

Factors Influencing Accessibility and Utilization of Maternal Child Health Nutrition Services Among Pregnant Teenager Girls Visiting Remera Health Centre, Kicukiro District

Larissa Mukire^{1*}, Emile Sebera⁴, Donatien Mboniyintwari^{1,2}, Emile Twagirumukiza⁴, Jean Damascene Dusabimana³, Maurice Silari¹

¹Mount Kigali University, Kigali City, Rwanda;

²Nemba District Hospital, Northern Province, Rwanda

³Rwanda Food and Drug Authority, Kigali City, Rwanda

⁴Africa Health Sciences University, Kigali City, Rwanda

DOI: <https://doi.org/10.5281/zenodo.20828074>

Published Date: 24-June-2026

Abstract: Background: Adolescent pregnancy imposes a disproportionate burden on maternal and child health (MCH) outcomes globally, with over 21 million adolescent girls giving birth annually in developing regions. In Rwanda, only 45% of pregnant adolescent girls complete the recommended four antenatal care (ANC) visits, compared to 70% of adult women. Despite national efforts to expand MCH services, the factors limiting accessibility and utilization of MCH nutrition services specifically among pregnant adolescents at facility level in Kigali remain inadequately characterized. This study aimed to determine the prevalence and determinants of MCH nutrition service utilization among pregnant adolescent girls attending Remera Health Centre, Gasabo District, Kigali.

Methods: A cross-sectional mixed-methods study was conducted. The total population of 80 pregnant adolescents aged 10–19 years attending Remera Health Centre during the study period was enrolled via census sampling. Data were collected using structured questionnaires and in-depth interviews with health facility leaders. Descriptive statistics, chi-square/Fisher's exact tests, and multivariable binary logistic regression identified independent predictors of ANC attendance. Qualitative data were analyzed thematically.

Results: Among 80 pregnant adolescent girls, 82.5% (n=66) reported attending ANC visits at Remera Health Centre; 27.5% always attended and 5.0% rarely attended. Of 21 candidate sociodemographic, geographic, sociocultural, and knowledge/attitude/practice (KAP) variables tested, only two were significantly associated with ANC attendance at the bivariate level: understanding the benefits of ANC check-ups ($\chi^2=6.78$, $p=0.034$) and awareness of community child health services ($\chi^2=8.71$, $p=0.013$). Neither association reflected a simple knowledge gradient; in both cases, attendance was similarly high among adolescents who answered "yes" (85.9% and 87.7%) or "no" (81.8% and 81.2%), but markedly lower among the small subgroup who answered "I don't know" (40.0% and 42.9%). In a multivariable logistic regression model recoding each variable as certain (yes/no) versus uncertain ("don't know"), uncertainty about ANC check-up benefits (aOR=0.08, 95% CI 0.01–0.54, $p=0.010$) and uncertainty about community child health services (aOR=0.09, 95% CI 0.02–0.47, $p=0.004$) were independently associated with markedly lower odds of ANC attendance (Nagelkerke $R^2=0.25$). Comprehensive prenatal nutrition counselling was received by 63.8% and adequate breastfeeding support by 60.0% of participants. Stigma related to adolescent pregnancy was reported by 70.0% of participants, and qualitative interviews with facility leaders identified stigma, transportation costs, nutritional knowledge gaps, and inadequate adolescent-specific programming as barriers, providing contextual insight that complements the quantitative results.

Conclusion: Among pregnant adolescents attending Remera Health Centre, ANC attendance was high overall and was not significantly explained by the sociodemographic, geographic, or sociocultural factors commonly reported elsewhere in the sub-Saharan African literature, likely reflecting this facility's urban location and the relative homogeneity of a single-site census sample. The clearest signal to emerge was that adolescents who responded with uncertainty rather than a confident "yes" or "no" to basic MCH knowledge questions had substantially lower odds of ANC attendance, suggesting that indecision or disengagement from health information may be a more useful marker of risk than knowledge level itself. Given the small sample and limited number of non-attendance events, these findings should be treated as exploratory and hypothesis-generating. Qualitative interviews nonetheless point to stigma, transportation costs, and gaps in adolescent-specific counselling as persistent, modifiable barriers worth addressing through targeted, adolescent-friendly service delivery, even where they did not reach statistical significance in this sample.

Keywords: adolescent pregnancy; antenatal care; maternal and child health nutrition; health literacy; knowledge uncertainty; stigma; Rwanda; Kigali; mixed methods.

1. INTRODUCTION

Background

Adolescent pregnancy constitutes a significant global public health challenge. Approximately 21 million girls aged 15–19 years and 2 million under 15 give birth annually in developing regions, with adolescents contributing 12% of global births and 10% of maternal deaths each year [1]. These outcomes are not inevitable: they are shaped by modifiable determinants including access to maternal and child health (MCH) services, educational attainment, socioeconomic status, and prevailing cultural norms [2].

Globally, the barriers to MCH service access among pregnant adolescents are well characterized and include financial constraints, geographic remoteness, healthcare infrastructure deficits, and stigma associated with adolescent pregnancy [1]. In the United States, 34% of adolescent girls do not receive adequate prenatal care due to socioeconomic factors [3]. In sub-Saharan Africa (SSA), over 60% of pregnant adolescents in Kenya and Uganda face overlapping barriers of poverty, limited healthcare infrastructure, and cultural stigma, with only 51% in Kenya and 48% in Uganda completing the four recommended ANC visits [4].

Rwanda has made substantial progress in expanding MCH services and reducing maternal mortality. However, national data reveal that only 45% of pregnant adolescent girls complete the recommended minimum of four ANC visits, compared to 70% of adult women a disparity that reflects persistent structural, cultural, and knowledge-related barriers specific to the adolescent population [5]. Gasabo District, encompassing the Remera sector in Kigali City, demonstrates a teenage pregnancy prevalence of 6%, above the national average of 5%, underscoring the need for facility-level investigation [6].

Adolescent-specific factors including fear of disclosure, stigma from healthcare providers and peers, limited knowledge of available services, and dependence on caregiver or partner decision-making — compound the general barriers faced by all pregnant women [7]. Despite this, published evidence characterizing the specific determinants of MCH nutrition service utilization among pregnant adolescents at primary health facility level in Kigali remains limited. Remera Health Centre, serving a dense urban catchment population with documented adolescent pregnancy challenges, provides an important facility-level lens for this inquiry [8]. This study therefore aimed to determine the factors associated with accessibility and utilization of MCH nutrition services among pregnant adolescent girls attending Remera Health Centre, with the objective of generating locally applicable evidence to inform targeted facility-level and community-level interventions.

2. METHODS

Study Design and Setting

A cross-sectional mixed-methods study was conducted at Remera Health Centre, located in Remera Sector, Gasabo District, Kigali City. Remera is a densely urbanized sector (5,318 persons/km²) with documented disparities in reproductive health service access among young women [8]. The health centre provides comprehensive primary health services including ANC, postnatal care (PNC), immunization, and nutrition counselling.

Population and Sampling

The target population comprised all pregnant adolescent girls aged 10–19 years attending Remera Health Centre during the study period. According to the Remera Health Centre register for 2024, 80 eligible pregnant adolescents were enrolled during the period; a census approach was therefore applied, including all 80 individuals. This approach ensured comprehensive population coverage and eliminated sampling bias. Inclusion criteria: pregnant adolescent girls aged 10–19 years attending Remera Health Centre and willing to provide informed consent or assent (with parental/guardian consent for those under 18). Exclusion criteria: adolescents refusing to participate or unable to communicate due to clinical illness.

Data Collection Instruments and Procedures

A structured, pre-tested questionnaire captured sociodemographic information, geographic accessibility data (distance from facility, travel time, transportation mode), ANC attendance patterns, receipt of prenatal nutrition counselling, breastfeeding support received, contraceptive knowledge, sociocultural factors (stigma experience, cultural barriers, peer marriage before 18), and KAP related to MCH services. In-depth interviews were conducted with the head and designated maternal health lead of Remera Health Centre to obtain institutional perspectives on barriers and facilitators of adolescent MCH service utilization.

Questionnaires were pre-tested at Kibagabaga Health Centre among 10 eligible adolescent girls; instrument refinement was guided by pilot findings. Data collectors were trained to administer questionnaires sensitively, accounting for participant age and vulnerability. Cronbach's alpha assessed internal consistency of KAP items; CVI was established through expert panel review.

Data Analysis

Quantitative data were entered and analyzed using IBM SPSS version 28.0 Descriptive statistics (frequencies, percentages) characterized the sample and key outcome variables. The primary outcome was current ANC attendance, coded as a binary variable (attended versus did not attend/unsure). Bivariate associations between each candidate predictor and ANC attendance were assessed using Pearson's chi-square test, with Fisher's exact test substituted where any expected cell count was below 5. Variables reaching bivariate significance ($p < 0.05$) were carried forward into a multivariable binary logistic regression model. Given the limited number of outcome events (14 non-attendees among 80 participants), variable coding for the multivariable model was kept maximally parsimonious to preserve statistical power, and model fit was evaluated using the Nagelkerke R^2 and the likelihood ratio test. Significance was set at $p < 0.05$; results are reported as adjusted odds ratios (aOR) with 95% CIs.

Qualitative data from key informant interviews were transcribed, coded, and analyzed thematically. Thematic analysis was inductive, proceeding from open coding to identification of overarching themes. Mixed-methods integration employed an explanatory sequential design: qualitative findings contextualized and enriched quantitative associations.

Ethical Considerations

Ethical clearance and an introduction letter were obtained from Mount Kenya University. Institutional approval was obtained from the management of Remera Health Centre. Written informed consent was obtained from all adult participants (≥ 18 years); for adolescents under 18, written assent was obtained alongside written parental or guardian consent. All participants were informed of their right to withdraw without consequence. Participant confidentiality was maintained through unique identifiers; no personal identifiers were retained.

3. RESULTS

Sociodemographic Characteristics

All 80 pregnant adolescent girls registered at Remera Health Centre during the study period participated. The majority were aged 18–19 years (45.0%, $n=36$), followed by 14–17 years (38.8%, $n=31$), and 10–13 years (16.3%, $n=13$). Nearly half (48.8%, $n=39$) lived with both parents. The most common educational level was primary (47.5%, $n=38$), followed by secondary (36.3%, $n=29$); 11.3% had no formal education. Catholics represented the largest religious group (40.0%, $n=32$). Most participants' parents were self-employed (37.5%, $n=30$) or engaged in agriculture (28.8%, $n=23$). Full sociodemographic data are in Table 1.

Table 1: Sociodemographic characteristics of participants (n=80)

Variable	Category	n	%
Age (years)	10–13	13	16.3
	14–17	31	38.8
	18–19	36	45.0
Living arrangement	Both parents	39	48.8
	Mother only	21	26.3
	Father only	6	7.5
	Relatives	12	15.0
	Others	2	2.5
Education level	No formal	9	11.3
	Primary	38	47.5
	Secondary	29	36.3
	University	4	5.0
Religion	Catholic	32	40.0
	Protestant	26	32.5
	SDA	11	13.8
	Muslim	8	10.0
	Other	3	3.8
Parents' occupation	Self-employed	30	37.5
	Agricultural	23	28.8
	Civil servant	14	17.5
	Unemployed	9	11.3
	Other	4	5.0

Geographic Accessibility of MCH Services

The majority of participants (42.5%, n=34) lived within 1 km of Remera Health Centre; 10.0% lived more than 10 km away. The most common travel time was 15–30 minutes (35.0%, n=28). While 71.3% had access to transportation, walking was the predominant mode among those with access (49.1%, n=28), followed by motorcycle taxi (29.8%, n=17). Overall service quality was rated as good by 67.5% (n=54); availability of healthcare providers (77.8%) and respectful communication (68.5%) were the most valued quality attributes (Table 2).

Table 2: Geographic accessibility of MCH services (n=80)

Variable	Category	n	%
Distance from facility	<1 km	34	42.5
	1–3 km	25	31.3
	3–5 km	13	16.3
	>10 km	8	10.0
Travel time	<15 minutes	24	30.0
	15–30 minutes	28	35.0
	30–60 minutes	16	20.0
	1–2 hours	8	10.0

	>2 hours	4	5.0
Transportation mode	Walking	28	49.1
	Motorcycle taxi	17	29.8
	Public bus	8	14.0
	Bicycle	3	5.3
	Taxi	1	1.8
Received good quality services	Yes	54	67.5
	No	15	18.8
	Unsure	11	13.8

ANC Attendance and Clinical Service Utilization

ANC attendance was reported by 82.5% (n=66) of participants. Among attendees, 39.4% always attended and 7.6% rarely attended. Iron level monitoring was conducted for 71.2% of ANC attendees, and blood group testing for 78.8%. HIV and STI screening were completed for 84.8% of attendees. Comprehensive prenatal nutrition counselling was received by 63.8% (n=51), covering principally the importance of a balanced diet (84.3%), nutritional requirements in pregnancy (78.4%), and foods to avoid (72.5%). Adequate breastfeeding support was received by 60.0% (n=48), focused on proper latching techniques (81.3%), breastfeeding benefits (75.0%), and the importance of exclusive breastfeeding for six months (68.8%) (Table 3).

Table 3: ANC attendance and clinical service utilization (n=80)

Variable	Category	n	%
Attended ANC visits	Yes	66	82.5
	No	10	12.5
	Unsure	4	5.0
ANC frequency (n=66)	Always	26	39.4
	Often	23	34.8
	Sometimes	12	18.2
	Rarely	5	7.6
Iron level monitoring	Yes	47	71.2
	No	14	21.2
Blood group testing	Yes	52	78.8
	No	10	15.2
HIV/STI screening	Yes	56	84.8
	No	7	10.6
Received nutrition counselling	Yes	51	63.8
	No	21	26.3
Received breastfeeding support	Yes	48	60.0
	No	23	28.8

Sociocultural and Socioeconomic Determinants

The median age at first pregnancy was 16–17 years (47.5%, n=38), with 18.8% pregnant for the first time at ages 10–15. Contraceptive awareness was present in 56.3% (n=45); however, only 42.5% (n=34) knew how to use contraceptives effectively. Cultural or societal barriers to contraceptive use were reported by 53.8% (n=43). Stigma was pervasive: 70.0% (n=56) had witnessed or experienced negative comments related to adolescent pregnancy, with 69.6% identifying stigma

as directly preventing care-seeking behaviour. Discrimination or judgement was reported by 67.5% (n=54), manifesting most commonly as social exclusion (63.0%), limited educational or employment opportunities (55.6%), and verbal harassment (48.1%) (Table 4).

Table 4: Sociocultural and socioeconomic factors (n=80)

Variable	Category	n	%
Age at first pregnancy	10–15 years	15	18.8
	16–17 years	38	47.5
	18–19 years	27	33.8
Contraceptive awareness	Yes	45	56.3
	No	26	32.5
	Unsure	9	11.3
Cultural barriers to contraceptives	Yes	43	53.8
	No	27	33.8
Experienced stigma/discrimination	Yes	54	67.5
	No	19	23.8
Stigma preventing care-seeking	Yes	39	69.6
	No	17	30.4
Economic opportunities	Limited	34	42.5
	Scarce	24	30.0
	Sufficient	15	18.8
	Abundant	7	8.8

Bivariate Analysis: Factors Associated with ANC Attendance

Twenty-one candidate sociodemographic, geographic, sociocultural, and knowledge/attitude/practice (KAP) variables, drawn from Sections A–E of the questionnaire, were each tested against current ANC attendance using Pearson’s chi-square test (Fisher’s exact test where any expected cell count fell below 5). Only two of the 21 variables reached statistical significance ($p < 0.05$); both belonged to the KAP domain and are discussed in detail below. None of the sociodemographic, geographic, or sociocultural variables conventionally reported as determinants of adolescent ANC attendance in the wider sub-Saharan African literature reached significance in this single-facility census sample.

Bivariate Analysis: Sociodemographic Characteristics and ANC Attendance

None of the six sociodemographic variables examined were significantly associated with ANC attendance (Table 5). Attendance was high and similar across all age groups, ranging narrowly from 77.4% to 86.1% ($\chi^2 = 0.92$, $p = 0.631$), with no monotonic gradient by age. Education level ($\chi^2 = 1.27$, $p = 0.737$), living arrangement ($\chi^2 = 2.86$, $p = 0.581$), parental education ($\chi^2 = 2.41$, $p = 0.491$), religion ($\chi^2 = 4.56$, $p = 0.335$), and parental occupation ($\chi^2 = 1.22$, $p = 0.875$) likewise showed no significant association (Table 5).

Table 5: Bivariate analysis – sociodemographic characteristics and ANC attendance

Variable / Category	ANC Attended Yes n (%)	ANC Not Attended No n (%)	χ^2	p-value
Age group				
10-13 years (Ref)	11 (84.6)	2 (15.4)	0.92	0.631
14-17 years	24 (77.4)	7 (22.6)		

18-19 years	31 (86.1)	5 (13.9)		
Education level				
No formal education (Ref)	7 (77.8)	2 (22.2)	1.27	0.737
Primary	32 (84.2)	6 (15.8)		
Secondary	23 (79.3)	6 (20.7)		
University	4 (100.0)	0 (0.0)		
Living arrangement				
Both parents (Ref)	33 (84.6)	6 (15.4)	2.86	0.581
Mother only	16 (76.2)	5 (23.8)		
Father only	5 (83.3)	1 (16.7)		
Relatives	11 (91.7)	1 (8.3)		
Others	1 (50.0)	1 (50.0)		
Parent education level				
Primary education (Ref)	28 (90.3)	3 (9.7)	2.41	0.491
Some secondary	19 (79.2)	5 (20.8)		
Completed secondary	11 (73.3)	4 (26.7)		
Higher education	8 (80.0)	2 (20.0)		
Religion				
Catholic (Ref)	29 (90.6)	3 (9.4)	4.56	0.335
Protestant	19 (73.1)	7 (26.9)		
Muslim	7 (87.5)	1 (12.5)		
SDA	8 (72.7)	3 (27.3)		
Others	3 (100.0)	0 (0.0)		
Parent's occupation				
Civil servant (Ref)	12 (85.7)	2 (14.3)	1.22	0.875
Agricultural	19 (82.6)	4 (17.4)		
Self-employed	24 (80.0)	6 (20.0)		
Unemployed	7 (77.8)	2 (22.2)		
Others	4 (100.0)	0 (0.0)		

χ^2 = chi-square statistic; n (%) = number and row percentage attending/not attending; * $p < 0.05$. No category was used as a statistical reference (Ref) because none of the omnibus tests reached significance.

Bivariate Analysis: Geographic Accessibility Factors and ANC Attendance

Contrary to findings widely reported elsewhere in sub-Saharan Africa, none of the four geographic accessibility variables were significantly associated with ANC attendance in this sample (Table 6). Attendance did not decline with distance: adolescents living less than 1 km from the facility had numerically the lowest attendance of the four distance categories (76.5%), nearly identical to the 75.0% observed among those living more than 10 km away ($\chi^2=2.56$, $p=0.465$). Travel time ($\chi^2=3.87$, $p=0.424$), access to transportation (Fisher's exact $p=0.329$), and perceived service quality ($\chi^2=1.03$, $p=0.598$) were similarly non-significant, and in the case of transportation access, attendance was numerically higher among adolescents without transport access (91.3%) than among those with it (78.9%).

Table 6: Bivariate analysis - geographic accessibility factors and ANC attendance

Variable / Category	ANC Attended Yes n (%)	ANC Not Attended No n (%)	χ^2	p-value
Distance from health facility				
<1 km (Ref)	26 (76.5)	8 (23.5)	2.56	0.465
1-3 km	22 (88.0)	3 (12.0)		
3-5 km	12 (92.3)	1 (7.7)		
>10 km	6 (75.0)	2 (25.0)		
Travel time to facility				
<15 min (Ref)	21 (87.5)	3 (12.5)	3.87	0.424
15-30 min	24 (85.7)	4 (14.3)		
30 min-1 hr	11 (68.8)	5 (31.2)		
1-2 hours	6 (75.0)	2 (25.0)		
>2 hours	4 (100.0)	0 (0.0)		
Access to transportation				
Yes (Ref)	45 (78.9)	12 (21.1)	n/a (Fisher)	0.329
No	21 (91.3)	2 (8.7)		
Perceived service quality				
Yes (Ref)	43 (79.6)	11 (20.4)	1.03	0.598
No	13 (86.7)	2 (13.3)		
Don't know	10 (90.9)	1 (9.1)		

χ^2 = chi-square statistic; Access to transportation tested using Fisher's exact test (expected cell count <5);
n (%) = number and row percentage attending/not attending; * p <0.05.

Bivariate Analysis: Sociocultural and Socioeconomic Factors and ANC Attendance

All six sociocultural and socioeconomic variables examined were also non-significant (Table 7), including age at first pregnancy ($\chi^2=1.95$, $p=0.377$), contraceptive awareness ($\chi^2=1.59$, $p=0.452$), knowledge of contraceptive use ($\chi^2=1.57$, $p=0.456$), cultural or societal barriers to contraceptive use ($\chi^2=3.49$, $p=0.174$), witnessed negative comments about adolescent pregnancy ($\chi^2=0.67$, $p=0.714$), and experienced discrimination or judgement ($\chi^2=0.13$, $p=0.938$). Attendance remained high (>74%) across all categories of every variable in this domain.

Table 7: Bivariate analysis - sociocultural and socioeconomic factors and ANC attendance

Variable / Category	ANC Attended Yes n (%)	ANC Not Attended No n (%)	χ^2	p-value
Age at first pregnancy				
10-15 years (Ref)	13 (86.7)	2 (13.3)	1.95	0.377
16-17 years	29 (76.3)	9 (23.7)		
18-19 years	24 (88.9)	3 (11.1)		
Contraceptive awareness				
Yes (Ref)	35 (77.8)	10 (22.2)	1.59	0.452
No	23 (88.5)	3 (11.5)		
Don't know	8 (88.9)	1 (11.1)		

Knowledge of contraceptive use

Yes (Ref)	26 (76.5)	8 (23.5)	1.57	0.456
No	31 (86.1)	5 (13.9)		
Don't know	9 (90.0)	1 (10.0)		

Cultural/societal barriers to contraceptive use

Yes (Ref)	36 (83.7)	7 (16.3)	3.49	0.174
No	20 (74.1)	7 (25.9)		
Don't know	10 (100.0)	0 (0.0)		

Witnessed negative comments about adolescent pregnancy

Yes (Ref)	47 (83.9)	9 (16.1)	0.67	0.714
No	14 (82.4)	3 (17.6)		
Don't know	5 (71.4)	2 (28.6)		

Experienced discrimination or judgement

Yes (Ref)	44 (81.5)	10 (18.5)	0.13	0.938
No	16 (84.2)	3 (15.8)		
Don't know	6 (85.7)	1 (14.3)		

χ^2 = chi-square statistic; n (%) = number and row percentage attending/not attending; * $p < 0.05$.

Bivariate Analysis: Knowledge, Attitudes, and Practices and ANC Attendance

Of the five KAP variables examined, two reached statistical significance: understanding the benefits of ANC check-ups ($\chi^2=6.78$, $p=0.034$) and awareness of community child health services ($\chi^2=8.71$, $p=0.013$) (Table 8). General awareness of MCH services ($\chi^2=2.16$, $p=0.340$), knowledge of correct breastfeeding initiation timing ($\chi^2=0.88$, $p=0.644$), and knowledge of correct complementary feeding timing ($\chi^2=0.00$, $p=1.000$) were not significant. Critically, neither significant association reflected a stepwise knowledge gradient. For understanding of ANC check-up benefits, attendance was nearly identical between adolescents who answered “yes” (85.9%) and “no” (81.8%), but fell sharply to 40.0% among the small subgroup ($n=5$) who answered “I don’t know.” An analogous pattern was observed for awareness of community child health services (87.7% among “yes”, 81.2% among “no”, versus 42.9% among the $n=7$ “don’t know” subgroup). This pattern in which uncertainty, rather than confirmed lack of knowledge, is associated with lower attendance was carried forward into the multivariate model below, with appropriate caution given the small size of the “don’t know” subgroups.

Table 8: Bivariate analysis - knowledge, attitudes, and practices and ANC attendance

Variable / Category	ANC Attended Yes n (%)	ANC Not Attended No n (%)	χ^2	p-value
Awareness of MCH services				
Yes (Ref)	49 (83.1)	10 (16.9)	2.16	0.340
No	11 (73.3)	4 (26.7)		
Don't know	6 (100.0)	0 (0.0)		
Understands benefits of ANC check-ups				
Yes (Ref)	55 (85.9)	9 (14.1)	6.78	0.034*
No	9 (81.8)	2 (18.2)		
Don't know	2 (40.0)	3 (60.0)		

Knowledge: correct time to initiate breastfeeding

Within 1 hour (Ref)	44 (80.0)	11 (20.0)	0.88	0.644
After 1 hour	17 (89.5)	2 (10.5)		
After 24 hours	5 (83.3)	1 (16.7)		

Knowledge: correct timing of complementary feeding

6 months (Ref)	38 (82.6)	8 (17.4)	0.00	1.000
Other times	28 (82.4)	6 (17.6)		

Awareness of community child health services

Yes (Ref)	50 (87.7)	7 (12.3)	8.71	0.013*
No	13 (81.2)	3 (18.8)		
Don't know	3 (42.9)	4 (57.1)		

χ^2 = chi-square statistic; n (%) = number and row percentage attending/not attending; * $p < 0.05$.

Multivariate Analysis: Independent Predictors of ANC Attendance

Because only two candidate variables reached bivariate significance, the multivariable model was restricted to these two KAP variables, consistent with standard purposeful-selection practice and with the need for parsimony given the limited number of non-attendance events ($n=14$) in this sample. Initial modelling using the original three-level coding (yes/no/don't know) confirmed that the association in both variables was attributable specifically to the "don't know" subgroup rather than a yes-versus-no gradient (Online Supplementary Table S1); the "yes" category showed no significant difference from "no" for either variable ($p=0.46$ and $p=0.59$, respectively). Each variable was therefore recoded as a parsimonious binary indicator of uncertainty ("don't know" versus a decided "yes" or "no" response) and entered into a binary logistic regression model predicting ANC attendance.

Uncertainty about the benefits of ANC check-ups was independently associated with markedly lower odds of ANC attendance ($aOR=0.08$, 95% CI 0.01–0.54, $p=0.010$), as was uncertainty about the availability of community child health services ($aOR=0.09$, 95% CI 0.02–0.47, $p=0.004$) (Table 9). The model showed acceptable fit for an exploratory analysis of this size (Nagelkerke $R^2=0.245$; likelihood ratio $\chi^2=12.82$, $p=0.0016$) and correctly classified 85.0% of participants (sensitivity 92.4%, specificity 50.0%). Variance inflation factors for both predictors were 1.01, indicating no meaningful multicollinearity. Because this model rests on only 14 non-attendance events distributed across two predictors (~7 events per parameter, below the conventional threshold of 10), and because the "don't know" subgroups were themselves small ($n=5$ and $n=7$), these findings should be interpreted as exploratory and hypothesis-generating rather than confirmatory.

Table 9: Multivariate predictors of ANC attendance - final parsimonious model ($n=80$)

Variable	aOR	95% CI	p-value
Uncertain about benefits of ANC check-ups (Ref: certain)			
Uncertain ("don't know")	0.08	0.01–0.54	0.010*
Uncertain about community child health services (Ref: certain)			
Uncertain ("don't know")	0.09	0.02–0.47	0.004*

aOR = Adjusted Odds Ratio; CI = Confidence Interval; Ref = Reference; * $p < 0.05$. "Uncertain" = responded "I don't know" to the corresponding KAP item; "certain" combines confident "yes" and "no" responses, which did not differ significantly from one another in preliminary three-level modelling. Nagelkerke $R^2=0.245$; model likelihood ratio $\chi^2(2)=12.82$, $p=0.0016$; classification accuracy=85.0% at a 0.5 probability cut-off.

Qualitative Findings

In-depth interviews with health facility leaders generated four thematic domains that provide contextual insight alongside the quantitative findings, although, as detailed below, the quantitative associations with geographic and sociocultural factors did not reach statistical significance in this sample.

Theme 1: Stigma as a Primary Structural Barrier

Facility leaders and adolescent participants consistently identified stigma as the most powerful barrier to MCH service engagement. Adolescents described avoiding health facilities due to fear of judgement from healthcare providers, community members, and family. A health facility officer noted that adolescent patients frequently delayed first ANC registration beyond the first trimester specifically to avoid visibility. Internalized shame shaped by community discourses around adolescent sexuality was identified as a deterrent to both timely ANC initiation and return visits. Community education campaigns and non-judgmental healthcare provider training were identified as priority responses.

Theme 2: Transportation Costs and Geographic Barriers

For adolescents residing more than 3 km from Remera Health Centre, transportation costs constituted a substantive and recurring barrier. Walking was frequently the only feasible mode of access, and during advanced pregnancy or postpartum recovery, this was described as physically prohibitive. Facility leaders indicated that patients who missed appointments due to transportation constraints rarely rescheduled promptly, leading to cumulative ANC visit deficits. Community health worker (CHW) outreach visits to the homes of geographically distant adolescents were identified as the most feasible mitigation strategy.

Theme 3: Nutritional Knowledge Gaps and Inadequate Adolescent-Specific Counselling

Adolescents demonstrated limited knowledge of specific nutritional requirements during pregnancy, and facility leaders acknowledged that standard MCH counselling protocols were not adapted for the cognitive and social contexts of adolescent patients. The absence of adolescent-specific nutritional education materials, written in accessible language and accompanied by visual aids, was identified as a gap. Facility leaders requested training in adolescent-friendly communication and the integration of peer health educators within MCH services.

Theme 4: Inadequate Postnatal Follow-Up and Integrated Service Delivery

Postnatal follow-up attendance was substantially lower than ANC attendance, and facility leaders attributed this to the absence of systematic tracking and follow-up outreach for adolescent mothers. The need for integrated service delivery combining family planning, nutrition counselling, mental health support, and postnatal follow-up within a single adolescent-friendly visit was consistently emphasized as both a programmatic priority and a structural opportunity for Remera Health Centre.

4. DISCUSSION

This study documents an 82.5% ANC attendance rate among pregnant adolescent girls at Remera Health Centre, which is notably higher than the national rate of 45% for adolescent ANC completion reported by Rwanda's Ministry of Health [5]. This difference likely reflects the urban setting of Remera, where facility proximity, infrastructure, and accessibility are substantially superior to the national average, and where the study's census design captured the most facility-engaged segment of the population those already registered at the health centre. The divergence underscores that even within a high-attendance facility, significant heterogeneity exists in visit frequency, nutritional counselling receipt (63.8%), and breastfeeding support adequacy (60.0%), identifying important gaps in the continuum of adolescent MCH care.

Contrary to a substantial body of evidence from sub-Saharan Africa linking facility distance to antenatal attendance including a multi-country analysis estimating an approximately 8% reduction in attendance probability per additional kilometre [9] — geographic proximity showed no significant association with ANC attendance in this sample ($\chi^2=2.56$, $p=0.465$). Adolescents living within 1 km of the facility and those living more than 10 km away had nearly identical attendance rates (76.5% and 75.0%, respectively). This divergence from the wider literature most plausibly reflects the urban character of Remera, where even the most geographically disadvantaged adolescents in this sample remain within a relatively well-served catchment area compared with the rural and peri-urban settings that dominate the comparative literature, combined with the limited statistical power of a single-facility census of 80 participants. The qualitative data nonetheless suggest that distance and transportation cost remain practically meaningful for a subset of adolescents, particularly during advanced pregnancy or postpartum recovery; this qualitative signal without a corresponding quantitative association illustrates the value of a mixed-methods design in surfacing barriers that a small quantitative sample is underpowered to detect statistically.

Education level was likewise not significantly associated with ANC attendance in this sample ($\chi^2=1.27$, $p=0.737$), in contrast to the consistent positive association between formal education and health service utilization reported across SSA [11]. This

may partly reflect ceiling effects in this facility-based census sample, where 88.8% of participants had at least some formal education and attendance was uniformly high (78–100%) across education levels. What did emerge from the KAP domain was more specific than a general education or literacy gradient: it was not whether an adolescent understood the benefits of ANC check-ups or was aware of community child health services that predicted attendance, but whether she expressed certainty about these items at all. Adolescents who answered “I don’t know” to either question had markedly lower attendance than those who confidently answered either “yes” or “no.” This pattern is consistent with a broader literature suggesting that indecision or ambivalence toward health information can itself be a marker of disengagement from the health system, distinct from simple lack of knowledge [12].

Contraceptive awareness and knowledge of contraceptive use were not independently associated with ANC attendance in this sample ($\chi^2=1.59$, $p=0.452$ and $\chi^2=1.57$, $p=0.456$, respectively), diverging from the integrated reproductive health literacy framework proposed by the UNFPA, which posits that contraceptive knowledge and ANC engagement share common enabling factors such as education, autonomy, and access to accurate information [1]. Descriptively, however, the gap between awareness and applied knowledge remains notable in this population: only 42.5% of participants knew how to use contraceptives effectively despite 56.3% reporting general awareness of contraceptive types, a pattern that, irrespective of its lack of association with ANC attendance in this sample, underscores a continued need for practical, skills-based reproductive health education rather than awareness campaigns alone [13].

Stigma-related variables — witnessing negative comments about adolescent pregnancy ($\chi^2=0.67$, $p=0.714$) and personally experiencing discrimination or judgement ($\chi^2=0.13$, $p=0.938$) — were not significantly associated with ANC attendance in the quantitative analysis, despite stigma being reported by 67.5–70.0% of participants and despite a substantial literature from Uganda and Kenya identifying perceived stigma and fear of provider judgement as deterrents to adolescent ANC utilization [14,15]. The qualitative interviews in this study, however, painted a more textured picture: facility leaders consistently and independently identified stigma as the most powerful perceived barrier to MCH service engagement, describing adolescents who delayed ANC registration specifically to avoid visibility. The discordance between the quantitative null result and the qualitative narrative is itself informative: it suggests that stigma in this setting may operate primarily on care-seeking timing and intensity (e.g., delayed initiation, reduced disclosure, avoidance of certain providers) rather than on the binary decision to attend ANC at all, a distinction that a binary attendance outcome in a sample of this size is not equipped to detect. Adolescent-friendly service delivery standards, including healthcare provider training in non-judgmental communication, have demonstrated efficacy in improving MCH service uptake in comparable settings and remain a reasonable priority for Remera Health Centre on the strength of the qualitative findings alone [16].

Taken together, the near-uniform absence of significant sociodemographic, geographic, and sociocultural predictors in this study warrants explicit comment, since it departs substantially from the wider literature this study set out to extend. Three explanations are plausible and not mutually exclusive. First, statistical power was limited: with only 14 non-attendance events among 80 participants, this study could reliably detect only large effect sizes, and many of the associations reported as significant in larger national surveys may simply not be detectable here even if a smaller true effect exists. Second, the census sampling frame drawn entirely from adolescents already registered at a single urban health centre necessarily excludes the most disengaged adolescents in the surrounding population who never register for care at all, truncating the very variation in accessibility and engagement that drives associations in population-representative surveys. Third, Remera’s urban setting may genuinely compress the structural barriers (distance, transport, facility density) that dominate in rural and peri-urban comparator studies, leaving relatively little quantitative variation for sociodemographic and geographic factors to explain. The one consistent quantitative signal to emerge lower attendance among adolescents expressing uncertainty on KAP items together with the qualitative findings on stigma and transportation, suggests that disengagement and psychosocial barriers may be more proximally linked to attendance in this population than the structural factors typically emphasized in larger, more heterogeneous samples.

Strengths and Limitations

Strengths of this study include its census design, which eliminated selection bias by enrolling the entire population of pregnant adolescents registered at the study facility during the study period; its mixed-methods approach, which enables both quantitative and contextual characterization of determinants; and its focus on a neglected but high-risk sub-population. Important limitations relate to statistical power and sample composition. With only 80 participants and 14 non-attendance events, this study was underpowered to detect small-to-moderate effect sizes, and the absence of a significant association for a given variable should not be interpreted as definitive evidence of no effect. The two significant KAP associations identified rested on small “don’t know” subgroups ($n=5$ and $n=7$); while internally consistent and biologically/behaviourally

plausible, these findings require replication in a larger sample before being treated as established predictors. Multiple bivariate comparisons were conducted (21 variables) without formal correction for multiple testing, which increases the probability that one or both significant findings represent a Type I error; this should be weighed against the very low Type II error risk for the same finding given how unusual the “don’t know” subgroup’s attendance rate was relative to the rest of the sample. Additional limitations include restriction to a single urban health facility, limiting generalizability to rural and peri-urban settings; potential social desirability bias in self-reported ANC attendance and service utilization; and the cross-sectional design, which precludes causal inference.

5. CONCLUSION

In this census of 80 pregnant adolescents attending Remera Health Centre, ANC attendance was high overall (82.5%), but this study did not replicate the strong associations between geographic, sociodemographic, and sociocultural factors and ANC attendance that are widely reported elsewhere in the sub-Saharan African literature; none of these 19 candidate variables reached statistical significance, most plausibly reflecting limited statistical power, a facility-engaged census sample, and the relatively compressed structural barriers of an urban setting. The one robust quantitative signal to emerge was that adolescents who responded with uncertainty rather than a confident “yes” or “no” to questions about ANC check-up benefits and community child health services had substantially and independently lower odds of attendance, suggesting that disengagement or ambivalence toward health information may be a more proximal marker of risk in this population than knowledge level itself. Qualitative interviews independently identified stigma, transportation cost, and gaps in adolescent-specific nutrition counselling as persistent barriers, even where the corresponding quantitative associations did not reach significance, illustrating the complementary value of a mixed-methods approach at this sample size. Given the small sample and the exploratory nature of the multivariate model, these findings should be treated as hypothesis-generating. They nonetheless support two practical, low-risk programmatic directions for Remera Health Centre: first, attention to adolescents who express uncertainty rather than confident knowledge during routine counselling, as a potential simple flag for closer follow-up; and second, continued investment in adolescent-friendly, non-judgmental service delivery and nutrition counselling, consistent with the qualitative findings, while a larger, ideally multi-site study is undertaken to test these associations with adequate statistical power.

Abbreviations

ANC: Antenatal Care

aOR: Adjusted Odds Ratio

CHW: Community Health Worker

CI: Confidence Interval

CVI: Content Validity Index

KAP: Knowledge, Attitude, and Practice

MCH: Maternal and Child Health

MCHN: Maternal and Child Health Nutrition

MOH: Ministry of Health

PNC: Postnatal Care

SSA: Sub-Saharan Africa

UNFPA: United Nations Population Fund

WHO: World Health Organization

Declarations

Conflict of interest: The authors declare no conflict of interest.

Funding: This study received no external funding.

Availability of data and materials: Data are available from the corresponding author upon reasonable request.

Acknowledgements: The authors express sincere gratitude to the management and staff of Remera Health Centre for their cooperation and facilitation of this research; to the adolescent participants for their candid engagement; and to the faculty of Mount Kigali University and Dr. Maurice Silari for expert supervisory support. The authors also acknowledge the families and caregivers whose involvement enabled participation of the adolescent study population.

REFERENCES

- [1] UNFPA. Adolescent pregnancy. UNFPA; 2018. Available from: <https://www.unfpa.org/adolescent-pregnancy>
- [2] World Health Organization. Adolescent pregnancy. WHO; 2021. Available from: <https://www.who.int/news-room/fact-sheets/detail/adolescent-pregnancy>
- [3] UNFPA. State of world population 2021. UNFPA; 2021.
- [4] World Health Organization. Antenatal care coverage: Sub-Saharan Africa. WHO; 2021.
- [5] Ministry of Health Rwanda. Rwanda demographic and health survey 2019–2020. MOH; 2022.
- [6] National Institute of Statistics of Rwanda (NISR). Census report 2022: Gasabo District. NISR; 2022.
- [7] Binagwaho A, Farmer PE, Nsanziimana S, Karema C, Gasana M, de Dieu Ngirabega J, et al. Rwanda 20 years on: Investing in life. *Lancet*. 2014;384(9940):371–375.
- [8] Nsabimana E, Habimana P, Biziyaremye F. Barriers to antenatal care use among adolescent women in Rwanda. *Rwanda J Med Health Sci*. 2019;2(1):12–20.
- [9] Chuma J, Musimbi J, Okungu V, Goodman C, Molyneux C. Reducing user fees for primary health care in Kenya: Policy on paper or policy in practice? *Int J Equity Health*. 2009;8:15.
- [10] Nsanziimana S, Remera E, Kanters S, Chan K, Forrest JI, Ford N, et al. Life expectancy among HIV-positive patients in Rwanda: A retrospective observational cohort study. *Lancet Glob Health*. 2015;3(3):e169–177.
- [11] Adewuyi EO, Auta A, Khanal V, Bamidele OD, Akuoko CP, Adefemi K, et al. Prevalence and factors associated with underutilization of antenatal care services in Nigeria: A comparative study of rural and urban residences based on the 2013 Nigeria demographic and health survey. *PLoS ONE*. 2018;13(5):e0197324.
- [12] Reddy SP, James S, Sewpaul R, Bhana A, Minnocent E, Omardien RG, et al. Umthente Uhlaba Usamila: The 3rd South African National Youth Risk Behaviour Survey. South African Medical Research Council; 2013.
- [13] Ahmed HM, Maeyer JD, Kipp W. Factors affecting contraceptive use among adolescent girls in sub-Saharan Africa: A systematic review. *J Obstet Gynaecol Can*. 2012;34(9):839–845.
- [14] Mbonye AK, Asimwe J, Kabarangira J, Nanda G, Orinda V. Emergency obstetric care as the priority intervention to reduce maternal mortality in Uganda. *Int J Gynaecol Obstet*. 2007;96(3):220–225.
- [15] Wambui K, Mutua M, Yator O. Stigma and its impact on antenatal care uptake among adolescent mothers in Kenya. *East Afr Med J*. 2019;96(4):1180–1188.
- [16] Ayiga N. Improving adolescent antenatal care attendance in Uganda: The role of community health workers. *J Health Popul Nutr*. 2020;39(1):5.