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Women's experiences of antenatal care in Mukono district, Uganda: a facility-based cross-sectional study

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Research Article

Keywords: Antenatal care, Maternal Health Services, Patient-Centered Care, Patient Satisfaction, Uganda, Health Knowledge, Attitudes, Practice

Posted Date: June 10th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9923911/v1

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Additional Declarations: No competing interests reported.

Abstract

Background

Women's perspectives on antenatal care (ANC) are often overlooked, despite influencing uptake. In Uganda, retention in ANC throughout pregnancy remains a challenge that may limit the implementation of the recommended eight ANC contacts. In this study, we aimed to assess women's perceptions of ANC across five constructs and examine determinants of care satisfaction and uptake barriers using a newly developed questionnaire.

Methods

We conducted a health facility-based cross-sectional study of postpartum women in Mukono District, Uganda, using a structured questionnaire. We applied exploratory factor analysis (EFA) and multivariable regression.

Results

Among 358 participants, most attended four or more ANC visits, while only one third initiated ANC in the first trimester. Reponses for perceived satisfaction, perceived quality, and opportunities for improvements were mostly positive, with 68% – 98% of participants selecting high response categories, while greater variability was observed for perceived barriers and beliefs and values concerning pregnancy and ANC. Women prioritized increasing staff, improving facility resources and establishing savings groups to improve ANC quality and access. EFA identified 18 factors across the five perception constructs, with 2–4 factors per construct. The variance explained by the factors varied considerably (31%–84%), with the lowest proportions observed for the constructs of perceived barriers, and beliefs and values concerning pregnancy and ANC. Higher parity, and longer time spent at ANC were associated with higher satisfaction, while higher wealth index, receiving care from a preferred provider, and shared or no financial responsibility for ANC were associated with lower perceived barriers.

Discussion

In this study, we documented the multidimensional nature of women's perceptions of ANC and highlighted the interplay of health workforce capacity, facility resources, and experience of care, while supporting the use of quantitative tools to assess client perspectives. Integrating women's perspectives into routine health system planning may support responsive, equitable, and person-centered care.

Background

Antenatal care (ANC) encompasses an interplay between biomedical practices, cultural interpretations of pregnancy, and individual decision-making. While clinical outcomes and procedural components of ANC have been well studied, far less attention has been devoted to women's perceptions of ANC, including perceived satisfaction with care, despite growing evidence that these factors directly influence ANC service utilization and uptake (1–3). Understanding determinants of ANC uptake, such as perceptions of service quality, and satisfaction with care, and health beliefs related to pregnancy and ANC, is central to achieving better ANC coverage.

Donabedian's model conceptualizes quality of care through the interplay of structure, process, and outcomes, emphasizing that strong system inputs and effective clinical interactions drive better patient experiences (4). Women's satisfaction with ANC is shaped by the process domain such as respectful communication, timeliness, and interpersonal quality as well as the structural environment, including facility readiness and continuity of services. Perceived quality of care extends beyond clinical services and incorporates women's lived experiences within health systems (4). Women who perceive ANC as low-quality, culturally incongruent, or unhelpful may be less likely to participate consistently in this critical intervention. Ultimately, positive ANC experiences reflect not only clinical competence but also the extent to which care is responsive, person-centered, and aligned with women's expectations. Studies from Ethiopia and Zambia show that women's satisfaction with antenatal care ranging from 54% to 75% is shaped by access and socio-demographic factors, while the experience of care, described as respectful communication, short waiting times, and access to information, are central to women's appraisal of care and continued engagement with services (5–8).

As part of a larger project to improve coverage of ANC8 in Uganda, our team conducted a systematic review of both qualitative and quantitative studies to understand the factors influencing antenatal care (ANC) utilization (9). This review highlighted how socio-demographic factors, cultural beliefs, and financial barriers shape the perceptions and behaviors of Ugandan women, their families, and healthcare workers regarding ANC services. In this review, we identified key barriers, including transportation costs, gendered decision-making, and insufficient healthcare resources. However, we identified a significant gap in the literature regarding survey-based assessments of users' experiences and preferences related to ANC in Uganda and similar contexts. Studies have shown that women value ANC but frequently express dissatisfaction due to long waiting times, staff shortages, stock-outs of medicines, and negative provider attitudes, particularly in public health facilities (10, 11). The aim of this study was to develop a questionnaire and assess women's perceptions of ANC, including satisfaction with ANC, perceived quality of care, barriers to attendance, pregnancy- and ANC-related beliefs and values, and perceived opportunities for improvement of care in Mukono district, Uganda. We further aimed to explore the determinants of satisfaction with ANC and barriers to ANC attendance.

Methods

Study Setting

This study was conducted in Mukono District, Uganda from April to May 2023. Mukono district, a neighboring district to the capital city of Uganda, Kampala, is comprised of four subdistricts: Mukono North, Mukono South, Nakifuma, and Municipality. Each sub-district contains either rural or urban villages. Uganda's public health system at district level is composed of four health center (HC) levels (Level 2, 3, 4, and district hospitals). With increasing HC level, more services are available for patients, including but not limited to imaging, diagnostic testing, treatment of pregnancy complications, and emergency obstetric care. ANC in Uganda is expected to be free of charge for all pregnant women at government health facilities and midwives are the primary providers of ANC. Physicians typically conduct ANC for high-risk pregnancies.

Our target population consisted of parous women who had the chance to attend ANC. We surveyed women at child immunization clinics in HC2 and HC3. Women were included if they had been pregnant at least once and had given birth within the last three months. This was to ensure that if there was an experience in ANC, women were referring to the time spent in Mukono district HCs. Women who had given birth more than three months since the date of data collection were excluded to minimize recall bias.

Study Design and data collection

We collected self-reported information from women regarding their experiences with ANC in a facility-based cross- sectional study. Data were collected by four trained data collectors and participants were recruited from Health Center II (HC II) and Health Center III (HC III) facilities during child immunization clinics. This provided access to recently delivered women who had most likely attended ANC at these facilities. Eligible women who expressed interest in participating received verbal information about the study, including its purpose, procedures, and expected duration. Written informed consent was obtained prior to participation. The questionnaire was administered in the participant's preferred language (Luganda or English) by trained data collectors using electronic tablets. The survey captured information on women's perceived satisfaction with ANC, perceived quality of care, perceived barriers to attendance, health beliefs related to pregnancy and ANC, and perceptions of priorities for improving ANC quality and access, as well as information related with their pregnancy and medical history, socio-demographic characteristics and other information related to their experience with ANC (Supplementary Material 1).

Sample Size and sampling

The sample size was calculated based on women's satisfaction with ANC. Previous research conducted in Uganda reported a satisfaction level with ANC of 74.6% among pregnant women attending ANC services (10). Assuming a conservative satisfaction proportion between 50% and 70%, a 95% confidence level, and a 5% margin of error, the required sample size ranged from 323 (for 70%) to 385 (for 50%). We selected a target sample size of 350 women.

A proportional sampling approach was used to ensure representation across facility levels. In Mukono District, 25 HC II facilities serve approximately 40 pregnant women per month at each facility (~ 1,000

annually per facility group), while 13 HC III facilities serve approximately 800 pregnant women per month (~ 10,400 annually per facility group). Based on these proportions and target sample size of 350 women, we aimed to recruit a minimum of 31 women for HC II facilities and 319 women from HC III facilities.

Facilities were clustered by sub-district to ensure geographic variation. Within each cluster and facility level, a subset of facilities was selected for data collection. At each selected facility, eligible women were recruited using convenience sampling during immunization clinic days.

Survey development

The questionnaire was developed through a stepwise process. First, we conducted a scoping literature review to identify barriers and supporting factors to ANC access, health beliefs, and women's perceptions of ANC in Uganda (12). Themes emerging from this review, including structural access barriers, sociocultural influences, knowledge and beliefs, perceived quality of care, and broader perceptions of ANC services, were used to guide item generation for the survey. This ensured that the instrument captured both contextual determinants and women's subjective experiences related to ANC utilization. Second, to strengthen construct alignment and item quality, we reviewed validated maternal health questionnaires used in other settings (13–18). These instruments informed question phrasing, response scaling, and domain structures. Elements from Service Provision Assessments (SPA) were incorporated to align selected items with recognized measures of service availability and quality (19). In addition, items assessing women's satisfaction and care experience were adapted from World Health Organization (WHO) survey tools on patient experience and respectful maternity care to ensure consistency with internationally recognized indicators (20).

Content and face validity of the questionnaire was assessed by experts in obstetric and antenatal care in Uganda. Item relevance and conceptual coherence were evaluated through discussion with the Uganda-based expert team. We conducted pilot testing of the questionnaire in two HC III in Mukono. Following the pilot, minor revisions were made to items addressing socioeconomic status and perceived quality of ANC (Supplementary Material 1). As revisions were limited and did not substantially alter the instrument structure, re-piloting was deemed unnecessary. Due to limited variability in pilot responses, formal construct validity testing and internal consistency analyses were not feasible.

Variables

Socio-demographic characteristics included age (< 20 years, 20–29 years, ≥ 30 years), wealth index tertiles (low, middle, high), educational level (primary school or lower (≤ 7 years of education), secondary school or higher (≥ 8 years of education), occupation (not working, salary worker or self-employed). Marital status was collected but not included in further analysis since most women (n = 326, 91%) were grouped under the category "married".

Pregnancy history and medical information was assessed by parity (1, 2–3, 4 or more) and self-reported reported pregnancy complications in last pregnancy (yes, no). This included gestational diabetes,

anemia, gestational hypertension, preeclampsia or eclampsia. Most women (89%, n = 318), reported no chronic illness, hence this variable was not included in further analysis.

Variables related to health service uptake included ANC attendance (less than 4 contacts, 4 contacts or more), early ANC initiation (before 3 months of gestation, after 3 months of gestation) and receiving ANC services (screening of anemia, diabetes, syphilis, HIV, blood pressure, malaria, provision of malaria prophylaxis, free bed net, abdominal check, ultrasound scan, supplements, ANC card, information about timely ANC visits). We defined adequate ANC as receipt of anemia, syphilis, HIV, and blood pressure screening, as well as provision of malaria prophylaxis, in line with previous definitions of ANC quality(21).

ANC access constraints were assessed by the following: time required to reach health facility (< 30 minutes, 30–59 minutes, ≥ 60 minutes), mean of transportation to health facility (walk/bicycle, motorcycle/car/public transportation), cost of transportation (no cost, low cost (≤ 4000 Ugandan Shillings), high cost (> 4000 Ugandan Shillings)), time spent at health facility during ANC (< 1 hour, 1–2 hours, > 2 hours), and missed work or household chores due to ANC (no, yes). Health facility delivery and health facility attendance for first ANC were also collected but not included in further analysis as 98% (n = 350) and 100% (n = 358) of women reported delivering in a health facility and attending health facility for their first ANC. In addition, 96% of women reported attending ANC at the closest health facility, hence it was not included in further analysis.

Variables related to autonomy and preferences for healthcare services included ANC accompaniment (none, partner/husband, other relative/friend), and woman's preference of the accompanying person (not as preferred, as preferred), preference for type of ANC provider (not as preferred, as preferred), household decision maker (woman alone, jointly with partner/husband, others only), pregnancy healthcare decision-maker (woman alone, jointly with partner/husband, others only), responsible for cost of ANC (woman alone, jointly with partner/husband, others only), and main household income provider (woman, partner/husband, other relatives). Of note, 96% (n = 345) of women reported receiving care by a nurse, as opposed to doctor, community health worker or traditional birthing attendant, hence this variable was not included in further analysis. Most women (n = 326,91%) reported that the head of the household is their husband, as opposed to the woman herself or other relatives, hence this was variable was also not included in further analysis.

We assessed perceived satisfaction with ANC, quality of ANC, barriers to ANC uptake, potential improvements of ANC quality and access, pregnancy and ANC related beliefs and values using a focused set of five-point Likert scale questions (Supplementary Material 1).

Perceived satisfaction with ANC was assessed by the question "To what extent are you satisfied with the following aspects of ANC?", comprising the following 12 items: time between ANC visits, facility of ANC, sex of ANC provider, duration of ANC visit, waiting time for ANC, pregnancy information received in ANC visit, number of health workers providing ANC at the health facility, availability of medications and medical supplies at the health facility, laboratory services at the health facility, availability of space and

comfort of waiting areas, cost of ANC services and privacy during ANC. An additional question on overall ANC satisfaction, with response options ranging from ‘very dissatisfied’ to ‘very satisfied’ was also included.

Perceived ANC quality was assessed by asking women to rate the importance of seven items in terms of quality of care: knowledgeable staff, kind and caring staff, obtaining education about pregnancy, obtaining relevant tests and imaging, access to medications and proper equipment, 24/7 access to health professionals and emergency services, reminders of upcoming visits.

Perceived barriers to ANC uptake were assessed by asking about the extent to which the following eleven items are perceived as barriers: lack of resources at the facility, bad attitudes by the health provider, training of the health worker, transportation to ANC, distance to ANC, extra cost of ANC, work and/or household responsibilities, partner/family approval, lack of personal money, waiting time at ANC and fear associated with ANC.

We assessed perceptions of improvements of quality of and access to ANC by asking women to rank the importance of the following ten items: increased staff at ANC, improving facility resources (equipment, medication), improving health worker attitudes, improving women’s pregnancy education, training level of community health workers (CHWs), increasing privacy and respect at ANC, female employment, saving groups, increased number of CHWs, increased male involvement at ANC. Women’s saving groups are a collective of women who save money and provide financial assistance to one another, resulting to expanding women’s access to financial resources(22).

Finally, we assessed beliefs and values in relation to pregnancy and ANC by requesting women to rank the extent to which they agree or disagree with the following twelve items: pregnancy is only a mother’s responsibility, pregnancy can cause illness or have complications, complications in pregnancy can be harmful for me or my baby, the number of ANC visits I have attended are adequate, I believe I come to ANC the right time in my pregnancy, I know when to come to ANC, I find value in attending ANC, I had choice in my ANC provider, it was important to me that I have the same provider at each ANC visit, I visited the same ANC provider at each visit, I would return to this health facility for ANC, I would recommend this health facility to relative or friend (Supplementary file 1).

Statistical Analysis

We used descriptive statistics for participant characteristics and to explore differences across education and wealth index categories using chi-square test. We performed exploratory factor analysis to assess the internal construct validity of the questionnaire by examining whether items loaded onto theoretically coherent factors. Factor analysis was performed for each of the five components of interest: i) perceived satisfaction with ANC, ii) perceived quality of ANC, iii) perceived barriers related to ANC uptake, iv) perceived improvements of ANC quality and access and v) beliefs and values related to pregnancy and ANC. A principal component analysis was conducted on polychoric correlation matrices, given the

ordinal nature of the survey items. Oblique promax rotation was applied to allow correlation between factors in all four cases except for perceived satisfaction, where a degenerate solution was produced by promax rotation; here, oblimin oblique rotation was used which is equivalent to the orthomax criterion function. Sampling adequacy was assessed using the Kaiser–Meyer–Olkin (KMO) statistic (acceptable threshold > 0.60) and Bartlett's test of sphericity ($p < 0.001$) was used to assess sufficient intercorrelations to conduct factor analysis (23–25). The number of factors retained was initially guided by the Kaiser criterion (eigenvalues ≥ 1) and inspection of factor interpretability. Items with factor loadings ≥|0.40| were retained. Items with lower loadings, substantial cross-loadings, or that did not load onto any factors together with other variables, were removed iteratively in a stepwise manner to achieve a stable factor structure. We assessed the internal consistency of the items of each of the five components using Cronbach's alpha, before (for composite/global score) and after data reduction (for individual factors).

Finally, summarized composite scores were created for two of five components: perceived satisfaction with ANC and perceived barriers related to ANC uptake, by averaging the responses across all items. Multivariable linear regression models were used to examine associations between participant characteristics and composite satisfaction and barrier scores, while accounting for potential confounding between covariates. Explanatory variables were included simultaneously in regression models to explore whether associations between potentially modifiable ANC-related characteristics and composite scores persisted after accounting for sociodemographic and pregnancy-related characteristics. We have treated non-modifiable background characteristics as confounding factors of the association between potentially modifiable characteristics and the composite satisfaction and barrier score. Potential confounders included: age, educational level, wealth index, maternal occupation, parity, previous pregnancy complications and household income provider. After fitting each multivariable regression model, multicollinearity was assessed using variance inflation factors (VIFs). A VIF > 10 was used as a threshold to indicate substantial multicollinearity. In cases where multicollinearity was detected, model specifications were reviewed, and variables were excluded based on conceptual relevance and statistical contribution. Descriptive statistics of all participant characteristics and the composite scores were applied to explore differences across groups using Mann-Whitney or Kruskal-Wallis non-parametric tests. Stata version 18.0 was used for all statistical analyses (26).

Ethical Considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. All participants received written and verbal information about the study in their preferred language. Informed consent was obtained prior to participation. For participants with limited literacy, the consent form was read aloud, and verbal consent was documented in the presence of an independent witness who signed an attestation form. Participation was voluntary, and participants were informed of their right to refuse or withdraw at any time without consequence.

The study was approved by the Makerere School of Public Health Research and Ethics Committee (SPHREC) (reference number SPH-2022-358) and exempt for review by the Regional Ethics Committee for medical and health related research (reference number 571965), South-East Norway. This study was part of a larger project titled eReg4ANC8: Implementation of an eRegistry Enabled Transition from Four to Eight Antenatal Care Contacts - a Cluster Randomized Controlled Trial in Mukono District, Uganda.

Results

Participant characteristics and ANC visits

We surveyed 358 parous women in Mukono district, Uganda. Half of the participants were surveyed at their first postpartum month (n=173, 48%). Women's ages ranged from 16 to 44 years, and most women were 20 years or older, had primary school or lower education and were employed (Table 1). Most of the participants were multiparous (n=256, 71%) and reported no pregnancy complications in their last pregnancy (n=282, 79%). The proportion of primiparous women was increasing as educational level and wealth index were increasing, while women with higher wealth index were more likely to report earlier pregnancy complications (Supplementary Table 2).

Most women reported attending ANC four times or more (83%) but only one third initiated ANC during or at the first trimester. The proportion of those with early ANC initiation increased with wealth index (Supplementary Table 2). Approximately half of the participants received adequate ANC, but diabetes screening and ultrasound scans were less frequently provided (approximately 30% prevalence) (Supplementary Table 1).

Regarding ANC constraints, most women reported spending more than half an hour to reach their ANC health facility and spending more than 2 hours at the health facility for ANC. Almost two thirds reported that they missed work or household chores to attend ANC. Approximately half of them also reported transportation costs as a barrier to care. This proportion was higher for women with higher wealth index (Supplementary Table 2). The use of motored transportation (motorcycle, car, public transportation) was positively correlated with education level and wealth index (Supplementary Table 2).

Nearly half of women reported that were accompanied by their husbands at least once during ANC, and most reported that their preferences for companionship and provider type were met. Regarding autonomy, most women reported that household decisions, responsibility for the cost of ANC, and household income provision was a responsibility of their husband or others, while the women were responsible for seeking pregnancy healthcare. This was even more prevalent for women in the upper wealth index tertile (Supplementary Table 2).

Regarding the five perception constructs across all constructs, most women reported positive or important perceptions of ANC, with the majority of responses concentrated in the higher categories (scores of 4 or 5 of Likert scale) (Supplementary Table 3). This pattern was consistent for satisfaction, perceived quality, and suggested improvements, with 68% to 98% of women being satisfied or

considering all components of the construct as important. We observed greater variability in responses for perceived barriers and beliefs and values. When focusing on the highest response category (e.g., very satisfied, very important, very big barrier, strongly agree), several components emerged as the most salient within each construct (Figure 1). For satisfaction, women were mostly very satisfied with the health provider sex, privacy at ANC and time between ANC visits. For perceived quality, women mostly considered kind and caring staff, reminders of upcoming visits and knowledgeable staff as most important. For perceived barriers, women mostly considered poor health provider attitudes, the lack of or limited training of health provider and lack of resources at HC very big barriers. Regarding potential improvements of ANC quality and access, women mostly considered increasing staff at ANC, improving health facility resources and saving groups as very important. Lastly, regarding beliefs and values related to pregnancy and ANC, women strongly agreed to the following statements: I find value in attending ANC, I would return to this facility for ANC, I would recommend this facility to a relative or friend. These findings identify the aspects of ANC that women prioritize most strongly within each domain.

Exploratory factor analysis results

Exploratory factor analysis yielded a total of 18 factors across the five components of interest (Tables 2-6). Overall, Cronbach's alpha values across the 18 factors ranged from 0.48 to 0.91, which indicated moderate to good internal consistency across the derived factors. The sampling adequacy was acceptable (KMO>0.60), indicating that the correlations between items were sufficiently compact to justify factor analysis. In addition, the correlation matrix was significantly different from an identity matrix (Bartlett's Test $p < 0.001$), supporting the suitability of the data for factor analysis.

More specifically, for perceived satisfaction with ANC, we identified four underlying factors (Table 2); ANC health worker time (Factor 1), facility infrastructure and supplies (Factor 2), ANC service organization (Factor 3), and facility services/amenities and staffing (Factor 4). Three items were not included in these factors, suggesting that perceived satisfaction with ANC may encompass additional independent dimensions.

Analysis of perceived ANC quality identified two factors influencing women's perceptions of ANC quality (Table 3): human resources at ANC (Factor 1) and technical services and infrastructure (Factor 2).

Regarding perceived barriers related to ANC uptake, we identified four factors (Table 4): health facility-based barriers (Factor 1), structural barriers (Factor 2), household-level barriers (Factor 3), and service experience/emotional concerns (Factor 4). The explained variance for each factor was lower than what we estimated for perceived satisfaction and quality of ANC. Two out of the total of eleven items did not load into any derived factor.

For perceived improvements of ANC quality and access, we identified three distinct factors (Table 5) reflecting facility staff and resources (Factor 1), improving health worker attitudes and pregnancy education (Factor 2) and women's socioeconomic empowerment and outreach of ANC (Factor 2). Three out of the total ten items did not load onto any derived factor.

Finally, four distinct factors were identified for the component of beliefs and values (Table 6): pregnancy health beliefs (Factor 1), timing and number of visits (Factor 2), provider choice and preferences (Factor 3), and positive experiences and facility satisfaction (Factor 4). Two out of the twelve items did not load onto any of the derived factors.

Associations between participant characteristics and composite scores of satisfaction with ANC and barriers to ANC

We further explored the associations between socio-demographic and other ANC related characteristics with composite scores of perceived satisfaction and perceived barriers of ANC. We note that even though exploratory factor analysis results suggest multidimensionality, composite scores were constructed to reflect overall perceptions of satisfaction with ANC and barriers to ANC uptake. Cronbach's alpha values across all assessed items were 0.76, for both satisfaction and barriers, indicating moderate to good internal consistency of each of the components of interest. The satisfaction and barriers scores were negatively but weakly correlated (Spearman's rho= -0.15, p-value<0.05). Being satisfied with care, as assessed by one question on overall satisfaction with care, was associated with 10% higher median satisfaction score, compared to women who were not satisfied with overall care (Supplementary Table 4).

In multivariable regression analysis, time spent at the health facility during ANC (1-2 hours: beta=0.3 (95%CI=0.1, 0.5) and >2 hours: beta=0.2 (95%CI=0.1, 0.4) was the only factor positively associated with the composite satisfaction score, after adjustment for potential confounders (Supplementary Table 4). The means of transportation to ANC was removed due to multicollinearity. In bivariate analyses, women who missed their work/chores due to ANC, and women who were not involved in household decision making had higher ANC satisfaction score, though this was not observed in multivariable regression analysis (p-value<0.05 for chi-square test (Supplementary Table 4).

Receiving ANC by the preferred provider (beta=-0.3 (95%CI=-0.5, -0.1) for yes vs. no), and coming from a household in which the responsibility of the ANC attendance cost is either joint, or someone else's responsibility (jointly responsible: beta=-0.6 (95%CI=-1.1, -0.1) and others responsible: beta=0.6 (95%CI=-1.0, -0.2 compared to only the woman's responsibility) were associated with lower perceived barriers for ANC, after adjustment for confounders (Supplementary Table 5). The following characteristics were associated with higher perceived barriers score: receiving adequate ANC services (beta=0.2, 95%CI=0.1,0.4), spending 1 hour or more reaching the health facility (beta=0.3, 95%CI=0.1,0.5), missing work/chores due to ANC (beat=0.2, 95%CI=0.1,0.4) and having the partner or husband accompanying to ANC (beta=0.3, 95%CI=0.1,0.5). In multivariable analysis, means of transportation to ANC was removed due to multicollinearity. In bivariate analyses, women who were working, those who reported pregnancy complications in last pregnancy, women who were not satisfied with ANC, those paid most for ANC, as well as women who alone or jointly with their husband were decision makers for seeking healthcare had higher barrier scores (Supplementary Table 5). However, these were not observed in multivariable regression analyses.

Discussion

We developed a questionnaire and conducted a survey to assess women's perceptions of ANC, including satisfaction with ANC, quality of care, barriers to attendance, potential improvements, and pregnancy and ANC-related beliefs and values in Mukono district, Uganda. We further explored the determining factors of satisfaction with ANC and barriers to ANC attendance.

Our findings reveal consistent patterns across the different perception constructs, highlighting key domains that shape women's perceptions of ANC. Components related to health providers' attitudes, competence, and availability, emerged as central across perceived satisfaction, quality, and barriers, suggesting that human resources represent both a critical strength and a potential constraint within ANC services. Moreover, structural factors, such as health facility resources appeared across multiple constructs, reinforcing their importance for both perceived quality and access. Factors related to experience of care including privacy, respectful interactions, and trust in providers, were strongly reflected in satisfaction and beliefs and values.

Through exploratory factor analysis, we identified a clear, multidimensional structure underlying women's perceptions of ANC, encompassing both provision of care (infrastructure, staffing, and technical services) and experiences of care (communication, service organization, emotional concerns, and satisfaction). Overall, our findings aligns with the WHO Quality of Care framework for maternal and newborn health, and adds to the evidence that women's perceptions are shaped by interacting health system, individual, and experiential dimensions(27). Greater variability in perceived barriers and health beliefs, also reflected in the lower explained variance in factor analysis, likely indicates the complex and context-specific interplay of structural and household constraints influencing ANC uptake, as well as more heterogeneous experiences related to access, social context, and individual expectations. Taken together, these findings underscore that women's perceptions of ANC are shaped by interconnected dimensions of care, where health system capacity, service experience, and individual context interact to influence both satisfaction and perceived barriers.

Assessing perceptions of care remains challenging due to their multidimensional and context-dependent nature. While large-scale surveys, such as the Service Provision Assessments conducted under the DHS Program, include some measures of client perspectives, they tend to capture fragmented aspects of care, focusing on satisfaction or access barriers(19). Domains such as perceived quality, opportunities for improvement, and underlying beliefs and values are more commonly explored through qualitative approaches, which limit comparability across settings. Our findings demonstrate that these dimensions can be meaningfully captured through a structured quantitative tool. The acceptable sampling adequacy and moderate to good internal consistency support the robustness of the identified constructs and the overall construct validity of the instrument. Similar tools to our questionnaire can be used as a complementary approach to existing surveys, enabling a more comprehensive and standardized assessment of women's perceptions of ANC, and by providing actionable insights to better align service delivery with women's needs and expectations.

Almost all women in our study reported that were satisfied with the received ANC (95%), which is in line with recent studies in Tanzania, Ethiopia, Nigeria and Zambia and reported in an older literature review (3, 5, 8, 28, 29). Among all the factors studied, we found that parity and time spent during ANC were positively associated with ANC satisfaction, as assessed by a composite score. The positive association with longer time spent at ANC likely reflects women's perceptions of greater attention to health needs. However, longer time spent at ANC was also related to a lower likelihood of receiving adequate ANC, suggesting that longer consultations do not necessarily indicate higher-quality care, even if they enhance perceived attentiveness and satisfaction with care. Time related barriers can operate through inefficient time spent in long waiting periods, which increases perceived burden of attending ANC due to the household opportunity cost, as well as insufficient care time via short consultations which can hinder meaningful interactions and decrease satisfaction with care (29, 30). Taken together, our results suggest that longer consultations may enhance satisfaction without necessarily improving care adequacy, which provides a distinction between perceived and technical quality of care. Regarding parity, our findings suggest that multiparous women with previous ANC experience may have more realistic expectations of the services provided and may therefore perceive the care received more positively than women attending ANC for the first time. This is in contrast with Bergh et al, in a large multi-country study, who reported higher satisfaction among nulliparous women and lower satisfaction among those with previous ANC experience(31), while such literature inconsistencies have been previously reported(29).

Perceived barriers to ANC attendance were associated with both health system related and individual or household factors. Regarding health system factors, receiving care from a preferred provider was associated with lower perceived barriers, while receiving adequate ANC quality and longer travel time to the health facility were associated with higher perceived barriers, in line with previous evidence (5, 7, 29, 31). In our study, extended travel time was more frequently reported among women with lower socioeconomic status and those relying on non-motorized transport, which reflects the intersection between poverty and physical access. Receiving adequate ANC quality was associated with higher perceived barriers, possibly because these women attended more visits and spent more time in the health system, increasing opportunity costs. This is supported by our findings that women attending four or more ANC visits were more likely to receive adequate ANC care. Regarding individual characteristics, household-level opportunity costs, assessed as missing work or household responsibilities, and the need to be accompanied to ANC visits were also associated with higher perceived barriers, which highlights the role of competing demands and social constraints at the household level. In addition, households of higher wealth index and where the financial responsibility for ANC was shared or assumed by others, reported fewer barriers. While male involvement in ANC is often promoted as a strategy to improve service uptake, our findings suggest that, in some contexts, it may increase the overall time burden and contribute to perceived barriers. Cost, access, and socioeconomic status have been directly linked to satisfaction and utilization of ANC, while our findings contribute to this evidence by describing the influence of intra-household financial dynamics and explicitly assessing opportunity cost(9, 29). Increasing the capacity to cover transportation and direct and indirect healthcare costs, as well as

through partner or household financial support can alleviate structural barriers to care and also signal broader household valuation of ANC, thereby encouraging utilization(32–34).

Importantly, women's own prioritization of strategies to improve ANC closely reflects these identified constraints. Our study participants emphasized the need to increase health workforce capacity, improve facility resources, and strengthen respectful and private care, alongside community-based solutions such as savings groups. These priorities align with both the structural and experiential barriers identified in our analysis, which are also consistently reported in the literature and provide actionable and context-relevant solutions(29, 35, 36). Strengthening health system capacity while addressing financial and social constraints at the household level may therefore be critical for improving both the uptake and experience of ANC.

Strengths and limitations

The questionnaire for the survey was developed using established principles of survey design, with careful consideration of question wording, response options, format, and length. Our questionnaire has good construct validity and is available for use by other researchers conducting studies in similar settings. We recruited parous women 1 to 3 months after delivery, to capture the entire ANC experience of the most recent pregnancy while minimizing recall bias. The questionnaire was administered by trained research assistants, and in a setting that was familiar to the participants.

Prior research suggests that reported client satisfaction may reflect low expectations, social desirability, or culturally influenced response patterns rather than true assessments of care. In our study, the high proportion of uniformly positive responses particularly suggests possible acquiescence bias, which may have led to an overestimation of perceived satisfaction and quality. Our choice of recruitment after birth, rather than during ANC as commonly applied in the literature, was intended to reduce this bias, as the women do not feel the pressure to report positively on the ANC they received, given the later recruitment. However, postnatal recruitment may also increase the risk of recall bias regarding details of ANC experiences. ANC quality was assessed using self-reported data collected at a single point in time, which may not fully capture women's experiences across the full continuum of antenatal care. Longitudinal data reflecting care received throughout the entire ANC period would provide a more comprehensive assessment of quality and change over time.

Conclusions

Women's perspectives remain underrepresented in routine health system monitoring and planning. Our study demonstrates the value of using comprehensive, quantitative tools to capture these multidimensional perceptions. Integrating such approaches into health system design and evaluation may support more responsive, equitable, and woman-centered ANC services.

Our findings add to the current evidence and reinforce the multidimensional nature of ANC perceptions, which are shaped by interconnected health system, household, and experiential factors. Across

constructs, health workforce capacity, facility resources, and experience of care are important determinants of satisfaction and perceived barriers. context-specific and actionable insights for improving services pointed towards the need to strengthen staffing, resources, and respectful care, alongside community-based financial support mechanisms.

Declarations

Consent for publication: Not applicable.

Availability of data and materials: The datasets generated or analyzed during the current study are not publicly available due to ethical and confidentiality restrictions related to the informed consent provided by participants.

Competing interests: The authors declare that they have no competing interests.

Funding: This study was conducted as part of a research project funded by the Research Council of Norway (Evidence-based policies and health systems interventions for antenatal care, grant agreement number: 315902). One author was funded by the Arnold S. Penner and Madaleine Berly International Health Fellowship from Albert Einstein College of Medicine.

Authors' contributions: K.B., M.V., and E.P. wrote the main manuscript text. R.S.T. and E.P. performed the formal analysis. K.B., M.A., F.N, and V.N. conducted the investigation and managed project administration activities. K.B., M.V., M.A., J.F.F., V.N. and E.P. developed the methodology. J.F.F. and V.N. acquired funding for the study. M.V., V.N., and E.P. provided supervision. All authors reviewed and edited the manuscript.

Acknowledgements: We sincerely thank all the study participants for their time, insights, and valuable contributions to this research. We also acknowledge the research assistants and data collectors supporting this work. This study was conducted as part of a research project funded by the Research Council of Norway (Evidence-based policies and health systems interventions for antenatal care, grant agreement number: 315902).

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Tables

Table 1 to 6 are available in the Supplementary Files section.

Figures

Figure 1. Proportion of women reporting highest-level responses across ANC perception constructs.

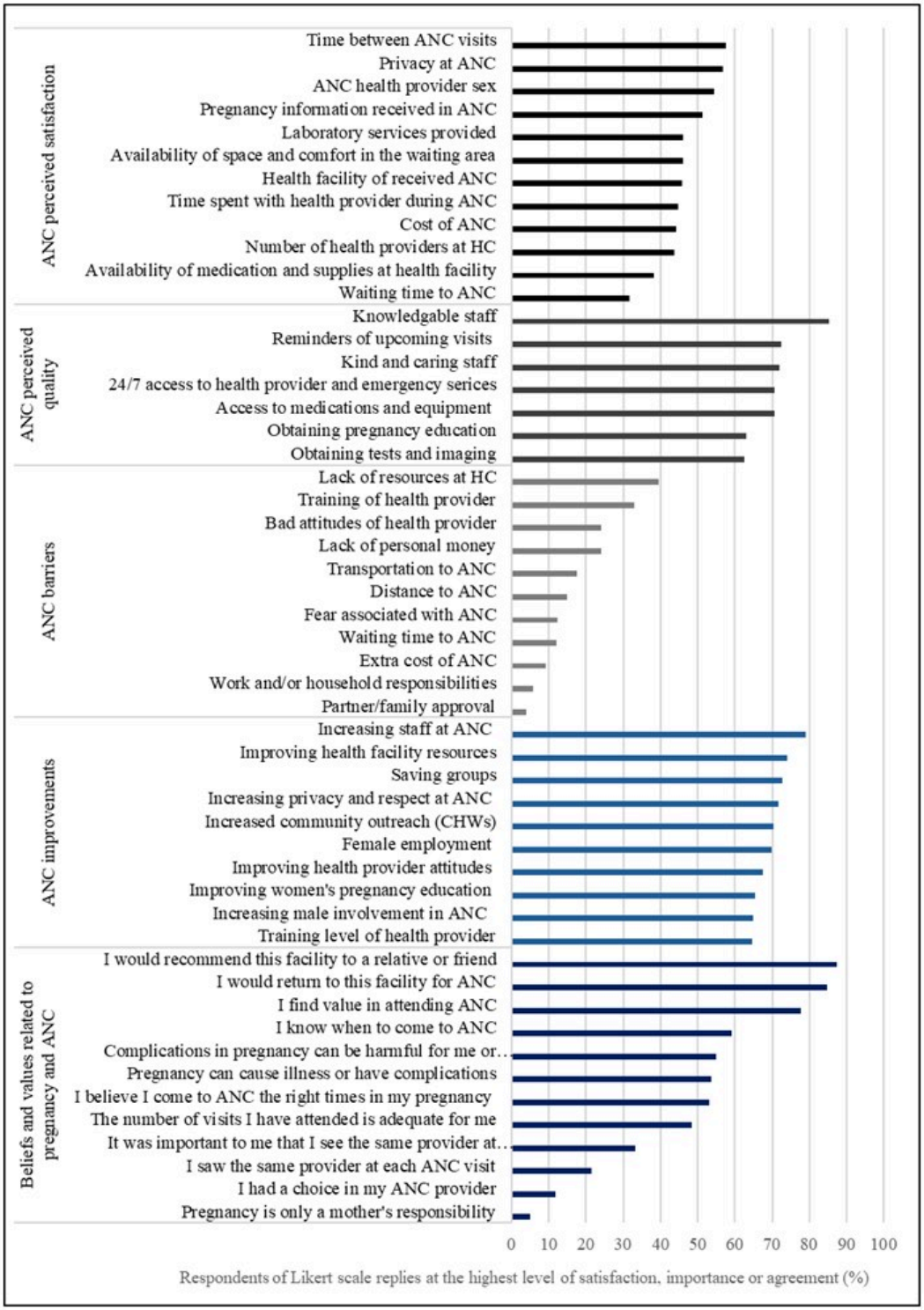


Figure 1

See image above for figure legend

Supplementary Files

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- Table1.docx
- Table2.docx
- Table3.docx
- Table4.docx
- Table5.docx
- Table6.docx
- Supplementalmaterial.docx
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