Factors influencing antenatal corticosteroid administration for management of women imminent preterm birth: A cross-sectional study in two Kenyan county referral hospitals

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https://doi.org/10.51867/ajernet.7.2.90

ABSTRACT

Antenatal corticosteroids (ACS) are an established, evidence-based intervention that significantly reduces morbidity and mortality associated with prematurity. However, despite strong global recommendations, including those from the World Health Organization (WHO), their utilization remains suboptimal in low- and middle-income countries (LMICs), where the burden of neonatal deaths is highest. Understanding the determinants of ACS use is therefore critical for improving implementation. This study was primarily guided by the Donabedian Model, which examines healthcare quality through structure, process, and outcomes. A cross-sectional design was employed between June and August 2025 at Nyahururu County Referral Hospital (Laikipia County) and Wamalwa Kijana County Referral Hospital (Trans Nzoia County). The study included 160 healthcare providers (80 per facility) involved in maternal and newborn care. Data were collected using structured questionnaires covering demographics, knowledge (20 items), practices (15 items), and perceived facility-level factors (10 items). Additionally, a data extraction tool was used to get information from the records of the 160 preterm birth cases that were conducted. A data extraction form was used to do record review, which was done to obtain information regarding preterm birth (n=160). Quantitative data were analyzed using chi-square tests, independent t-tests, and bivariate and multivariable logistic regression, while qualitative insights were obtained through thematic analysis of eight key informant interviews. Thematic analysis of key informant interviews (n=8) provided complementary qualitative insights. The mean knowledge score was 55.2% (SD 20.7), with only 49.4% of providers correctly identifying ACS indications and 46.9% knowing WHO-recommended gestational age. ACS was administered to only 30.6% (49/160) of eligible women. The primary reason for non-administration was failure to prescribe (82.5% of missed cases). Facility-level factors significantly associated with ACS administration included availability of visible standard operating procedures (adjusted OR [aOR]: 2.34, 95% CI: 1.28-4.27, p=0.006), access to WHO guidelines (aOR: 1.89, 95% CI: 1.04-3.43, p=0.037), and prior training on evidence-based practices including ACS (aOR: 2.67, 95% CI: 1.41-5.06, p=0.002). Provider knowledge score was associated in bivariate analysis (p=0.018) but not after adjusting for facility factors (aOR: 1.02, p=0.412). Qualitative findings revealed four major themes: knowledge and practice gaps, challenges in identifying eligible clients, lack of accessible guidelines and protocols, and inconsistent administration practices. Facility-level system factors, particularly visible protocols, guideline accessibility, and provider training, are stronger predictors of ACS administration than individual provider knowledge alone. Interventions to improve ACS utilization in resource-limited settings should prioritize system-level changes alongside educational programs. Policy recommendation: Hospital administrators and county health management teams should provide necessary facility-level actors, including displaying visible standard operating procedures (SOPs), ensuring accessible WHO guidelines, and supporting the Kenyan Ministry of Health (MOH) to implement regular evidence-based practice training, integrate ACS administration indicators, and develop a national ACS clinical decision support tool.

Keywords: Antenatal Corticosteroids, Cross-Sectional Study, Facility Factors, Healthcare Providers, Kenya, Preterm Birth

I. INTRODUCTION

Preterm birth, defined as delivery before 37 completed weeks of gestation, remains a leading cause of neonatal mortality worldwide. Out of the 130 million born annually world-wide, approximately 15 million newborns are born preterm and about 1 million die due to prematurity related complications. About Over 60% of all preterm births occur

in South Asia and sub-Saharan Africa as well as 80% of the world's preterm related mortalities. This in contrast to high-income countries, where nearly all preterm infants with similar age survive. A study conducted in Zambia, revealed that almost 50% of the babies born at or below 32 weeks dies due to preterm complications. These deaths could however be averted by adapting the World Health Organization (WHO) low cost but highly effective evidenced based interventions such as the use of Antenatal corticosteroids. Alamneh et al. (2021). The findings of a study done in Kenya revealed that preterm birth complications account for approximately 35% of neonatal deaths Mworia (2022), representing a significant public health challenge Preterm newborns are at greater risk of short-term morbidities, including respiratory distress syndrome (RDS), intra ventricular hemorrhage, necrotizing enter colitis and sepsis, as well as long-term morbidities, such as chronic lung disease and neurological disabilities.(Greensides et al., 2018).

Antenatal corticosteroids have been proven as the most effective and standard care for managing women with imminent preterm birth to improve preterm related morbidities and mortalities and should be administered to women at risk of imminent preterm birth between 24 and 34 weeks of gestation. Antenatal Corticosteroid provides surfactant factor which aid in accelerating fetal lung maturation and thus reduce the incidence of respiratory distress syndrome (RDS), intra ventricular hemorrhage, and neonatal mortality. A Cochrane review demonstrated that a single course of ACS reduces neonatal death by 31% and RDS by 44% (Costa et al., 2022).

Health care provider factors such Knowledge and skill on ACS use ,Health facility factors such as availability of ACS and client factors such number of antenatal care attendance and time of 1st ANC, level of education and maternal infection were found to be associated with ACS administration. Further the study found out that, there was a persistent low utilization of ACS in hospital settings in many low- and middle- income countries. Reports put the utilization rate as low as 10% and the highest being at 68% of eligible women receive ACS. The reasons for low utilization range from; unavailability of ACS in health care settings, inadequate prescription of ACS and the arrival of pregnant women at health care facilities in well-established labor were cited as contributors to low use of ACS in these settings.

1.1 Statement of the Problem

Despite strong evidence supporting ACS use, global uptake remains highly variable and generally suboptimal in low- and middle-income countries (LMICs). Systematic reviews report ACS administration rates ranging from 10% to 68% in LMIC settings, with many facilities lacking essential supplies or clinical protocols Mwita et al. (2021), Yang et al. (2025). In Kenya, national surveys indicate that only 44.7% of facilities have injectable corticosteroids available, with just 22.1% having administered ACS in the preceding three months (Ngare et al., 2020) .

A study by Zahroh et al. (2022), identified eight factors influencing ACS as; In accurate assessment of gestational age, Inconsistent practice guidelines, Variable knowledge about the interventions; Providers' perceived risks and benefits; Barriers in administration of interventions, Appropriate settings for administration, Strategies to improve appropriate use; and Women's perspectives and experiences. World Health Organization (WHO) together with other professional bodies have approved antenatal corticosteroid (ACS) as the standard intervention for management of imminent preterm birth among other interventions such as the use of tocolytics and antibiotics for specific at-risk women, these recommendations have however not been always adhered to and used without standardization.

Disparity in adoption and use of antenatal corticosteroids vary but majority of the studies indicating that availability of the essential drugs, knowledge and practice of health workers, lack of guidelines or failure to adhere to guidelines and other inconsistencies in health systems,(Stock et al. (2022) : Mpinga et al., (2023) . Another study by Smith et al. (2022) agreed with these findings suggesting that low coverage of ACS has been attributed to lack of guidelines, prescribing authority, provider awareness or skills, drug availability, and patient access to appropriate facilities. The study further summarized main bottle-necks to ACS administration as; Health care provider factors, Facility factors and Client factors.

In Kenya, including Laikipia and Trans Nzoia Counties, gaps in healthcare providers' knowledge, skills, and adherence to clinical guidelines contribute to suboptimal identification of eligible women and inappropriate or missed administration of ACS. Despite the availability of national and international guidelines recommending ACS for women at risk of imminent preterm birth, coverage and correct use remain below optimal levels. According to the Kenya National Bureau of Statistics (KNBS) and ICF. (2023), Tranzoia county and Laikipia Counties are among the top five counties in newborn mortality with 36 and 33 neonatal deaths per 1000 live births respectively. These findings are way higher compared to the WHO recommendation of 21 neonatal deaths per 1000 live births. It is also way too high compared with the target of the third Sustainable Development Goal (SDG3) which aims to reduce neonatal mortality to 12 deaths per 1000 live births by 2030.There are no published studies on the use of ACS in the management of women of preterm birth done in both Tranzoia and Laikipia counties. This study sought to Factors Influencing Antenatal Corticosteroid Administration for Imminent Preterm Birth in Laikipia and Trans Nzoia Counties, Kenya.

1.2 Research Objective

The main objective of this study is to analyze the factors Influencing Antenatal Corticosteroid Administration for Imminent Preterm Birth: A Cross-Sectional Study in Two Kenyan County Referral Hospitals

II. LITERATURE REVIEW

2.1 Theoretical Framework

Donabedian Model, which examines healthcare quality through structure, process, and outcomes, was primarily used to guide this study. Healthcare provider knowledge and clinical decision-making reflect care processes influencing ACS utilization while facility-related factors such as availability of drugs and guidelines represent structural components that equally affect Use of Antenatal Corticosteroids. The Knowledge-to-Action framework was incorporated to this model to highlight barriers to guideline implementation, including provider attitudes, contextual constraints, and system-level challenges.

Prematurity is the leading cause of newborn deaths and the leading cause of deaths among children under the age of five and is responsible for an estimated 35% of neonatal (Ekitela et al., 2023). The burden of preterm birth is higher in low- and middle-income countries, where health system constraints further exacerbate adverse neonatal outcomes. Prematurity is strongly associated with a wide range of short- and long-term complications that significantly impact survival, growth, and neurodevelopment. It is also associated with newborn mortality (Busuulwa et al., 2021)

Respiratory distress syndrome (RDS) is a serious complication of preterm birth and is the main cause of perinatal mortality, RDS is caused by the absence or insufficient production of pulmonary surfactant and the associated immaturity of the lungs. Antenatal corticosteroids (ACS) are recommended by World Health Organization WHO for the management of complications of preterm birth, but coverage remains inconsistent due to Health Care Provider's (HCP) knowledge and guideline adherence gaps especially in Low and Middle Income Countries LMIC (Zahroh et al., 2022)

Antenatal corticosteroids (ACS) have been recommended by the World Health Organization as the standard intervention for women at risk of preterm birth. ACS accelerates fetal lung maturation by provision of surfactant factor and reduces the risk of RDS and neonatal morbidity and mortality. ACS utilization remains inconsistent, particularly in LMICs, due to gaps in healthcare provider knowledge and adherence to guidelines, despite strong evidence and clear clinical guidelines, (Shittu et al., 2024).

Healthcare provider behavior highlights the "know–do gap," which refers to the discrepancy between knowledge acquisition and its application in clinical practice. Theoretical perspectives further indicate that although the Health care providers are aware of guidelines, multiple contextual factors including perceived risks, uncertainty in diagnosis, and systemic constraints may influence clinical decision-making, Stock et al. (2022). Further the unpredictability of preterm labor and challenges in distinguishing imminent from threatened preterm birth contribute to hesitation in administering ACS. Other studies also point at delay by the clients to reach the health facility.

According to the health system strengthening theory, effective implementation of interventions such as ACS further depends on functional health systems, including adequate infrastructure, availability of essential drugs, trained personnel, and clear clinical protocols, Dagklis et al., (2022). Emerging innovations such as clinical decision support systems (CDSS) are also theorized to improve adherence to guidelines by providing real-time, evidence-based recommendations tailored to patient characteristics (Vogel et al., 2022).

2.2 Empirical Evidence

Global and Regional ACS Coverage

Empirical studies show huge disparities in ACS utilization between high-income countries (HICs) and LMICs. In HICs, adherence to guidelines has led to rapid uptake of ACS since the 1990s, with coverage rates exceeding 90% (Rizzo et al., 2022). In contrast, LMICs where approximately 99% of neonatal deaths occur, report significantly lower coverage.

For instance, Zipori et al., (2021) found that only about one-third of eligible women in LMIC facilities receive ACS. Similarly, (Mwita et al., 2021) reported ACS utilization rates ranging from 10% to 68% across different LMIC settings. In Kenya, Ndwiga et al., (2023a) documented ACS use at Kenyatta National Hospital at 35%, with only 3% of patients receiving the complete recommended dose.

2.2.1 Health Care Provider factors

2.2.1.1 Healthcare Provider Knowledge and Practice

Evidence indicates that healthcare provider knowledge significantly influences ACS utilization. Islamiah et al., (2022) found that adequate knowledge and clinical experience facilitate ACS use, while inadequate or outdated knowledge acts as a barrier. The unpredictability of preterm birth, including difficulty diagnosing threatened versus imminent preterm birth, can lead to provider hesitation in administering ACS and magnesium sulphate providers fear being held responsible or blamed for potentially unnecessary treatment. To cope with these uncertainties, providers may delay treatment, preferring a "wait and see" approach. The "wait and see" approach can delay administration of ACS or referring decision making. The greater the uncertainty about the (Swarray-Deen et al., 2024) Additionally, studies have

demonstrated that healthcare providers' perceptions of risks and benefits strongly influence their decision to administer ACS, further reinforcing the existence of the know–do gap (Ekitela et al., 2023)

2.2.1.2 Healthcare Provider Constraints

According to Isangula et al., (2022), health care providers reported time constraints in prescribing and administering ACS and magnesium sulphate as the main barrier to appropriate use. Many health providers pointed that prescribing and administering magnesium sulphate was complex since the preparation takes too much time, or is difficult to "draw it all up," they further indicated that this is made even more challenging considering the acute nature and time pressures of imminent preterm birth, high intensity of workload, and competing tasks. The findings by Isangula further revealed that the Health care providers reported that they feel under a lot of pressure and may prevent them from administering ACS or administer them at inappropriate time. Acknowledging the unpredictability of preterm birth and complexity of preparing magnesium sulphate regimens, health providers suggested "readymade syringes" to enable prompt administration

2.2.2 Facility Factors

Health System Strengthening: According to study done in Embu county referral hospital on facility factors affecting ACS use, the following; Unavailability of ACS in health care settings, inadequate prescription of ACS, lack of displayed SOPs on ACS administration, lack of guidelines on ACS, and limited prescription authority (where prescription is reserved for medical Officers) were cited as contributors to low use of ACS in these settings. (Ndwiga et al., 2023a)

A study by Dagklis et al., (2022) discussed the importance of strengthening health systems to ensure that Antenatal Corticosteroids use is maximized. This multi-dimensional strategy focuses on resolving poor infrastructure and unequal resources in healthcare units. Effective health system strengthening supports a strong base for providing quality and ongoing antenatal care services. Sufficient infrastructure encompasses adequately equipped facilities and appropriately trained caregivers essential for streamlined corticosteroid management.

2.2.3 Clinical Decision Support Systems: Guiding Antenatal Corticosteroid Decision-Making

Integrating clinical decision support systems in electronic health records is a new and effective way to improve the utilization of antenatal corticosteroids Lv & Ming, (2022). This cutting-edge design offers healthcare professionals immediate, personalized decision assistance that helps them comply with clinical recommendations. The study emphasizes the importance of healthcare providers' decision-support tools in administering antenatal corticosteroid therapy according to patients' characteristics and gestational age. These systems use algorithms and patient-specific information pulled electronically from medical records to give prompt, appropriate treatment decisions supported by research-based suggestions.

2.2.4 Client factors

A study conducted in Ethiopia Jacobsson et al., (2025) found that low maternal awareness, late presentation to health facilities, and financial or logistical barriers were major obstacles preventing women at risk of preterm birth from receiving ACS on time. Many women either did not recognize the signs of preterm labor early enough or reached facilities too late for effective administration, often due to cost or transportation challenges .Further cross-country analyses showed that social and structural inequities ,including low education levels, poverty, and geographic isolation strongly influence ACS uptake. These inequities interplay with health system readiness and contribute to the persistently low utilization of ACS across LMICs (Ngare et al., 2020). Understanding the specific factors that influence ACS administration is essential for designing effective implementation strategies. However, limited research has comprehensively examined the factors influencing ACS use in Tranzoia and Laikipia Counties, Kenya. This study addresses this gap by investigating the multidimensional factors affecting ACS use in two county referral hospitals.

2.3 Research Gap

Although existing studies have identified multiple provider, facility, and client-related factors influencing ACS utilization, there is limited context-specific evidence examining these factors in Trans Nzoia and Laikipia Counties in Kenya. This study aims to address this gap by investigating the multidimensional determinants affecting ACS use in these settings, thereby informing targeted interventions to improve neonatal outcomes.

III. METHODOLOGY

3.1 Research Design

The study adopted an analytical cross-sectional design which efficiently measures the prevalence of ACS administration and identifies multi-level factors including provider knowledge, facility systems and client factors. This

design was used for this study because it makes it possible to efficiently measure the prevalence of ACS administration at a single point in time. This design also enables simultaneous examination of multi-level factors including provider knowledge, facility systems, and client factors making it practical and resource-efficient. The design further supports inferential analysis, allowing the study to identify associations between these factors and ACS administration outcomes

3.2 Study Site

Study conducted in two county referral hospitals in Kenya: Nyahururu County Referral Hospital and Wamalwa Kijana County Referral Hospital. Both facilities provide comprehensive emergency obstetric and newborn care services, with monthly deliveries of about 380, each.

3.3 Target Population

The participants included al healthcare providers directly involved in maternal and newborn care (nurses, clinical officers, medical officers, consultant obstetricians)

3.4 Sample Size Determination

Total population sampling was employed owing to their small numbers of the health care providers. All healthcare providers meeting eligibility criteria were enrolled. Inclusion criteria included: working in maternity, labor ward, or newborn unit for at least six months prior to the study; being available during the data collection period; and providing informed consent. A total of 160 healthcare providers (80 per facility) participated.

During the three months preceding data collection, maternity records were reviewed for women experiencing imminent preterm birth between 24 and 34 weeks of gestation. A total of 160 records were examined, with 80 records selected from each facility included in the study. Health care providers who had not been present in the facility during the three months prior to the study were excluded from participation.

3.5 Data Collection Instruments

Self-administered questionnaires were used to collect data from health care providers, including information on demographics, health care provider knowledge assessment, self-reported health care practices regarding ACS use, and facility factors. The questionnaire was pilot-tested at Baringo County Referral Hospital, which is a non-study facility with similar characteristics to the study sites. In the pilot facility, 20 health care providers filled out the questionnaires. Cronbach's alpha was 0.82 for knowledge items and 0.79 for practice items, indicating good internal consistency.

A structured data extraction form was used to extract data from maternity records. This form included maternal characteristics such as age, parity, ANC attendance, and comorbidities; delivery characteristics such as mode of delivery and gestation at birth; ACS administration details including whether ACS was prescribed, whether it was administered, the type of ACS, course completion, and the reason for non-administration if applicable.

A key informant interview guide, which was semi-structured, explored barriers and facilitators to ACS use. The guide included probes on knowledge, access to guidelines, clinical decision-making, and health system factors.

3.6 Data Analysis

Data were entered into EpiData version 3.1 and subsequently exported to STATA version 26.0 for analysis. For quantitative analysis, descriptive statistics—including frequencies, percentages, means, standard deviations, and medians with interquartile ranges—were computed for all variables. Bivariate analysis involved chi-square tests (or Fisher’s exact test when expected cell counts were less than five) for categorical variables, and independent t-tests for continuous variables, to compare characteristics between those who administered ACS and those who did not. For multivariable analysis, variables with $p<0.20$ in the bivariate analysis were entered into a backward stepwise logistic regression model to identify independent predictors of ACS administration. Adjusted odds ratios (aOR) with 95% confidence intervals (CI) were reported, and statistical significance was set at $p<0.05$.

For qualitative analysis, transcripts were analyzed using thematic analysis in NVivo 12. Two researchers independently coded transcripts using a hybrid deductive-inductive approach, with any disagreements resolved through discussion. Themes were organized according to the conceptual framework.

3.7 Ethical Considerations

Prior to commencement of this study, authorization to undertake this study was obtained from Institutional Scientific and Ethics Review Committee (MMUST/ISERC/040/2025) and National Commission for Science. Technology and Innovation (NACOSTI/p/25/4172599) Further approvals were obtained from Laikipia County and Tranzioa County as well as their respective referral hospitals where the study was conducted prior to commencement of the study. The HCP signed an informed consent prior to participating in the study.

IV. FINDINGS & DISCUSSION

This chapter contains the analysis of the data collected, presented according to the specific objectives; to determine the use of Antenatal Corticosteroids by Health Care Providers in the Management of imminent Preterm birth, to evaluate the factors influencing the administration of Antenatal Corticosteroids in the Management imminent Preterm birth.

4.1 Healthcare Provider Characteristics

A total of 160 healthcare providers participated (80 per facility), with a 100% response rate. Table 1 presents their demographic characteristics. The two facilities had comparable demographic profiles. Nurses constituted the majority (89.4% overall), with diploma as the most common educational qualification (69.4%). Median professional experience was 3.0 years (IQR: 2.0-5.0).

Table 1

Healthcare Provider Demographic Characteristics

Variable	Wamalwa Kijana (n=80)	Nyahururu (n=80)	Total (N=160)
Age (years), mean (SD)	34.1 (7.8)	36.0 (7.3)	35.1 (7.6)
Cadre, n (%)			
Clinical officer	0 (0.0)	4 (5.0)	4 (2.5)
Medical officer	7 (8.8)	4 (5.0)	11 (6.9)
Consultant obstetrician	1 (1.2)	1 (1.2)	2 (1.2)
Nurse	72 (90.0)	71 (88.8)	143 (89.4)
Education level, n (%)			
Certificate	3 (3.8)	9 (11.2)	12 (7.5)
Diploma	56 (70.0)	55 (68.8)	111 (69.4)
Bachelor's degree	20 (25.0)	15 (18.8)	35 (21.9)
Postgraduate	1 (1.2)	1 (1.2)	2 (1.2)
Experience (years), median (IQR)	3.5 (2.0-5.0)	3.0 (2.0-4.0)	3.0 (2.0-5.0)

4.2 Healthcare Provider Knowledge of ACS

Table 2 presents knowledge levels by specific domains, the cross-sectional analysis highlighted several gaps in ACS knowledge and utilization by health workers in both the two county referral hospitals, where only 30.6% of eligible women had received ACS. Less than half of healthcare providers correctly identified ACS indications (49.4%) and WHO-recommended gestational age (46.9%). Knowledge of the recommended number of courses was particularly low (31.9%).The main factor that contributed to the non-administration of ACS was the non-prescription of ACS to eligible individuals, constituting 82.0% of all participants. Most significantly, facility-level factors, such as visibility of SOPs, availability of WHO recommendations, and previous training in evidence-based interventions, emerged as independent determinants of ACS administration. On the other hand, individual knowledge of ACS did not emerge as an independent determinant. The mean knowledge score was 55.2% (SD 20.7), with scores ranging from 12.5% to 100%. The findings of this study concur with those of a study done in Ethiopia which revealed that various facility-level factors have been identified as key determinants of antenatal corticosteroid (ACS) use in LMIC. In particular, the presence of essential resources such as injectable corticosteroids and functioning ultrasound equipment, which enable accurate gestational age assessment was closely linked to higher ACS administration (Yang *et al.*, 2025a).

Table 2

Healthcare Provider Knowledge of Antenatal Corticosteroids (N=160)

Knowledge Item	N (%)
Indication for ACS	79 (49.4)
WHO recommended gestation for ACS (24-34 weeks)	75 (46.9)
Number of ACS recommended courses (one course only)	51 (31.9)
Contraindications of ACS	73 (45.6)
ACS given even if full course may not be completed	93 (58.1)
ACS given in PROM with no infection	124 (77.5)
ACS not recommended in pre-existing medical conditions	88 (55.0)
ACS recommended in both single and multiple pregnancy	123 (76.9)
Mean knowledge score (%), mean (SD)	**55.2 (20.7)**

4.3 Healthcare Provider Practices

Table 3 presents self-reported practices regarding ACS use. Only 71.9% of providers agreed or strongly agreed that they could reliably identify eligible clients. Routine prescription was reported by 59.4%, and routine administration by 66.2%. The mean practice score was 55.2% (SD 30.4).

Table 3

Healthcare Provider Self-Reported Practices (N=160)

Practice Item	Strongly Disagree, n (%)	Disagree, n (%)	Neutral, n (%)	Agree, n (%)	Strongly Agree, n (%)
I can reliably identify eligible clients for ACS	4 (2.5)	18 (11.2)	23 (14.4)	53 (33.1)	62 (38.8)
I routinely prescribe ACS to eligible women	11 (6.9)	38 (23.8)	16 (10.0)	44 (27.5)	51 (31.9)
I routinely administer ACS as prescribed	4 (2.5)	34 (21.2)	16 (10.0)	48 (30.0)	58 (36.2)
Mean practice score (%), mean (SD)					**55.2 (30.4)**

4.4 Facility-Level Factors

Table 4 presents healthcare providers' perceptions of facility-level factors supporting ACS use. While availability of ACS was reported as adequate (87.5%) in both facilities, significant gaps existed in other facility factors. The findings indicate low knowledge levels across all the domains with only 22.5% reporting availability of WHO guidelines, 16.9% reported visible displayed SOPs, and only 21.9% having received training on evidence-based practices including ACS. The principal conclusion of this study is that facility-level system factors were more significant predictors of ACS administration than the knowledge of individual providers. Following multivariable analysis, only three factors showed independent associations with ACS use: the presence of displayed standard operating procedures (aOR: 2.34), training in evidence-based practices (aOR: 2.67), and availability of WHO guidelines (aOR: 1.89). Although provider knowledge scores were significant at the bivariate level, they did not remain significant after adjustment.

The finding of this study agrees with another study by" Ndwiga et al. (2023b). Which demonstrated that knowledge alone is enough to change clinical practice the "knowledge-practice gap is evident. This implies that sometimes the healthcare providers may be knowledgeable on a particular thing but may not transfer what they know to practice due to system-level barriers that prevent translation of knowledge into action. Visible SOPs serve as point-of-care decision support, particularly during high-stress situations such as night shifts or when experienced staffs are unavailable. Training programs not only impart knowledge but also build confidence and establish social norms around evidence-based practice. Accessible guidelines provide a reference for verification, reducing reliance on memory.

A study by Yang et al. (2025) reported similar findings across nine LMICs, where facility characteristics such as provider skills and obstetric emergency capacity were key determinants of ACS use. (Smith et al., 2022), demonstrated that capacity building at the facility level significantly increased ACS administration rates from 35% to 86% in Cambodia and from 34% to 56% in the Philippines. Our study adds to this evidence by quantifying the independent effect of specific facility-level factors in the Kenyan context LMICs. For instance, Rizzo et al., (2022), revealed similar levels of low knowledge on ACS guidelines among Nigerian healthcare providers, where only 45% were knowledgeable about ACS indication. Another study by Mwita et al. (2021) in Tanzania showed that knowledge was a significant constraint in using ACS. Nonetheless, since knowledge failed to predict ACS use in

Table 4

Facility-Level Factors (N=160)

Facility Factor	Agree/Strongly Agree, n (%)
ACS drugs consistently available	140 (87.5)
Ultrasound available for gestation dating	66 (41.3)
WHO guidelines on ACS available	36 (22.5)
Visible displayed SOPs for ACS	27 (16.9)
Training on evidence-based practices including ACS received	35 (21.9)

4.5 ACS Administration Rates from Record Review

Table 5 presents details of ACS administration. Review of 160 maternity records (80 per facility) revealed that ACS was administered to only 49 (30.6%) of eligible women with imminent preterm birth. Failure to prescribe was the predominant reason for non-administration, accounting for 82.0% of missed cases. Among those who received ACS, only 44.9% completed the full recommended course. *Antenatal Corticosteroid Administration***:** The ACS administration rate of 30.6% observed in this study is consistent with findings from other LMIC settings but remains unacceptably low.

Mwita et al. (2021) reported ACS administration rates ranging from 10% to 68% across sub-Saharan Africa. In Kenya, (Eddy et al., 2022) found that only 22.1% of facilities had administered ACS in the preceding three months. The rate observed in our study (30.6%) is slightly higher than the national average but still indicates that approximately 70% of eligible women with imminent preterm birth do not receive this life-saving intervention.

The finding that failure to prescribe accounted for 82.0% of missed cases is particularly important. This suggests that the bottleneck occurs at the clinical decision-making stage rather than at the drug administration stage. Similar findings were reported by Kibanga et al. (2023) at Kenyatta National Hospital, where non-prescription was the main reason for non-administration. This pattern indicates that interventions targeting prescribing behavior such as clinical decision support tools, provider education, and audit with feedback may yield significant improvements.

Table 5

ACS Administration from Maternity Records (N=160)

Variable	N (%)
ACS prescribed	
Yes	53 (33.1)
No	107 (66.9)
ACS administered	
Yes	49 (30.6)
No	111 (69.4)
Type of ACS (n=49)	
Dexamethasone	49 (100)
Betamethasone	0 (0)
Completed full course (n=49)	
Yes	22 (44.9)
No	27 (55.1)
Reason ACS not given (n=111)	
Not prescribed	91 (82.0)
Came in 2nd stage of labor	12 (10.8)
Emergency cesarean section	4 (3.6)
Prescribed but not administered	4 (3.6)

4.6 Factors Associated with ACS Administration (Bivariate Analysis)

Table 6 presents bivariate associations between potential factors and ACS administration. In bivariate analysis, factors significantly associated with ACS administration included: provider knowledge score (p=0.018), facility (p=0.028), availability of WHO guidelines (p=0.010), availability of displayed SOPs (p=0.004), and receipt of training on evidence-based practices (p=0.002).

Table 6

Bivariate Association of Factors with ACS Administration

Variable	ACS Administered (n=49)	ACS Not Administered (n=111)	Test statistic	p-value
Provider-level factors				
Age (years), mean (SD)	34.8 (8.2)	35.2 (7.4)	t=0.31	0.758
Cadre, n (%)			χ^2=0.15	0.703
Clinician (MO/CO/Consultant)	6 (31.6)	13 (68.4)		
Nurse	43 (34.4)	82 (65.6)		
Education level, n (%)			χ^2=1.28	0.258
Certificate/Diploma	36 (29.3)	87 (70.7)		
Bachelor's/Postgraduate	13 (35.1)	24 (64.9)		
Experience (years), median (IQR)	3.0 (2.0-4.0)	3.0 (2.0-5.0)	Z=0.48	0.629
Knowledge score (%), mean (SD)	61.5 (18.9)	52.8 (20.9)	t=2.39	**0.018***
Practice score (%), mean (SD)	62.4 (29.1)	52.1 (30.4)	t=1.94	0.054
Facility-level factors				
Facility, n (%)			χ^2=4.80	**0.028***
Wamalwa Kijana (Control)	19 (23.8)	61 (76.2)		
Nyahururu (Study)	30 (37.5)	50 (62.5)		
ACS drugs available, n (%)			χ^2=1.98	0.160
Agree/Strongly agree	46 (32.9)	94 (67.1)		

Neutral/Disagree	3 (15.0)	17 (85.0)		
Ultrasound available, n (%)			χ^2=0.67	0.413
Agree/Strongly agree	19 (28.8)	47 (71.2)		
Neutral/Disagree	30 (31.9)	64 (68.1)		
WHO guidelines available, n (%)			χ^2=6.62	**0.010***
Agree/Strongly agree	17 (47.2)	19 (52.8)		
Neutral/Disagree	32 (25.8)	92 (74.2)		
Displayed SOPs available, n (%)			χ^2=8.25	**0.004***
Agree/Strongly agree	14 (51.9)	13 (48.1)		
Neutral/Disagree	35 (26.3)	98 (73.7)		
Training on EBP received, n (%)			χ^2=9.20	**0.002***
Agree/Strongly agree	17 (48.6)	18 (51.4)		
Neutral/Disagree	32 (25.6)	93 (74.4)		

*Statistically significant at p<0.05

4.7 Independent Predictors of ACS Administration (Multivariable Analysis)

Table 7 presents the final model-Variables with p<0.20 in bivariate analysis (knowledge score, practice score, facility, ACS drug availability, WHO guidelines availability, displayed SOPs, training on EBP) were entered into multivariable logistic regression. After adjusting for confounders, three facility-level factors emerged as independent predictors of ACS administration: Availability of displayed SOPs: Healthcare providers who reported visible SOPs had 2.34 times higher odds of administering ACS (95% CI: 1.28-4.27, p=0.006). Training on evidence-based practices: Providers who had received training had 2.67 times higher odds of administering ACS (95% CI: 1.41-5.06, p=0.002). Availability of WHO guidelines: Providers who reported access to WHO guidelines had 1.89 times higher odds of administering ACS (95% CI: 1.04-3.43, p=0.037). Provider knowledge score, facility type, and ACS drug availability were not independently associated with ACS administration after adjusting for other factors.

Table 7

Multivariable Logistic Regression for Factors Associated with ACS Administration

Variable	aOR	95% CI	p-value
Provider knowledge score (%)	1.02	0.98-1.06	0.412
Facility (Nyahururu vs. Wamalwa Kijana)	1.47	0.65-3.31	0.354
ACS drugs available	1.89	0.47-7.60	0.371
WHO guidelines available	1.89	1.04-3.43	0.037*
Displayed SOPs available	2.34	1.28-4.27	0.006*
Training on EBP received	2.67	1.41-5.06	0.002*

4.8 Qualitative Findings

Thematic analysis of key informant interviews (n=8) revealed four major themes influencing ACS utilization.

Theme 1: Knowledge and Practice Gaps

Despite clinical experience, providers acknowledged gaps in their knowledge of ACS guidelines, particularly regarding gestational age criteria and contraindications.

> *"Some of our colleagues are not very clear on the exact gestation when ACS should be given. There is confusion between 24-34 weeks versus up to 37 weeks in some guidelines."* (KII 3, Medical Officer, Wamalwa Kijana, 13th August 2025)*
>
> *While the KII 2 from the Nyahururu had this to say I can confidently say that the knowledge gap has been the main reason for underutilization of ACS as we have noted an improvement in its prescription as well as administration following the intervention KII 2- 23rd AUG 2026.*
>
> *Theme 2: Challenges in Identifying Eligible Client*

Providers identified difficulties in accurately determining gestational age, particularly when ultrasound was unavailable or unaffordable.

> *"Some of the clients cannot afford to pay for the ultrasound, leading to delay in identifying eligible clients. Without ultrasound, we rely on last menstrual period, which many women cannot remember accurately."* (KII 5, *Clinical Officer, Wamalwa Kijana, August 2025). These sentiments were shared by a KII from Nyahurur who had this to say "The problem is getting to know the right gestational age since majority of the clients are unable to pay for ultra sound services. (KII 5 -24th Aug 2026)*

Theme 3: Lack of Accessible Guidelines and Protocols

The absence of visible protocols was identified as a major barrier to consistent ACS use.

> *"In some units there are no clear SOPs displayed, so providers rely on what they remember. When you are working night shift alone, you need something to refer to quickly."* (KII 6, Nurse Manager, Wamalwa Kijana 14th Aug 2025)

Theme 4: Inconsistent Administration Practices

Providers reported that even when ACS was prescribed, administration was not always completed due to various barriers.

> *"The challenge is that some mothers present very late, and there is no time to complete the doses. They come already in the second stage or with cervical dilatation of 8-10 cm."* (KII 1, Nurse, Nyahururu 23rd Aug 2025)*

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The findings of this study revealed an overall low ACS administration rate: Only 30.6% of eligible women with imminent preterm birth received ACS, in both facilities indicating that approximately 70% of at-risk newborns miss this life-saving intervention Lack of Prescription of ACS to eligible clients was found to be the main barrier with 82.0% of eligible clients having missed ACS, suggesting the critical barrier occurs at the clinical decision-making stage rather than drug availability. Further facility-level factors were found to outweigh individual knowledge regarding failure to administer ACS. After multivariable adjustment, only facility-level factors remained independent predictors of ACS administration.

5.2 Recommendations

Policy makers -Hospital Administrators and County Health Management Teams to provide necessary facility level actors including; Display visible standard operating procedures (SOPs), Ensure accessible WHO guidelines and support Implementation of regular evidence-based practice training and the Kenyan Ministry of Health (MOH) Integrate ACS administration indicators and Develop a national ACS clinical decision support tool. Future research needs to be done to explore long-term sustainability of educational interventions. Future research explore long-term sustainability of educational interventions.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding Declaration

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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