contributing delays of care	Overcrowding	134	170	304(45.4%)
	Staff	92	217	309(46.1%)
	Level			
	No	18	39	57(8.5%)
	Overall	244	426	670(43.7
Rate the healthcare staff availability during the shift	High level	193	132	325(48.5%)
	low level	51	294	345(52.5%)
	Overall	244	426	670

5.4 Incidence rate and mean arrival to health professional visit time

The study participant was followed for a minimum of 1 min and a maximum of 60 min with a median follow-up time of 25minutes. Sixth hundred seventy participants were followed for different periods of maximum of one minute and give 8556 number of new cases/person time of observation. Around 244 (36.4%) developed the (contact within 10minutes) (95% CI: 32.72–40) while 426 (63.6%) women were censored (95% CI: 59.9–67.5). The overall arrival to health professional visit time rate was 0. 030 per 100-person minute (95% CI: 25–41.) The overall median time was undetermined because the largest observed data was censored. The overall Restricted mean survival (RMST) from arrival to health professional visit time in this study was 26.7minutes with 95% CI: 24.94-28.51) (**Figure 2)**

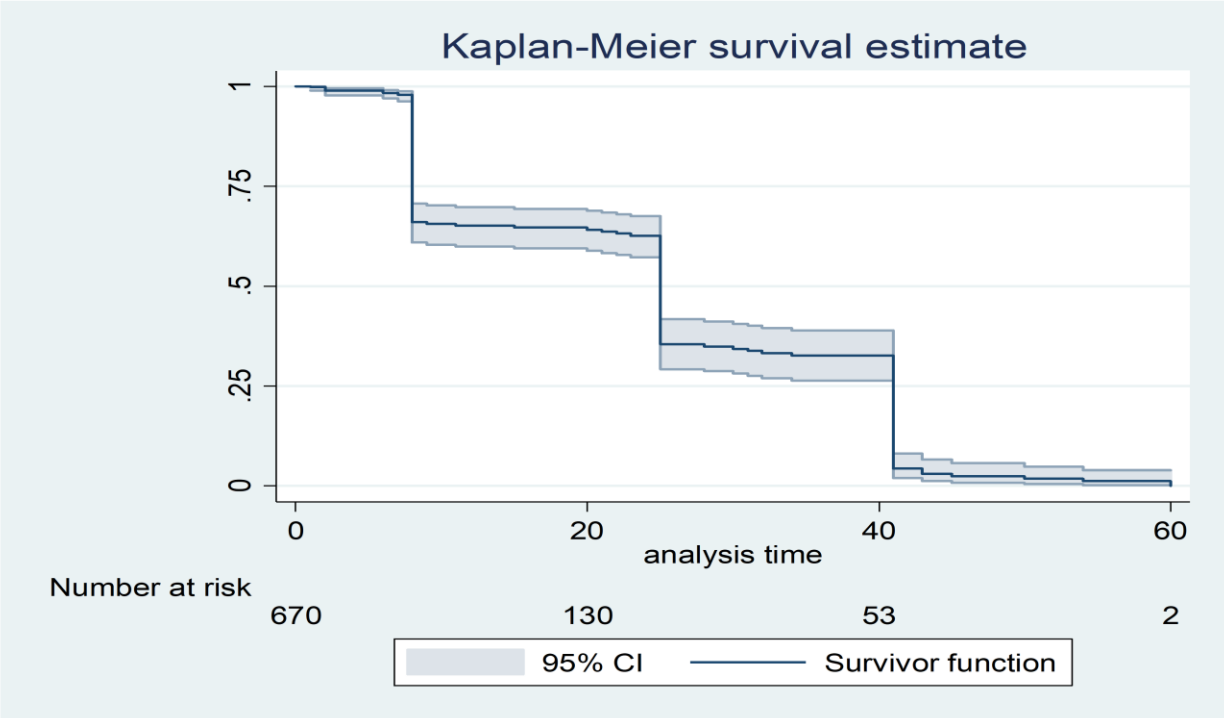

Figure 2. The overall mean arrival to health professional visit among laboring mothers at Asella teaching and referral hospital, Oromia Regional state, Ethiopia.2024G.C

5.5 Comparison of Survival Status for Different covariates with the Log Rank Test

The equality of survival curves was examined using the log rank test to determine whether there were any significant differences in survival rates among the different levels of the categorical parameters considered in the study. For a number of categorical variables, the test results in this study showed a significant variation in the survival function. As a result, there was substantial evidence of differences in arrival to health professional visit timelines according to the Kaplan–Meier analysis revealed strong evidence of variations arrival to health professional visit timeframes. It is found that the mean arrival to health professional visit time for those age 15-19, 20-25 and 26-30 were shorter than those above 30 years old (31.63 minute, 95% :28.04- 35.22) this difference was statistically significant with p-value < 0.02.

The mean survival times for the morning shift are close, indicating a relatively symmetrical distribution of survival times (25.19 hours, with a 95% Confidence Interval (CI) of 22.27 to 28.1). Similar to the morning shift, the mean is close, indicating a symmetric distribution of survival times for the afternoon shift (25.14 hours, with a 95% CI of 21.34 to 28.93).
The survival times vary significantly across different hospital arrival shifts, with the evening shift showing notably shorter mean survival times, while the night shift shows longer survival times. The log rank test indicates there is significant difference between the groups at p-value of 0.000.

Regarding working day of the weeks the highest mean survival time is on Wednesday (32.05 minutes)**,** followed by Thursday (2545 minutes)**,** and Tuesday (22.94 minutes**)**. Monday (20 minutes), Sunday (22.20) and Saturday (22.30) (The lowest mean survival time is on Friday (22.11 minutes) The p-value is 0.000, which **is** less than 0.05**,** indicating that there is a statistically significant difference in survival distributions between the different days of the week

Table 6. The mean survival time of different covariates using the Kaplan-Meier method on arrival time to health professional visit time among laboring mothers at Asella Teaching Referral Hospital, Oromia Regional State, Ethiopia.2024G.C(n=670)

Covariate	Status variable minutes Mean 95% CI	Chi-square		Log rank test
Age				
15- 19	23.67(15.96 31.39)	10.06		0.02
20-25	31.2(20.61 30.85)			
26-30	23.7(20.28 24.67)			
>30	31.6(26.14 32.60)			

During which shift did the mother arrive at the hospital	25.2(22.1 27.58)	10.96		0.000
Morning				
Afternoon	25.14(21.34 28.89)			
Evening	21.73(18.57 24.89)			
Night	35.789(32.173 39.40)			
On what day of the week did the mother arrive		11.83		0.000
Tuesday	22.94(19.07 26.82)			
Wednesday	32.05(28.97 35.25)			
Thursday	25.54(22.74 28.01)			
Friday	22.1(16.65 27.57)			
Saturday	18.20(15.04) 23.13)			
Monday	20.10(17.02) 25.04)			
Sunday	17.30(14.20) 22.02)			

The survival time during labor varies by stage, with the latent phase (28.8minutes with 95% CI: 25.1-32.5) having the highest mean survival time, while the "not laboring (21.9minutes with 95% CI: 18.9-24.7**)** shows the lowest. This statistically significant at p value of 0.03 **(Figure 3)**

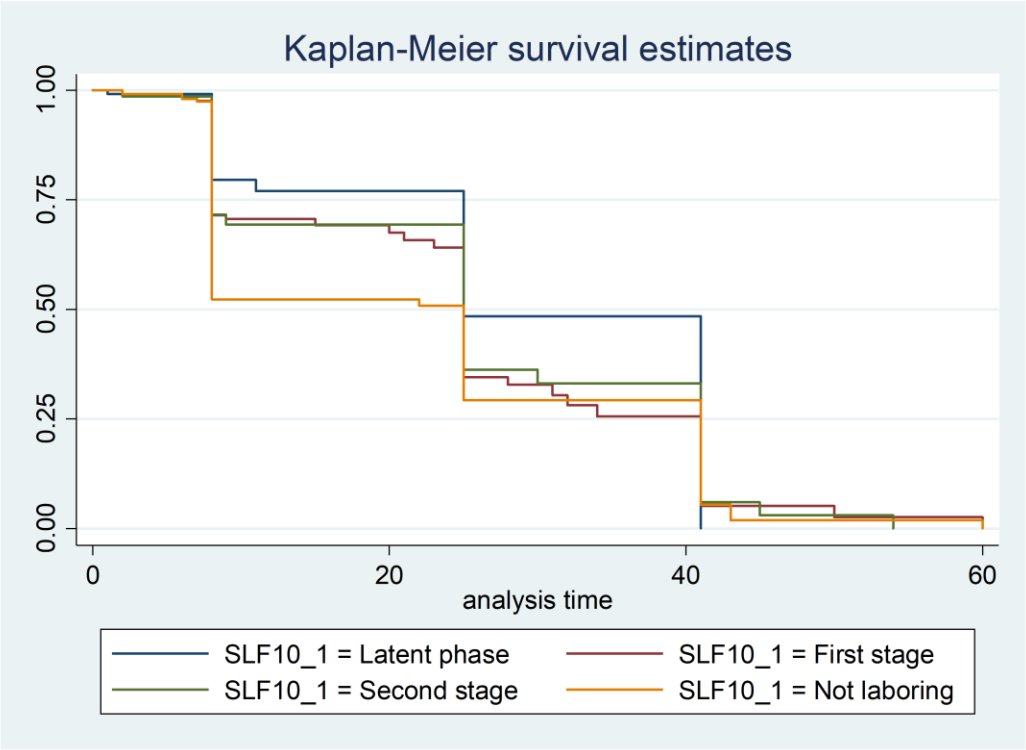

Figure 3 Kaplan–Meier survival curve for comparison of the mean arrival to health professional visit time among laboring mothers at Asella teaching referral hospital, Oromia Regional state, Ethiopia.2024G.C.

The Kaplan-Meier graph shows that the mean arrival to health professional visit time among mothers waiting for bed was longer (25.08 minutes with 95% CI: 24.6-29.6) than mothers who are not waiting the bed (22.6 minutes with 95% CI: 20.8-25). This difference was statistically significant with p-value = 0.004(**Figure 4**)

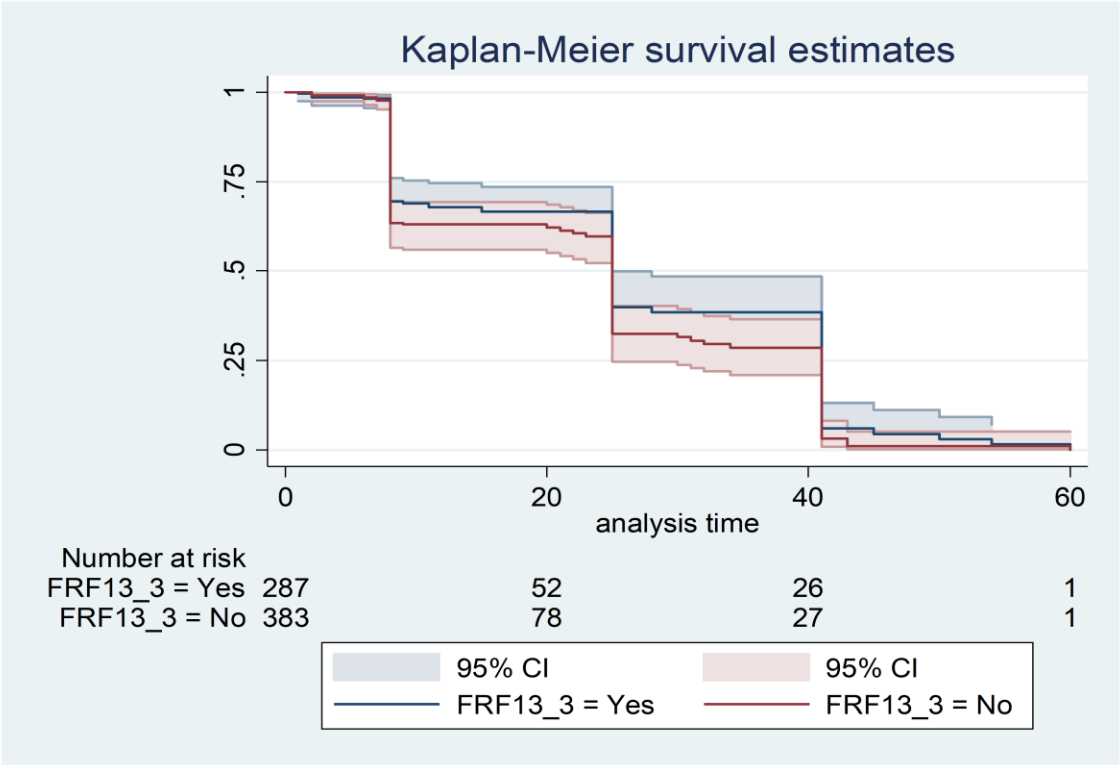

Figure 4 Kaplan–Meier survival curve waiting for bed and the mean arrival to health professional visit time among laboring mothers at Asella teaching and referral hospital, Oromia Regional state, Ethiopia.2024G.C

The Kaplan-Meier survival curve was visually show that low-level staff availability leads to longer survival times (27.38, 95% CI: 24.78-29.98) while high-level staff availability results in shorter survival times (23.18, 95%CI: 21.05- 25.31) with the difference being statistically significant based on the Log Rank test (P-value 0.01) (**Figure 5**)

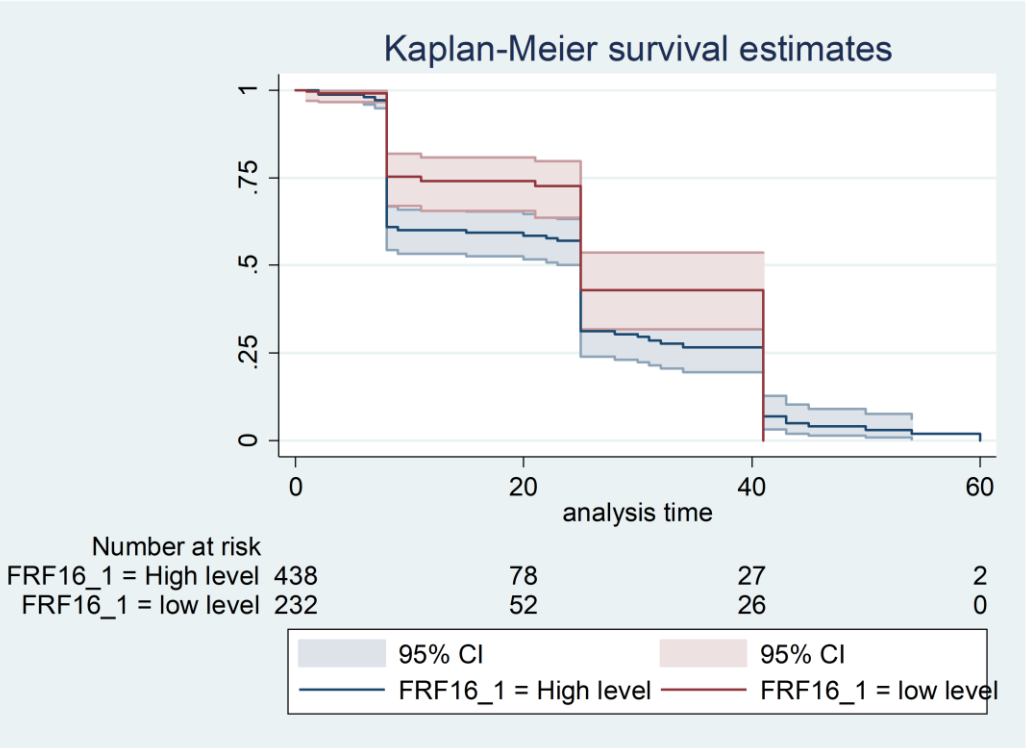

Figure 5**.** Kaplan–Meier survival curve for availability of the staff and the mean arrival to health professional visit time among laboring mothers at Asella teaching referral hospital, Oromia Regional state, Ethiopia.2024G.C

5.6 Predictors of arrival to health professional visit time

Predictors of arrival to health professional visit time in invariable cox proportional Hazard regression model, age, shift during mother arrive, day of the week, daily volume of the patients, availability of essential resource, presence of risk factors during arrival to facility, overcrowded, labor status, shortage of bed, and availability of staff were predictors of the covariate in this study (p- value 0.25).

In multivariate Cox regression analysis those variables with p-value less than 0.25 and non-collinear independent variables were included. In multivariable cox proportional hazards model, three variables (availability of the staff, availability of essential resource and waiting for bed were associated with arrival to health professional visit. The result of multivariable analysis revealed that women waiting for bed were 0.63 less likely to contact health professional than those not waiting for bed (AHR: 0.63, 95%CI: 0.4596708-0.87). The p-value is 0.006, which is

statistically significant, indicating that access to resources delays the arrival to health professional visits. Availability of essential resource were 0.57 times less likely to contact compared to those women whose without availability of essential resource (AHR: 0.57, 95% CI: .39 – 0.85). Healthcare facility with staff availability were 1.7 times more likely to visited by health professional as compared to those low availability of the staff (AHR: 1.7, 95% CI: 1.13-2.56). Women with second stage of labor were more likely to get service as compared with women present with latent phase (AHR: 2.093, 95% CI 1.34-3.25

Table 7. Results of the bivariable and multivariable cox regression analysis on arrival to health on arrival time to health professional visit time among laboring mothers at Asella Teaching Referral Hospital, Oromia Regional State, Ethiopia.2024G.C(n=670)

Covariate	Status		Bivariable CHR (95% CI)	Multivariable AHR (95% CI)	P-value
	event	censored			

Age					
1<20	17	15	1.56(.89-2.71)	0.88(0.48-1.61)	
20-25	203	41	1.20(0.79-1.83)	0.73(.46-1.17)	0.199
26-30	313	137	1.61(1.160- 2.237)	1.33(0.924- 1.936)	
>30	122	49	1	1	
during which shift the mother arrive					
Morning	67	127	1	1	0.61
Afternoon	53	29	0.96(0.67-1.38)	1.22(.65-2.26)	
Evening	82	129	1.18(0.85-1.63)	0.71(.15-3.26)	
Night	42		0.48(0.32-0.71	1.15(0.65-2.02)	
Day of the week					
Tuesday	40	53	1	1	0.330
Wednesday	57	156	0.93(0.60-1.44)	0.85(0.18-4.03)	
Thursday	93	130	0.52(0.35-0 .79)	0.85(.18-4.039)	
Friday	26	67	0.81(0.55-1.19)	0.758(0.43-1.32)	
Saturday	10	23	0.96(0.67-1.38)	1.22(.65-2.26)	
Monday	15	25	0.48(0.32-0.71	1.15(0.65-2.02)	
Sunday	10	20	0.42(0.55-1.19)	1.15(.35-2.20)	
Daily volume of the patients					0.13
Less than 10	105	144	1	1	
10-19	71	108	1.14(0.84-1.56)	0.95(.67-1.36)	
20-29	60	104	1.33(0.96-1.84)	1.31(0.91-1.89)	
30 or more	8	70	0.62(0.30-1.28)	0.68(0.31-1.49)	
Risk factors during arrival					
Hypertensive	37	73	1.48(1.01-2.16)	1.11(.72-1.72)	0.27

Disorders of Pregnancy (HDoP)					
Sepsis	6	20	1.76(0.76-4.04)	1.04(0.44-2.46)	
Obstetric Hemorrhage	8	7	1.48(0.72-3.04)	0.912(0.424-1.96)	
Preterm Labor	10	20	1.56(0.81-2.99)	1.46(0.73-2.91)	
No risk factors	70	144	1	1	
Labor status during arrival					
Latent phase	34	225	0.593(.36- 0.97)	0.788(.45-1.36)	0.1
First stage	46	90	1.201(0.76-1.89)	1.25(.70-2.23)	
Second stage	133	26	1.47(0.99-2.19)	2.09(1.34-3.25)	
Not laboring	31	85	1	1	
Facility overcrowded					
Yes	137	220	1.15(0.89-1.49)	1.15(0.85-1.55)	0.36
No	107	206	1	1	
Waiting for bed					
Yes	76	290	0.47(.36-0.62)	0.63(0.50-0.960)	0.02
No	168	136	1	1	
Availability of Essential material affecting					
Yes	44	329	0.179	0.358(0.242-0 .531)	0.000
No	200	97	1	1	
Availability of staff					
High	193	132	2.28(1.67-3.11)	1.97(1.34-2.88)	0.000
Low	51	294	1	1	

5.7 Testing proportional hazard assumption

A Cox regression model was used to examine the effects of socio demographic, facility related factors and System level factors, health care providers related factors on arrival to health professional visit. The following variables were included in the model as predictors: availability of essential resource, mother waiting for bed and availability of health professional. A goodness-of-fit (GOF) test was conducted to assess the proportional hazard (PH) assumptions of the Cox model for given predictor variables **(Table 8)**. The findings indicated that all variable included in the model were satisfy PH assumptions (p-value>0.05).

Table 8. Goodness-of-fit test assessing proportional hazards Assumption

Predictors test	rho*	Chi-square	df**	p-value
Age	-0.02174	0.13	-1	0.7218
Educational status	-0.09026	2.33	1	0.1267
Shift of arrival	-0.03300	0.28	1	0.5979
Week of the day	-0.01410	0.05	1	0.8199
Volume of the patients	0.03834	0.37	1	0.5407
Presence of risk factors	-0.02806	0.21	1	0.6483
Current labor status	0.03312	0.30	1	0.5839
Condition of overcrowded	-0.03413	0.28	1	0.5983
Mothers waiting for bed	-0.05006	0.71	1	0.4010
Availability of essential resource	0.11760	4.09	1	0.430
Staff availability	-0.06438	1.15	1	-0.283
global test		9.71	11	4.89

•

Discussion

The current study showed that 47.8% of participants were aged 15-20 years, a notably higher proportion compared to the 3.7% reported in the South Gondar Zone study. This age group had the lowest event rate (53%, n=17), primarily due to their lesser familiarity with the hospital environment. In contrast, the 26-30 age group had the highest event rate (44%, n=137), as this

group tends to be more familiar with the hospital environment. Additionally, the over 30 age group exhibited a high censored rate (60%, n=73).

Younger mothers (under 30) generally experienced shorter waiting times compared to older mothers (over 30). Specifically, older mothers waited an average of 32 minutes longer than younger mothers. Globally, younger mothers tend to experience 10-20 minutes shorter wait times, a trend also observed in the South Gondar Zone, where delays for older mothers are attributed to the need for more comprehensive assessments. The study also found that mothers aged 20-25 received quicker care than those under 20, likely due to their greater familiarity with the hospital environment, whereas older mothers (over 30) faced longer waits due to the need for more detailed assessments.

The study also highlighted that mothers with secondary education had a higher event rate (34%, n=91) compared to those with no formal education (31%, n=27). This could be attributed to the fact that less educated mothers require more counseling, leading to longer wait times. However, these findings are higher than those reported in the South Gondar Zone, where less educated mothers waited 20-30% longer (38, 41). Education plays a significant role in reducing wait times and improving healthcare efficiency. The results suggest that higher levels of education can reduce waiting times due to mothers being more prepared for their visits.

A significant issue reported by 50.9% (n=341) of respondents was provider negligence. This rate was notably higher than that observed in Sidama (17%, n=27) and the Arsi Zone (18.2%, n=36). Provider negligence was often linked to careless staff attitudes, contributing to delays in care and negatively impacting patient waiting times. This emphasizes the need for improvements in staff training and professionalism to reduce delays and enhance the overall patient experience.

The study also examined the impact of shift times on waiting times. The evening shift had the highest event rate (39%, n=82), while the morning shift had the shortest wait times, with a mean of 27 minutes—shorter than the 37-minute median reported in Ghana. The night shift had the lowest survival rate (23%, n=43), with a mean wait time of 36 minutes, still shorter than the 55-minute median wait time reported for the night shift in Ghana. Longer wait times during the night shift are likely due to lower staffing levels and limited resources, suggesting that better staffing strategies are needed during night shifts.

Additionally, weekdays generally showed better outcomes compared to weekends, with a higher event rate (42%, n=93) on weekdays. The mean wait time on weekdays was 32 minutes, shorter than the 40-minute median wait time reported in Ghana. Weekends had a higher censored rate (66.3%, n=30), possibly due to lower staffing levels and higher patient volumes, which can negatively affect care delivery.

The study also found a relationship between patient volume and event rates. On days with fewer than 10 expected patients, the event rate was highest (42%), while days with 30 or more patients had the highest censored rates (90%). This suggests that overcrowding significantly impacts event rates and censored data, with trends differing from those observed in a similar study conducted in Ghana.

Sepsis had the highest event rate (76.9%), followed by hypertensive disorders and preterm labor (66.4% and 66.7%, respectively). The mean wait time was 42 minutes, longer than the 35 minutes observed in a similar study in Ghana. Obstetric hemorrhage, with the lowest event rate (46.7%), had a shorter median wait time of 33 minutes, although still lower than the 37 minutes observed in the Ghana study. The variations in wait times may be attributed to differences in healthcare system structures.

Event rates varied across the different stages of labor. In the first stage of labor, the censored rate was higher (66%, n=90) compared to the 56% (n=489) in a similar study in Ghana. The second stage of labor had a higher event rate (84%, n=133) than the first stage, likely due to quicker assessments. The lowest event rate (73%, n=85) was found in women who were not in labor, as this stage of labor involved fewer interventions.

The study also explored the effect of overcrowding. A total of 244 (36.4%) participants were attended to within 10 minutes of arrival, while 426 (63.6%) experienced delays. The median wait time was 38 minutes, which is shorter than the 65 minutes observed in a similar study in Ghana. Notably, overcrowding contributed to longer delays, with mothers waiting for bed availability and essential resources. The study found that staff availability was 59% during high-level events, while low-level events had an 85% censoring rate, highlighting the impact of inadequate staffing on triage efficiency.

Conclusion

The study analyzed 670 laboring mothers at Asella Teaching and Referral Hospital to identify factors influencing timely arrival to health professionals. Key findings included overcrowding and long waiting times, with only one-third of mothers being seen within 10 minutes, and over half having delayed or censored data. These delays were largely linked to overcrowding and waiting for a bed. Only one-third of mothers were seen within 10 minutes, while more than half experienced significant delays.

The study found that overcrowding, bed availability, and resource allocation significantly affected timely care. Ensuring a sufficient number of staff and improving resource allocation directly impacts the timeliness of care for laboring mothers.

The study showed that the median follow-up time was 25 minutes, and the overall rate of timely arrival to health professionals was low (0.030 per 100-person minutes). Factors like age, shift timing, day of the week, and labor stage further influenced arrival times.

Younger mothers and those in the second stage of labor had quicker access to care, with the evening shift being more efficient than the night shift. These findings are important as they emphasize the need for targeted improvements in shift management, staff distribution, and hospital resources to reduce delays, especially for younger mothers and those in advanced stages of labor.

The study used the Cox Proportional Hazards Model to identify that waiting for a bed, availability of essential resources, and staff availability were significant predictors of timely care

The Strength of this study

Study uses its large sample size, which enhances the generalizability of the results and improves the detection of significant differences across subgroups. Additionally, real-time data collection provides an accurate picture of hospital conditions.

Limitations

The study's generalizability is limited due to its focus on a single hospital and not fully representative or is not homogenous.

Recommendation

In this study, an administrative intervention is recommended to address significant delays in timely care, such as those caused by the availability of essential resources and overcrowding in waiting for a bed.

The study suggests that further research is needed to explore the causes of delays in receiving care and the outcomes of both timely and untimely care. This will help identify additional areas for improvement in the obstetric care process and ensure better overall care for patients and align the standard of recommended for Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN). Obstetric triage Guidelines.

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ANNEXE

Annex 1:

Information sheet and informed voluntary consent form for head of the obstetric word.

My name is **Eyob Amare** I am working as a principal investigator of the study being conducted in this health facility. I am MSc student at Arsi University College of health sciences department of midwifery. I kindly request you to lend me your attention to explain you about the study and your institution being selected as the study setting.

The study title: arrival to health professional visit time and its predictors among laboring mothers at Asella teaching and referral hospital. In 2024

Aim of study: The finding from this study will help to provide up-to-date information about arrival to health professional visit time and its predictor among laboring mothers at Asella teaching and referral hospital which may help to know area of intervention to improve. In addition to generate useful information and guide to health planners, administrators, policy makers, and health facilities to facilitate conditions for the need to ensure the provision maternity services through developing appropriate structures and management capabilities as a platform for maternity service Moreover, the aim of this study is to write a thesis as partial requirements for the fulfillment of master's program in maternity and reproductive health nursing for the principal investigator.

Procedure and duration: Direct observational during arrival-to-visit time' will be provided to the health care workers to provide me with pertinent data that is helpful for the study. The time is required from arrival to the hospital until start triage time in obstetric ward.

Risks and benefits: The risk of participating in this study is very minimal, but only taking few minutes or an hour from health worker's time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for the community, local health planners and for your institution.

Confidentiality: The information that we will be provided will be kept confidential. There will be no information that will identify the participants in particular. The findings of the study will be general for the study community and will not reflect anything particular of individual persons. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

Rights: The rights keep the contact address for any queries. The information that we will be provided will be kept confidential.

Principal investigator: **Eyob Amare**

Mobile phone of the principal investigator: **+251 938091140**

Email address of investigator: **eyobamare702@gmail.com**

ANNEX 2.

Data collection checklist

Code_____

Questionnaire arrival to Health professional visit time and its predictors among laboring mothers at Asella teaching referral hospital, oromia regional state, Ethiop.2024G.C

S No	Questions	Response	Code	Remark
	Part I: Identifications and waiting time			
101	Date of Arrival at Hospital	Date_____/____/____EC		
102	Time of arrival at hospital			

		Time ---------/-------Mints		
103	Initial Evaluation time			
	Start Time	----------/-------Mints		
	End Time	---------/---------Mints		
104	Total Waiting time from arrival to initial visit (Waiting time)	Hrs. --------/------Mints		
	Part II Socio demographic characteristics			
201	How does the age of the mother?	1. 15 - 19 2. 20- 25 3. 26 - 29 4. >30		
202	What is the educational status of the mother?	1.No formal education 2.Primary education 3.Secondary education 4.Higher education		
203	Does the laboring mother come from?	1.Urban 2.Rural		
204	What is the marital Status of the Mother?	1.Married 2.Non-married 3.Divorced		
	Part IV Health provider related factors			
301	Are the health care providers communicating with the mother while she is waiting?	1Yes 2 No		

302	Are there visible signs of provider negligence?	1Yes 2 No		
303	Is there immediate acknowledgment of the mother's arrival by the healthcare staff?	1Yes 2 No		
304	Did complications were observed, the provider respond promptly?	1.Yes 2.No		
305	What is the current position in the health care facility?	Resident Intern Midwife Nurse		
	Part V System-Level Factors			
401	During which shift did the mother arrive at the hospital?	1. Morning 2. Afternoon 3.Evening 4.Night		
402	On what day of the week did the mother arrive?	1. Monday 2. Tuesday 3.Wednesday 4. Thursday 5. Friday 6. Saturday 7. Sunday		
403	Were there staffing shortages during the visit?	1 Yes 2 No		
404	How would you rate the availability of staff during the shift?	• Low level <15 • high level ≥15		

405	What was the expected Daily Volume of patient?	1. Less than 10 2. 10-19 3. 20-29 4. 30 or more		
406	Does Presence of risk for mother present during arrival?	1. Hypertensive Disorders of Pregnancy (HDoP) 2. Sepsis 3. Obstetric Hemorrhage 4. Other (please specify): _____		
407	What is the current labor status?	1.Latent phase 2.First stage 3.Second stage 4.Not laboring		
	VI Facility related factors			
501	What factors could contribute to delays in care?	1.Overcrowding 2.Staff Level 3.Availability of Essential Resources Specify Other:_____		
502	Is the facility currently overcrowded?	1. Yes 2. No		
503	Are there currently mothers waiting for a bed?	1. Yes 2. No		
504	Do the mother's essential resources affect the waiting time?	1.Yes 2 .No		
505	Do essential resources (e.g., medications and clinical supplies affected	1.Yes 2.No		

	the waiting time upon arrival?			

Foormii Hayyamaa

Mata-duree Qorannoo:

Yeroo dhaqqabuu fi hojii fayyaa jalqabaa irraa eegaluun, dubartoota akkaataa yeroodhaa fi sababoota danda’an adda baasuuf, Hospitaala Barnoota fi Tajaajila Asella, Bara 2024.

Ibsa:

Qorannoon Kun, yeroo dhaqqabuu fi hojii fayyaa jalqabaa irraa eegaluun, dubartoota akkaataa yeroodhaa fi sababoota danda’an adda baasuuf kan xiyyeeffateedha. Qorannoon kun, yeroo dhaqqabuu fi hojii fayyaa jalqabaa irraa jalqabuu yeroo gahaa fi sababa fidu adda baasuufi kan hojjetuudha. Kanaaf, yeroo kee hospitaala keenya keessatti ta'uu keetiin, sochii kee hordofna. Kaayyoon qorannoo kanaas bu’aan isaa tajaajiloota hatattamaa fooyyessuuf ta’a.

የስምምነት ቅጽ

ርእሰ ጥናት: እናቶች በጤና ተቋም አንደደረሱ በሰዓቱ መስተናገዳቸውን እና ተጓዳኝ የሆኑ ችግሮች የሚዳስስ ጥናት በአርሲ ዩኒቨርሲቲ አሰላ የትምህርትና አጠቃላይ ሆስፒታል 2024.

ማብራሪያ:

ይህ ጥናት ለወላድ እናቶች በአሰላ ሆስፒታል ልክ እንደመጡ በጤና ባለሙያ ወዲያው ለመታየት (ለመገናኘት) ፤የሚፈጅባቸውን ጊዜ የሚያጠና ሲሆን በሆስፒታላችን በሚኖርዎት ቆይታ የፈጀብዎትን ጊዜ እየተከታተልን የምንመዘግብ መሆኑን እያሳወቅን የጥናቱ ውጤት የሆስፒታሉን የወሊድ ህክምና ለማሻሻል መሆኑን እንገልጻለን።

/ ታካሚው ስለጥናቱ የተደረገለትን ገለጻ መረዳቱንና ግልጽ ባልሆኑ ጉዳዮች ላይ የመጠየቅ እድል ተሰጥቶት አጥጋቢ መልስ ማግኘቱን እየገለጽኩ በጥናቱ ለመሳተፍ መስማማቱን አረጋግጣለሁ።

_____ _____

Guyyaa "Mallattoo funaansa dataa"

ቀን የዳታ ሰብሳቢ ፊርማ

Declaration of Investigator

I, the undersigned student of Maternity and Reproductive Health Nursing, declare that this thesis work is my original work in partial in fulfillment of the requirements for a Master of Science degree in Maternity and Reproductive health nursing to my knowledge.

Name of Investigator: _____

Signature:____ Date: _____-

Declaration of Advisors

We, the undersigned Advisors, declare that this research is our original work in partial fulfillment of the requirements for the master of science degree in Maternity and reproductive Health nursing for the stated student above to our best knowledge. We confirm that this thesis is ready for examination with our approval as university advisors.

Name of primary Advisors	Signatures	Date
_____	_____	_____
Name of secondary Advisors	Signatures	Date
_____	_____	_____

Department Head	Signatures	Date
_____	_____	_____

Examining board approval

We undersigned examining board , approved that this thesis is original work with basic merits for partial fulfillment of the requirement for MSc. for maternity and reproductive health for stated student above to our best knowledge. We confirmed that this thesis is sufficient for student promotion to higher level.

Name of external examiner signature Date

1._____ _____ _____

Name of internal examiner signature Date

_____ _____ _____

Name of internal examiner signature Date

_____ _____ _____

Name of department head signature Date

_____ _____ _____