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Dhondup Tso King April 29, 2020

Determinants of Delayed First Presentation for Antenatal Care at Four Selected Health Centers in Gasabo Districts, City of Kigali Province, Rwanda

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Abstract

Determinants of Delayed First Presentation to Antenatal Care at Four Selected Health Centers in Gasabo Districts, City of Kigali Province, Rwanda

By Dhondup Tso King

Objective: To identify the socio-demographic, cultural, and health system factors related to delayed attendance to antenatal care in Gasabo District, Rwanda.

Methods: A cross-sectional study women aged 18-49 who had given birth to a live child within 12 months prior to data collection, able to speak and understand Kinyarwanda, Rwanda national language, and have access to Antenatal Care Card from the last pregnancy. Data was collected using an interviewer-administered survey questionnaire. For the analysis, a bivariate and multivariate logistic regression were conducted, and odds ratios were presented with their 95% confidence intervals.

Results: Only 12% of the study participants presented to antenatal care within 12 weeks of gestation and of which about 68.6% (n=24) had timely initiation of the first ANC and met the previous WHO and Rwanda national health system recommended four visits during pregnancy. Among the study participants who initiated the first ANC after 12 weeks of gestation, a relatively higher proportion reported not having a partner/husband accompanying to ANC (38.5%) followed by not knowing one's pregnancy status (34.8%) and lack of health insurance or money for treatment (16.4%). In the final logistical regression model, women with less than 4 ANC visits were more likely to delay service initiation (AOR, 20.42; 95%CI: 7.73-53.90) than women with ≥4 visits. The birth order of the last child, transportation modes, and highest-level education completed were significant in the bivariate analysis, however, lost significance when combined with each other in the final model.

Conclusion: A majority of the study participants had a delayed first ANC, while only 12% presenting on-time. Among those with delayed first ANC, almost 90% had less than the four visits. Health campaign and outreach activities need to prioritize community awareness messages targeting partners as well as community at large on the importance of timely initiation of ANC services. In addition, health facilities should be more flexible in policy and practice around male partner involvement when a woman is not able to present one or clarify any miscommunication regarding acceptance of pregnant women without the escort of a partner.

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Determinants of Delayed First Presentation for Antenatal Care at Four Selected Health Centers in Gasabo District, City of Kigali Province, Rwanda

Introduction

While the global ratio of maternal deaths almost halved from 385 deaths per 100,000 livebirths to 216 in 2015, this rate of mortality still remains unacceptably high in low-income countries like those in sub-Saharan Africa (SSA) (Alkema et al., 2016; Okedo-Alex, Akamike, Ezeanosike, & Uneke, 2019). One of the Sustainable Development Goals (SDG) targets include a reduction in global maternal mortality to less than 70 deaths per 100,000 livebirths, with each individual countries working to not let maternal mortality ratio (MMR) to surpass 140 deaths per 100,000 livebirths by 2030 (Alkema et al., 2016). Thereby, with a vision of "a world where every pregnant woman and newborn receive quality care throughout the pregnancy, childbirth , and the postnatal period", the World Health Organization (WHO) with contributions from the Guideline Development Group (GDG), an international group of experts put forth and published comprehensive guidelines and recommendations on routine antenatal care for pregnant women and adolescent girls in 2016. Antenatal care is an essential maternal and child health indicator and when the first ANC visit is timely initiated, it presents a critical opportunity for health providers to screen, detect, diagnose, and manage or control any risk factors that might have adverse effect(s) on the mother and/or her baby early on in the pregnancy. It is therefore advocated as the cornerstone for reducing maternal and child deaths since the majority of preventable deaths during the course of a woman's pregnancy and childbirth have been attributed to poor or non-attendance of ANC services (Ngxongo, 2018).

Problem Statement: Even though 98% of Rwandan women sought antenatal care, only 38% of women received that care within the first three months of pregnancy while nearly half of

Rwandan mothers seek ANC after four months of pregnancy and do not meet the recommended number of ANC visits (Manzi et al., 2014; National Institute of Statistics of Rwanda (NISR), Ministry of Health (MOH) [Rwanda], & ICF International, 2015). Delayed initiation of ANC is associated with increased rates of maternal and infant mortality due to the inability to identify clinical and social risk factors early in pregnancies. Though the implementation of and adherence to these guidelines is a national priority in Rwanda, delayed attendance of ANC continues to be an issue and limited comprehensive research has been done to understand the various factors at play.

Purpose Statement: Hence, this exploratory study allows the investigation of the proportion of women having a timely initiation of the first ANC visit, and identification of any socio-demographic, healthcare utilization, and obstetrical factors that act as determinants of delaying. In addition, this study gives the opportunity to also examine the proportion of women in the study who had met the previous WHO and the current Rwanda national health system recommended four ANC visits. This is especially important as countries like Rwanda plan on to adopt the 2016 WHO guidelines that recommend eight ANC 'contacts' be made between a pregnant woman and her healthcare providers.

Research Aim and Objectives: Therefore, the aim of this study is to examine determinants of delayed first presentation to antenatal care (ANC) at four selected health centers in Gasabo District to identify the socio-demographic, cultural, and health system factors related to delayed attendance to antenatal care by:

- Evaluating sociodemographic, health utilization, and obstetrical factors related to delayed first presentation to antenatal care in Gasabo District, Rwanda

- Determining any association between pregnancy related characteristics with untimely initiation of ANC and meeting the recommended visits
- Investigate any differential risk in delayed or poor utilization of antenatal care services by health center location

Significance Statement: In 2016, the World Health Organization (WHO) published a new comprehensive antenatal care guideline recommending increasing the number of ANC visits from the current four that many countries are still struggling to meet to eight. As Rwanda starts to roll out the implementation of the new WHO ANC guidelines, research is imperative to explore and identify the complex, interconnected socio-demographic, cultural, and health systems factors related to delayed ANC initiation.

Literature Review

Antenatal care visits are critical for positive pregnancy outcomes and to reduce maternal and infant mortality. Improvements in maternal mortality rates have been prioritized globally through the previous Millennium Development Goals (MDGs) as well as the current Sustainable Development Goals (SGDs). Globally, maternal mortality is disproportionately affecting low and middle-income countries and Sub-Saharan Africa accounted for 66.3 percent of global maternal deaths (Alkema et al., 2016; Sustainable Development Goals, 2020). Regional findings seem to mask differences between individual countries. For instance, Rwanda was among 95 countries with maternal mortality ratio (MMR) of more than 100 in 1990, however, by 2015 Rwanda was one of the nine countries (Maldives, Bhutan, Cambodia, Cape Verde, Timor-Leste, Iran, Laos, Rwanda, and Mongolia) with the greatest relative reduction in MMR, considered as having met the MDG 5 target of a 75 per cent reduction in MMR (Alkema et al., 2016). Rwanda has also recorded a notable decrease of more than 70 per cent in child mortality between 2002 and 2015

(Nisingizwe, Tuyisenge, Hategeka, & Karim, 2020). In terms of antenatal care targets, Rwanda has made significant progress where 99% of pregnant women had at least one ANC attendance; however, there is a substantial proportion of women (66%) presenting for their first ANC visit in the second or third trimester of pregnancy(Manzi et al., 2014; National Institute of Statistics of Rwanda (NISR) et al., 2015; Pafs et al., 2015). Based on Rwanda's Demographic and Health Survey conducted between 2010 and 2015, only 44% of women who had a live birth attended four or more ANC visits, while 56 per cent had their first ANC visit before the fourth month of pregnancy (National Institute of Statistics of Rwanda (NISR) et al., 2015). Like many other developing countries, Rwanda too look for best practice models to meet their individual country as well as regional health and well-being targets.

In 2003, Rwandan national health system adopted the 2001 World Health Organization's (WHO) focused antenatal care (FANC) model of four ANC visits which had the first ANC visit scheduled between 8 to 12 weeks, but not later than 16 weeks, the second visit to take place between 24 to 26 weeks, third visit at 32 weeks, and the fourth visit between 36 to 38 weeks (McHenga, Burger, & von Fintel, 2019; World Health Organization). A side by side comparison schedule and frequency of the previous and the current new WHO ANC models can be found in Figure1.

Antenatal care models and revisions

In 2002, the WHO recommended a focused antenatal care (FANC) model to improve quality of care and increase ANC coverage, particularly in low- and middle-income countries (World Health Organization). The GDG stressed that under the FANC model, women had an inadequate number of 'contacts' with healthcare providers and evidence indicated increased perinatal deaths and pregnant women's decreased satisfaction with the FANC model (World

Health Organization). Therefore, the 2016 WHO ANC model was "intended to reflect and respond to the complex nature of the issues surrounding the practice and delivery of ANC, and to prioritize person-centered health and well-being… [that is] in accordance with a human rights-based approach" (WHO). While the FANC model was more focused on quality of care and increased ANC coverage to prevent reproductive health related morbidity and mortality, there was an intentional use of a reference terminology from ANC "visits" to "contacts" in the new 2016 guidelines to imply an active connection between a pregnant woman and her healthcare provider with an "individualized and person-centered care" in a respectful environment to ensure pregnant women and adolescent girls have a positive pregnancy experience (World Health Organization). To achieve individualized and person-centered care, the 2016 WHO ANC model included 39 recommendations covering five categories of interventions: 1) Nutritional interventions, 2) Maternal and fetal assessment, 3) Preventive measures, 4) Interventions for common physiological symptoms, and 5) Health system interventions to improve utilization and quality of ANC. The following is a comparison between the timing of ANC schedule between the focused antenatal care and the new 2016 WHO ANC model:

Focused ANC Model	New WHO ANC Model (2016)
First trimester	
Visit 1: 8 to 12 weeks	up to 12 weeks
Second trimester	
Visit 2: 24 to 26 weeks	Contact 2: 20 weeks
	Contact 3: 26 weeks
Third trimester	
Visit 3: 32 weeks	Contact 4: 30 weeks
	Contact 5: 34 weeks
Visit 4: 36 to 38 weeks	Contact 6: 36 weeks
	Contact 7: 38 weeks
	Contact 8: 40 weeks

Figure 1. Source: World Health Organization. (2016). WHO recommendations on Antenatal Care for a positive pregnancy experience.

All of the recommendations in the guidelines are categorized into either recommended, not recommended, or context-specific recommendations. The new guidelines are recommendations where each individual country is advised to adapt to the context on the ground. At the same time, previous research findings have shown that a large proportion of pregnant women are not meeting the previous standard antenatal care recommendation of a minimum of 4 visits, therefore, it is critical to understand what barriers and determinant factors are attributed to the not meeting the recommended number of national and WHO recommended visits.

According to available data from UNICEF, about 86% of pregnant women globally had access to at least one antenatal care visit with a skilled health care provider, while only 65% received the minimum four standard antenatal care visits (UNICEF, 2019a). Countries in sub-Saharan Africa and South Asia had the lowest levels of antenatal care visits observed and in Rwanda, 43.9% of women aged 15-49 had at least four ANC visits with any provider (National Institute of Statistics of Rwanda (NISR) et al., 2015; UNICEF, 2019a). In August of 2018, Rwanda was among a few countries to plan on the implementation of the new WHO ANC

guidelines, therefore, research is essential to identify the complex, interconnected, socio-demographic, cultural, and health systems factors related to delayed attendance to ANC. The new ANC model's overarching aim is "to provide pregnant women with respectful, individualized, person-centered care at every contact, with implementation of effective clinical practices (interventions and tests), and provision of relevant and timely information, and psychosocial and emotional support, by practitioners with good clinical and interpersonal skills within a well-functioning health system".

Based on United Nations inter-agency estimates, between 2000 to 2017, the global maternal mortality ratio dropped by 38 percent. For every maternal death per 100,000 live births, Rwanda had a relatively low maternal mortality ratio of 248 compared to Rwanda's neighboring countries: Democratic Republic of the Congo (473), Uganda (375), Tanzania (524), and Burundi (548) (UNICEF, 2019b). Part of the contributing factor in Rwanda's low maternal mortality ratio has to do with Rwanda pioneering as the first developing country to institutionalize maternal death audits (MDA) on a routine basis back in 2008. The MDA provided health facilities with the cause of deaths and related risk factors so to facilitate timely and appropriate recommendations to reduce such deaths(Assaf, Staveteig, & Birungi, 2018).

Almost all maternal deaths can be prevented with timely screening, detection, diagnosis, and treatment. Health complications like hemorrhage takes the lead among the spectrum of causes of maternal mortality, accounting for over a quarter (27%) of deaths globally. Indirect causes by pre-existing health conditions share a similar proportion (28%) of maternal deaths. "Hypertensive disorders of pregnancy (14%), especially eclampsia, as well as sepsis (11%), embolism (3%), and complications of unsafe abortion (8%) also claim a substantial number of lives (UNICEF, 2019b). In 2017, one in every 5,400 pregnant mothers was likely to die from

pregnancy complications and child birth in high-income countries compared to 1 in every 45 pregnant mother dying in low-income countries as a whole (UNICEF, 2019b).

According to the Rwanda Health Management Information System (RHMIS), there were a number of achievements made in maternal health programs during the Fiscal Year 2016-17. Among notable antenatal care services related accomplishments, 39 percent of all Rwandan women attending ANC services initiated ANC in the first trimester of their pregnancies while 36 percent completed the ANC 4th standard visit (Ministry of Health Rwanda, 2017).

Socioeconomic status and demographic characteristics, perception and behaviors rooted in culture and beliefs, health systems and infrastructures, communication and health promotion all affect accessibility to care and delivery of services that influence one's health seeking behavior leading to service utilization. This study's main objective is to examine determinants of delayed presentation to first antenatal care visits among Rwandan women ages 18-49 interviewed at four selected Health Centers in Gasabo District, in the City of Kigali Province, Rwanda.

Antenatal care encompasses significant health-care functions to ensure a healthy motherhood and positive health outcomes for her baby. Routinely scheduled antenatal care attendance allows the opportunity for health promotion, screening, early detection, and diagnosis of preventable conditions in addition to monitoring pre-existing health conditions and planning appropriate referrals for pregnant women who are at risk for adverse pregnancy outcome or require urgent care beyond what is capable at the community health center level. Timely antenatal care attendance is associated with improved pregnancy outcomes and reduced maternal and infant mortality. Although Rwanda's maternal mortality ratio is still high at 210 deaths per

100,000 livebirths based on the 2014-15 Demographic Health Survey (National Institute of Statistics of Rwanda (NISR) et al., 2015), Rwanda is notable for its great strides and achievements in the reduction of maternal mortality over the past decade. Rwanda was among one of the few countries that achieved the fifth maternal health-related Millennium Development Goal (Alkema et al., 2016; UNDP in Rwanda, 2014) and improved access and coverage of ANC played a significant role in maternal and neonatal health in Rwanda (Hitimana, Lindholm, Krantz, Nzayirambaho, & Pulkki-Brännström, 2018).

Prior to the 2018 pilot implementation of the new WHO ANC guidelines, early antenatal services help connect women and their families to a formal health system, increased the chance of using a skilled attendant during birth, and contributed to healthy behaviors throughout their lifetime (Lincetto, Mothebesoane-Anoh, Gomez, & Munjana, 2006). Additionally, appropriate antenatal care can ensure the detection of early maternal and infant complications such as hypertension, anemia, HIV/AIDS, and other pre-existing medical conditions which are considered manageable. The antenatal period is a crucial time for mothers to be educated on nutrition and the importance of modifying lifestyle risk factors for medical conditions (EBCOG Scientific Committee, 2015).

On the other hand, delayed antenatal care is closely associated with increased risk for maternal and infant mortality. A majority of maternal and infant deaths are associated with factors that can be assessed in the early antenatal period, including hypertension, HIV/AIDS, and pre-existing medical conditions (Assaf et al., 2018). According to the 2015 Rwanda DHS, 73% of married women have the potential to give birth to a child with an elevated risk of mortality due to the aforementioned conditions. The Rwanda DHS also reports that about 1 in 6 women

who died in the five years preceding the survey died due to complications associated with pregnancy (National Institute of Statistics of Rwanda (NISR) et al., 2015).

Although most Rwandan women receive some kind of antenatal care, the care has been shown to be of comparatively low quality (A. A. Rurangirwa, Mogren, Nyirazinyoye, Ntaganira, & Krantz, 2017). Offering counseling and focusing on factors such as family planning, HIV status, and preventative methods (which include administration of tetanus toxoid injection and prescription for or provision of iron and folic acid at the first ANC visit) are often the main components of antenatal care (Ngabo, 2012). About 67% of healthcare workers discuss the client's HIV status, while only 14% discuss health promotion, and 26% discuss birth preparation counseling (Ngabo, 2012). A 2015 study assessing practices of healthcare providers found that 20.9% of health care providers did not discuss with women what to do if any serious complications were to arise during pregnancy, such as vaginal bleeding (R. A. Rurangirwa & Krantz, 2017). Thus, healthcare providers may play a major role in determining delayed ANC. Healthcare providers may also have different insights regarding women's reasons for delay ANC visits. Providers are privy to information on cultural standards and may be more likely to disclose details commonly regarded as taboo in the Rwandan culture.

A qualitative study conducted among 17 health facility professions at Muhima Health Center in Kigali, Rwanda, identified five themes related to delayed initiation of antenatal care in the first trimester: lack of knowledge, previous birth experience, unwilling/unable of male partners to accompany to clinical visits, poverty or cost of care, and culture around antenatal care seeking (Hagey, Rulisa, & Perez-Escamilla, 2014). Previous studies indicate that unplanned pregnancies, lack of education, and cultural perceptions are associated with delayed first presentation for antenatal care. Although methods of contraception has grown to become more

accessible over the years, nearly half (47%) of pregnancies in Rwanda are unintended (National Institute of Statistics of Rwanda (NISR) et al., 2015). As it relates to delayed ANC, level of education also plays a role in determining timing of first presentation to ANC. According to a 2017 study in Tanzania, mothers who receive a secondary education are more likely to visit an ANC provider before four months of pregnancy(Mgata & Maluka, 2019)**.** In sub-Saharan Africa, it has been shown that while pregnant women are aware of potential complications, they maintain misconceptions about the underlying pathophysiology due to deeply held cultural beliefs. Mothers may not believe that complications can be treated by obstetric care because of the belief that complications arise from evil spirits, disobedience, adultery, and illicit sex (Mgata & Maluka, 2019).

According to the United Nations, Rwanda was able to reduce the ratio of maternal mortality from 1,300 per 100,000 live births in 1990 to 325 in 2015. A similar significant decrease was also demonstrated in the infant mortality rate.. Furthermore, increased facility-based delivery by a skilled provider and timely initiation of antenatal care has been identified as the two main factors with negative correlation with maternal mortality (Berhan & Berhan, 2014; Worley, 2015). Receiving late access to antenatal care has been linked to increased rates of maternal and infant mortality due to the inability to identify clinical and social risk factors early in pregnancies (Haddrill, Jones, Mitchell, & Anumba, 2014). Despite tremendous efforts in improving maternal health and outcomes in Rwanda, delayed antenatal care continues to be prevalent, which may result in poor health outcomes that would interfere with the progress that has been made.

As Rwanda begins to implement the new WHO ANC guidelines, research is essential to identify the complex, interconnected socio-demographic, cultural, behavioral, and health systems

factors related to delayed attendance to ANC. Identifying these factors can contribute to decreasing maternal and neonatal mortality in Rwanda.

Adverse perinatal outcome

Timely initiation and following the recommended number of antenatal care visits allows the opportunity to address any existing or emerging risk factors that affect the health and wellbeing of the mother and her baby. An analysis conducted by Kuhnt and Vollmer (2017) used the a comprehensive and nationally representative sample of 193 Demographic and Health Surveys (DHS) conducted between 1990 and 2013 from 69 low- and middle-income countries. The co-authors discovered a positive association between seeking ANC services with improved newborn survival rates or the prevalence of low birth weight, stunting, and underweight. Mothers who attended at least one ANC visit had a 1.04% point reduction in neonatal or newborn death and a 1.07% point reduction in infant mortality (Kuhnt & Vollmer, 2017). When a mother made at least four ANC visits and was seen by a skilled medical provider, the likelihood of her child dying within one month of birth was reduced by an additional 0.56% points and an additional 0.42%-point reduction in her child's likelihood of dying before her/his first birthday. The number of ANC visits over the course of a mother's pregnancy was also associated with positive short- and long-term nutritional outcomes of her child. A mother's presentation to at least one ANC visit was associated with a reduced probability of stunting, underweight or delivering a low birth weight baby by (4.11% , 3.26% and 3.82%) point reduction respectively (Kuhnt & Vollmer, 2017). In addition, more and more countries are pushing towards increasing facility-based delivery and in the event of any pregnancy related complications arise, a pregnant woman is within the care of her healthcare providers. On a global scale, 81 percent of births were delivered with the assistance of a skilled birth attendant in 2018,

showing a significant improvement of 69 percent since 2015 when the SDGs were established (Sustainable Development Goals, 2020).

A population-based study conducted within the Health and Demographic Surveillance System (HDSS) of the International Centre for Diarrheal Disease Research, in Matlab, Bangladesh found that an antenatal care visit was associated with increased facility-based delivery. The Bangladeshi study has shown that among women who received ≤1 ANC had about 2-times higher adjusted odds of perinatal mortality compared to women who received ≥3 ANC visits (Pervin et al., 2012). A similar finding resulted from a prospective cohort study in Tigray Public Health institutions in Ethiopic where women with complete adherence to ANC visit was attributed to a significant increase in the overall reduction in postpartum hemorrhage preterm birth, early neonatal death and low birth weight complications(Haftu, Hagos, Mehari, & B, 2018).

Methods

Study setting, design, and population

Rwanda is a small landlocked country in central Africa bordered by Uganda to the north, Tanzania to the east, Burundi to the south, and the Democratic Republic of the Congo to the west. Rwanda is divided into administrative divisions consisting of 5 provinces, 30 districts, 416 sectors, 2,148 cells, and 14,837 villages (National Institute of Statistics of Rwanda (NISR) et al., 2015). This study was part of a mixed methods cross-sectional study carried out in collaboration with Emory University Global Health Institute and the University of Rwanda College of Medicine and Health Sciences. The study was conducted at two rural Health Centers (Nyacyonga and Gikomero) and two peri-urban Health Centers (Kabuye and Kinyinya) in Gasabo District

within the City of Kigali Province, Rwanda (**Error! Reference source not found.**2). These four health centers were purposefully selected based on their rural/urban location to allow for the opportunity to examine any differential risks in delayed or untimely initiation of the first antenatal care service. Based on the 2012 population census, Gasabo District represents about 5.9% of Rwanda's total households with 70.6 % of the district's households living in urban settings (National Institute of Statistics of Rwanda (NISR) et al., 2015).

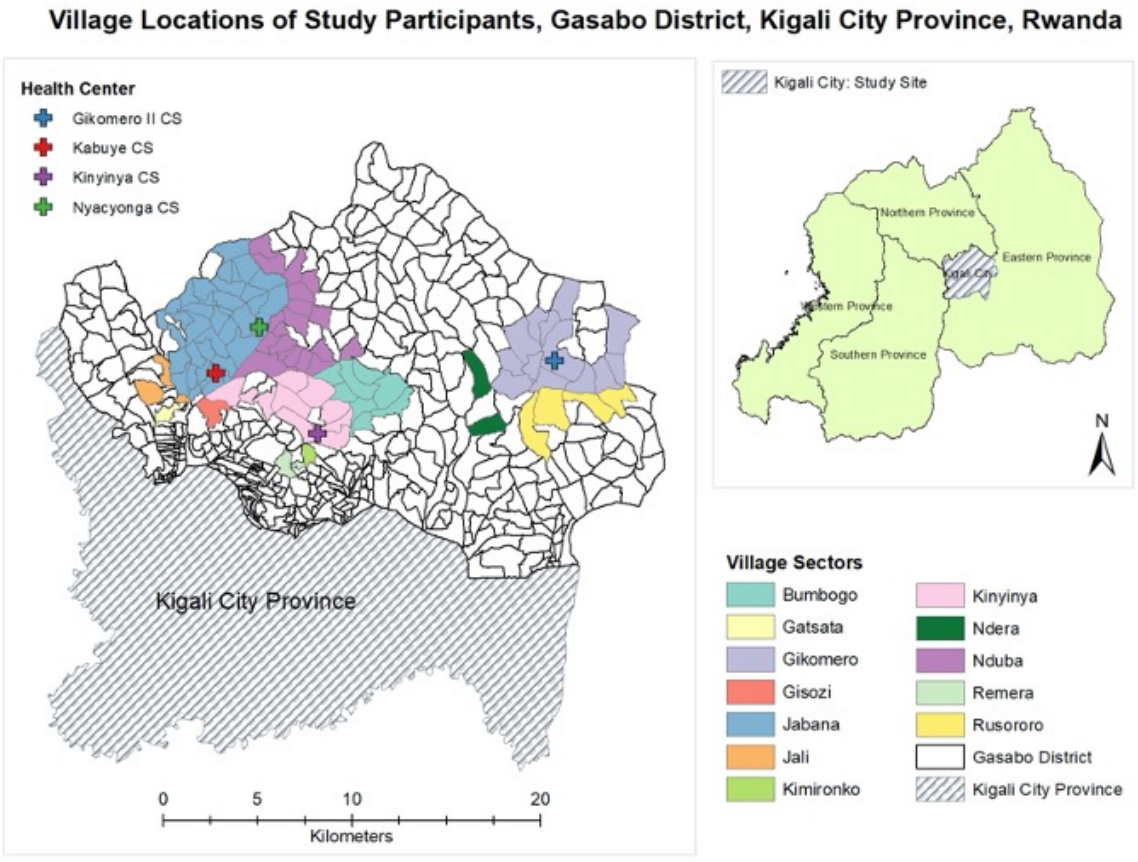

Figure 2 Map[1] of Rwanda and the four Health Center study sites

[1] Map was created using ArcMap 10.7.1 with Rwanda administrative level shapefiles downloaded from the Humanitarian Data Exchange and the geographic coordinates for the selected health centers were extracted from Rwanda Ministry of Health website.

The study population was women between the ages 18-49 who gave birth to a live child within 12 months prior to data collection and who met the inclusion criteria—ability to speak and understand Kinyarwanda, the Rwandan national language, as well as having access to an Antenatal Care Card from the recent pregnancy. Due to the exploratory nature of the study, the research team focused on determining the minimum detectable effect size of the predictor variables.

Participant selection

Recruitment of study participants took place during monthly Community Health Workers (CHWs) meetings. One local Rwandan research team colleague attended the CHWs' monthly meetings to explain the study and to request CHWs' assistance in spreading the message and identifying women in the communities who met the inclusion criteria. A roster list was created with information about the women who met the criteria including their contact information and was provided to health center staff. Community Health Workers (CHWs) affiliated with the four health centers contacted each of the eligible women, reiterated that their participation in the study was voluntary, and if they agreed to participate, reminded them to bring their Antenatal Care Card to the respective health center on the scheduled time and date of the interview. Contact information for the women were also used for outreach purposes if the research team needed to obtain dates of the ANC visits from the ANC card in case a woman forgot her ANC card on the day of the interview.

Data collection

Data collection took place between June and July of 2019. On data collection days, one of the local Rwandan research colleagues explained the study protocol and obtained a verbal informed consent from the group as the women and their infants congregated in a designated

room. Data collection commenced in a semi-private area of one of the health center's meeting rooms following obtaining individual informed consent privately from each subject and after screening for eligibility again.

A structured questionnaire was designed to capture participants' basic demographic characteristics, health utilization, history of adverse pregnancy experience, social network and support systems as well as one's desire to have additional children after their most recent pregnancy. During the first week of June, student research colleagues from Emory University and the University of Rwanda (UR) conducted a 5-hour training for eight enumerators consisting of nurses and midwives from the four selected health centers. The study instruments and interview guides were pre-tested during the training session to ensure clarity, context specificity, and cultural appropriateness before piloting the instruments with 10 participants at Kabuye Health Center. After modifying the form according to suggestions made by the enumerators.

An additional form was designed and attached to the study questionnaire to allow the enumerators to extract data from study participants' Antenatal Care Card. The Antenatal Care Card includes gravidity, parity, estimated date of delivery (EDD), dates of ANC visits, gestational age at the time of first visit, fundal height at each visit, date of next scheduled visit, comments made during the visits, and any unplanned ANC visits.

The enumerators, consisting of eight nurses and midwives, were only a portion of the overall study team. The study's local Rwandan principal investigator (PI) recruited three additional research colleagues to lead the data collection efforts along with student researchers from Emory University. Beside the Rwandan PI, two of the research colleagues are lecturers at the University, one with background in public health and one a trained nurse. The third Rwandan

research colleague was a recent a graduate with a background in nursing who attended the CHWs meetings to recruit study participants 2-3 months leading up to data collection.

Analytic sample

A total of 304 women were surveyed and interview representing two of the rural health centers (n=144) and two peri-urban health centers (n=150). Four of the mothers recruited from one of the rural health centers were excluded from the study since they had given birth over 12 months prior to the study. While eight of the mothers surveyed were missing data regarding their date of last menstrual period and the estimated date of delivery since gestational age at first ANC visit was calculated using the two dates. A total of 291 participants were included in the analysis.

Main outcome of interest

The primary outcome of interest was the proportion of the study participants having a "delayed" initiation of ANC which is defined as entry into antenatal care after 12 weeks of gestation. The determination of timely initiation of antenatal care was made by calculating the gestational age at first ANC visit using participants' self-reported last menstrual period (LMP) and estimated date of delivery (EDD) record by health center staff on the Antenatal Care Card. The calculations were carried out by the enumerators at the end of the interview and cross checked by the research team using a pregnancy wheel used by the healthcare providers at the health centers.

A secondary outcome of interest was the proportion of the women who met the previous World Health Organization and current Rwanda national health system recommendations of a minimum of four ANC visits over the course of a woman's pregnancy; therefore, the recorded date of each ANC visit was examined to assess this indicator.

Socio-demographic factors

Participants' age was categorized into three groups: 18-25 years, 26-34 years, and 35-49 years. Marital status was described as those married, cohabitating (living with a partner), single, and divorced, or widowed. Education level was categorized into those with no educational background, those with some or having completed primary level education, and those with secondary and/ or higher education attainment. Occupation was divided into housewife or having an income generating job. Rwanda's social stratification category, Ubudehe, was used as proxy for assessing household socioeconomic status. The Rwandan government uses the Ubudehe category to decide which households are eligible for special aid or service programs.

Statistical analysis

Frequencies and proportions were used to describe the socioeconomic and demographic characteristics of the study participants. Bivariate analysis (t-test and chi-squared tests) were conducted to identify correlation between categorical variables (socio-demographic, healthcare utilization, and obstetrical factors) and delayed first presentation to antenatal care. Any categorical factors that were significantly associated with the main outcome of interest in the bivariate analysis were further analyzed using multivariate logistic regression. For the purpose of statistical testing, a significance level of 0.05 was used throughout the analysis process. Any socio-demographic and pregnancy related continuous variables that exhibited as statistically significant during the bivariate analysis were included in a regression model and a final model was chosen through a stepwise selection strategy with entry and stay significance of 0.35. The 0.35 thresholds allowed for a wide catchment of variables that could be further defined vi manual assessment of model covariates. Multicollinearity assessment was conducted to ensure that the independent variables were not correlated with each other by ensuring that the tolerance values

of the independent variables were above the 0.1 threshold and that the variance inflation (VIF) values were less than 10 to indicate that there was no threat of collinearity. Pregnancy related factors like gravidity, parity, number of term deliveries were not included in the model selection process as they had a notably higher VIF value, the tolerance value fell well below 0.1 and the adjusted r-square was ≥0.45. Instead, the number of children in the household variable was kept and included along with the other significant variables in the regression model. All measures of association are presented with the crude and adjusted odds ratios (OR) with their 95% confidence interval. All of the analyses were conducted using SAS 9.4 (Cary, NC, USA).

Results

Sociodemographic and economic characteristics

Table 1 presents the sociodemographic characteristics of the sample of women ages 18-49 enumerated at four of the selected health centers in Gasabo District (N=291). The overall distribution of the study participants interviewed across the two rural health centers, Gikomero and Nyacyonga composed of 48.5% of the study participants (n=141) while the two urban health centers, Kabuye and Kinyinya composed of 51.6% of the study participants (n=151). The mean age of the entire study sample was 29.7 ranging from 18 to 47 years with just over half of the women were in the 26-34 years of age group (52.2%, n=152). The majority of the women were either married (41.4%, n=120) or cohabiting (51.4%, n=149), while only 4.5% of the study respondents reported to be single. A significant number of the women had some form of formal education (95.2%, n=277) of which, about one-third of them had some level of primary education without completion while another third had completed primary level (34.7%) and finally 31.8% had some secondary education and/or higher. In terms of occupation, 89.0% (n=259) of the women reported to be housewife while only 11.0% had a form of income

generating job. Just below two-thirds of the women (62.2%) reported to be religiously affiliation with Protestant, Pentecostal, or Adventist group. The Ubudehe or social stratification class/wealth category was used as a proxy for household economic status in the analysis since questions regarding household income level was not asked during data collection. The Ubudehe category is stratified into four categories with the 1st category constituted of the poorest households while the 4th category consists of the rich. Among the study respondents, no one reported to be in the 4th Ubudehe category instead close to half of the participants reported to be in the 2nd category (49.8%) while about one-fifth (19.6%) reported to be in the 1st category (poorest). The other 29.2% reported to be in the middle category. Only 1.4% reported that they were either not sure or preferred not to answer. Majority of the participants (96.2%) reported to have some form of health insurance coverage, while only 3.8% reported not having any form of insurance coverage.

Pregnancy related characteristics

Table 3 presents pregnancy related characteristics of the study participants. The variable gravidity was used to determine previous pregnancies before the last child. Among the study participants, for less than a quarter (23%) of the participants, the last child was their first. An approximated of 77.7% of the women reported of having 1-3 children while the rest reported having more than 4 children. The proportion of women having facility-based delivery was significantly high with 50.9% of the women having delivered their last child at a health center while 46.7% delivered at a district, referral hospital or at a private clinic. Only a marginal number of women (2.3%, n=7) delivering at home. Among the decisionmakers as to where to deliver, a large proportion of the women decided for themselves (52.8%) while healthcare staff including community health workers represented about 39.7%. Among the participants who had

previous pregnancy experience, about 14.3% reported to have had miscarriage (n=224), 7.2% reported of having a stillbirth (n=223), while only 3.1% reported having had given birth to a preterm baby.

Determinants of delayed Antenatal care service utilization

All of the women interviewed had at least one antenatal care visit regardless of how far into their pregnancy when they came in. Nearly all of the women had their ANC service at a community level health facility: 97.6% attended ANC at a health center while 2.1% had ANC at a community dispensary or health post. However, only 12.0% (n=35) of the participants met the Rwandan national health system's and the previous WHO recommendations on initiating the first antenatal care visit within 12 weeks of gestation while starkly higher proportion of the study participants 88.0% (n=256) initiated ANC after 12 weeks. Both of the Rwandan national health policy and the WHO recommend a minimum of four antenatal care visits over the course of a woman's pregnancy. Among the participants, less than one-fifth, 17.5% (n=51), of the participants had four or more ANC visits for the last live birth. Overall, less than 10 percent of the respondents 8.3% (n=24) started the initial ANC visit on time and have had four or more subsequent visits before delivery. The first ANC visit allows the opportunity to detect, diagnose, monitor, and treat any pregnancy related complications as well as allowing both the provider and the pregnant woman to establish a caring relationship to ensure a safe and healthy pregnancy experience.

Only 12% (n=35) of the study participants presented to antenatal care within 12 weeks of gestation and of which about 68.6% (n=24) had timely initiation of the first ANC and met the World Health Organization and Rwanda national health system recommended four visits during pregnancy. Among the study participants who reported of initiating the first ANC after 12 weeks of gestational, not having a partner/husband accompany to ANC services was relatively high at 38.5% followed by not knowing one's pregnancy status (34.8%) and either not having health insurance or money for treatment. Compared to women attending 4 or more visits, women with

less than 4 ANC visits were more likely to delay service initiation (AOR, 20.42; 95%CI: 7.73-53.90). The birth order of the last child means of transportation, and highest-level education completed among those who had some years of school attendance were significant in the bivariate analysis, however, lost significance when combined with each other.

In terms of antenatal care service utilization, only 12% (n=35) of the women initiated the first ANC visit within 12 weeks while 88% (n=256) initiated after the first trimester. Rwanda adopted the 2001 WHO's focused antenatal care model in 2003. Only 17.5% (n=51) of the women had four or more ANC visits recorded on their Antenatal Care Card. In the meantime, 240 women or 82.5% of the had less than the minimum standard 4 ANC visits over the course of her recent pregnancy. When it came to travel time to their local health center, well over half (67.4%) of the women reported to have travelled 30 minutes or more to get to the health center and over three quarters reported walking (79.7%) while only 20.3% took some form of transportation system (public bus, motorcycle taxi, bicycle taxi or by private car).

Notably, the mean month of first ANC visit among participants was 4.4 (±1.8 standard deviation), with about 17.5% (n=51) of the women had at least four ANC visits during pregnancy and all of whom had a facility-based delivery. Amongst 83.9% (n=244) of the participants reporting to have initiated their first ANC visit after 3 months of pregnancy, approximately 32.3% and 29.2% indicated not having husband or partner to accompany for ANC visit and not knowing they were pregnant were barriers that hindered their timely initiation of ANC services respectively. As reported in Table 1, the majority of women identify with delayed first ANC and receiving less than the recommended four visits were higher in the 26-34 age group, those currently married or cohabiting, those with 1-6 people in the household, main role as a housewife, religiously affiliated with Protestant, Pentecostal, or Adventist, having

incomplete primary level education, and those who identified as in the second Ubudehe (wealth) category.

The regression model for the number of antenatal care attendance included the birth order of the last child, maternal age, household social stratification class (Ubudehe), number of children and the number of children under 5-years old in the household. Including the variable, number of children under-five (p=0.0762) did not improve the model that already had the other four factors; therefore, it was removed in the reduced model. The overall F-test had a test statistics of 10.24 and a p=vale of <0.0001, therefore it was concluded that there was a significant linear association between the number of antenatal care services attended and birth order of the last child, maternal age, one's wealth category (Ubudehe), and the number of children in the household all taken together. The coefficient of determination (r^2) of 0.1253 indicates that about 12.5% of the variability in the number of ANC services received is accounted for by the four socio-demographic factors of the women. The following was the final model that best predicts the number of ANC service attendance:

$$\hat{Y} = 2.15 - 0.21\,(\text{birth order of last child}) + 0.05\,(\text{maternal age}) - 0.01(\text{wealth category}) - 0.19\,(\text{number of children in the household})$$

From the final regression model, it can be concluded that while holding maternal age, household wealth category, and the number of children constant, for every 1 unit of the last child's birth order increases, the number of ANC service attendance is expected to decrease by 0.21 times over the course of a woman's pregnancy. A similar conclusion can be drawn regarding the number of children in the household. For every 1 child increase in the family while holding the other three factors above constant decreases a mother's initiation of ANC by 0.19

visit. As mothers gain more experience with each pregnancy and childbirth, she might be more likely to not initiate as many ANC care as she would with her previous child(ren).

Discussion

Since the early 2000s, significant progress has been made to reduce global maternal mortality and an increasing number of women globally have access and use antenatal care (ANC) services. However, wide gaps in antenatal care exist across regions and countries. At the same time, not many pregnant women are meeting the standard minimum of four ANC visits during pregnancy or presenting to the first ANC on-time. From this study, only 12% (n=35) of the study participants presented to antenatal care within 12 weeks of gestation and of which about 68.6% (n=24) had timely initiation of the first ANC and met the previous World Health Organization and current Rwanda national health system recommended four visits over the course of one's pregnancy. Of the entire study participants (N=291), only 17.5% (n=51) of the women had 4 or more ANC attendance regardless of how far along they were in their pregnancies, while 82.5% (n=240) had less than four ANC. Although, the findings from this study do not have greater external validity, they call for prompt action to address and improve the situation. This study also examined the association between sociodemographic and delayed initiation of the first ANC.

Approximately 48.4% of the participants who had a delayed first ANC initiation were in the 26-34 age group. A majority (95.7%) of the women interviewed had some form of educational background and among this group of women, those with some secondary level education and/or higher had a slightly higher risk of going in for ANC service after 12 weeks of gestation (OR, 0.28; 95% CI: 0.11-0.76). When asked about the gestational age at first ANC, about 83.9% of the participants reported coming in after the first trimester. Amongst the reasons

for delay, a relatively higher proportion, 38.5% (n=94) of those who reported coming in late stated not having husband or partner to accompany was one of the main reasons. Among the women who lacked a partner escort, 54.3% were in the 26-34 age group of which 60.8% (n=31) were in a cohabiting or living with a partner followed by 31.4% (n=16) were married. As a number of previous researches evidenced that male involvement in ANC greatly influence the overall uptake and timely initiation of services. The frequency distribution from this find presents that more women in either a cohabiting or married relationship and those in the 26-34 followed by those in the 18-25 age group cited not having a partner's accompaniment was a deterrence for their untimely initiation of ANC services. In terms of hiding one's pregnancy from others, there is the sociocultural pressure knowing that others might judge if one was pregnant without being in a married or cohabiting relationship. However, no one in the singles category reported of hiding pregnancy.

Of the 34.4% (n=85) of the women who share that not knowing one was pregnant played a role in untimely initiation of ANC services, over half (58.3%) of them were between ages 26-34 either in a cohabiting arrangement (36.7%) or married (61.2%). There might be a number of reasons why a husband or partner might be absent on the day of an ANC visit—partner being away for work, less than supportive partner or no partner at all in the picture. This finding is consistent with previous like the ones carried out by (Pafs et al., 2015) in Rwanda revealed that both women and men were well aware of the recommended number and timing of the four ANC visits; however, they viewed partner accompaniment as an obligation otherwise the health facility staff 'would never receive [the pregnant woman] without a husband'. As such, pregnant single women are discriminated for having a child out of wedlock. A number of other primary studies and secondary systematic reviews have found that men's involvement in ANC has a

positive influence on the overall uptake of services and its early attendance (Jennings et al., 2014; Mgata & Maluka, 2019; Tesfaye, Loxton, Chojenta, Semahegn, & Smith, 2017) and the likelihood of having a facility-based delivery (Kashitala et al., 2015). An approximately 16.4% of the women who came after 3 months at the time of their first ANC also reported either not having health insurance or money for services was a deterrence.

Although only a small proportion of those delayed reported not having health insurance or money for ANC services was a barrier for initiating ANC on time or meeting the recommended number of visits. This finding is still meaningful among those in a low-income household. A recent study was examined both the societal and household cost of antenatal care in Rwanda. Societal and household costs of antenatal care will be of a greater concern if they are influential in a pregnant woman and her family's healthcare seeking behavior, especially as the number of ANC visits shift from the previous WHO recommendation of 4 visits to the new 2016 WHO guidelines recommending a total of 8 contacts made between a pregnant woman and her healthcare providers. As debates around cost implications and potential outcomes in countries move towards adopting the new 2016 WHO antenatal care guideline, Hitimana et al., (2018) stated that understanding the cost of the standard four ANC practice is a necessary step before making plans to shift and adopt more comprehensive guidelines. There is the risk of putting more pressure on pregnant women and her family who already face barriers while accessing ANC services. Findings from Hitimana et al., (2018), revealed that the average total cost for a four antenatal care visit package cost around $137 at a private health facility compared to ranging from $32.6 to $55.4 at a public health facility per four ANC visits. Regardless of health facility type, the initial ANC visit had higher health facility cost ranging from $73 at a private facility in contrast with public health facility cost which ranged from $16.8 to $24.2. At the health facility

level, drugs and consumables accounted for the higher health facility cost of antenatal care while for households, transportation and travel time accounted for the higher cost seen during the first ANC visit (Hitimana et al., 2018).

Limitations

Since this study was conducted during the summer of 2019, one of the main strengths lies in the exploratory approach to evaluate what considerations need to be made as Rwanda expands the new 2016 World Health Organization guidelines on antenatal care since they adopted the previous guideline just over a decade ago back in 2003. Although Rwanda was one of the pilot countries to implement the new guidelines starting in August of 2018, the data from this study does not reveal that antenatal care visits have increased or that a good proportion of the study participants are initiating the first antenatal care within 12 weeks of gestation. One of the limitations of this study is that given the small sample size, the findings have no external validity. The health centers were selected out of convenience and purposively. In addition, since this analysis is part of a mixed study, without the findings from the qualitative data, the quantitative findings are limited in drawing contextualized conclusions and associations. The available quantitative data from this study does not include an appropriate variable to assess economic status at each woman's household level. Moreover, there is no way to understand pregnant women's satisfactory with the services and care they received. If women had an adverse pregnancy history, they might be more likely to initiate ANC to prevent "the repetition of another negative birth outcome". Abortion is illegal in Rwanda, therefore, it is difficult to draw a conclusion as to "how women would behave in case of an unwanted pregnancy".

Conclusion

This study found that a significant proportion of the study participants initiated the first antenatal care services after the first trimester while only marginal number of about 12% present for ANC service within 12 weeks. Less than 10% of the study participants had an on-time attendance for their first ANC and met the 4 recommended number of ANC visits. At the health facility level, there needs to be some flexibility when it comes to partner escort for ANC service, by creating a welcoming environment. At the community level, additional social mobilization efforts should be beneficial in raising awareness of the importance of following the recommended number of ANC visits and initiating them as scheduled or at the first sign of pregnancy complication warning or danger signs. Since a greater proportion of women in the study reporting the lack of partner accompaniment and the cost of services as main reasons for delay, health communication messages target spouses and partners on the importance of antenatal care on maternal and child health. The early detection of pregnancy related complications should be addressed earlier on in the process when the conditions are manageable and not so costly as opposed to delaying and risking additional complications. As Rwanda invest in strengthening the health services field and deploying more community health workers at the community level, these influential stakeholders have an important role in reaching out to vulnerable population and their support network like spouses and partners to engage more in the health of a pregnant woman.

During the data collection, we did not encounter anyone who reported the government assigning their household into Category 4 (e.g. Rich). About less than two percent of the study participants reported either not knowing or chose not to answer the question. quite often households might not know which category they are assigned to if the application is not made on

time or not aware of the process. Approximately 59.8% of the women interviewed reported to be from a Category 2 household, about 29.2% belonging to a Category 3 and just less than 20% belonged to Category 1, the poorest households. Almost, all of the participants, 96.2% (n=280) reported to having insurance coverage and a similar proportion, 97.6% of them receive their antenatal care service at the local health center while only 2.4% received ANC at a dispensary post, either at a referral or district hospital, or at a private clinic. Often those receiving care at a referral or district hospital are the ones with complications that the local health center might not have the capacity to provide care for.

Tables

Table 1. Demographic characteristics of study participants ages 18-49 in Gasabo District, City of Kigali Province, Rwanda, N=291

		On-time (n=35)		Delayed (256)	
	Overall sample (N=291)	4 or more (n=24)	Less than 4 (n=11)	4 or more (n=27)	Less than 4 (n=229)
Respondent attributes	n (%)	n (%)	n (%)	n (%)	n (%)
Gestational age at first ANC					
Within 12 weeks	35 (12.0)	-	-	-	-
Greater than 12 weeks	256 (88.0)	-	-	-	-
Age in years					
18-25	77 (26.5)	7 (29.2)	2 (18.2)	14 (51.9)	54 (23.6)
26-34	152 (52.2)	11 (45.8)	7 (63.6)	11 (40.7)	123 (53.7)
35-49	62 (21.3)	6 (25.0)	2 (18.2)	2 (7.4)	52 (22.7)
Mean (±SD)	29.7 (±6.2)	29.9 (±6.1)	29.4 (±5.3)	26.9 (±4.6)	30.1 (±6.3)
Marital status					
Married	120 (41.4)	12 (50.0)	2 (18.2)	6 (23.1)	100 (43.7)
Cohabiting (living with a partner)	149 (51.4)	12 (50.0)	9 (81.8)	17 (65.4)	111 (48.5)
Single	13 (4.5)	0 (0)	0 (0)	2 (7.7)	11 (4.8)
Divorced or widowed	8 (2.8)	0 (0)	0 (0)	1 (3.9)	7 (3.1)
Number of people in the household					
1-6	254 (87.3)	22 (91.7)	9 (81.8)	25 (92.6)	198 (86.5)
≥ 7	37 (12.7)	2 (8.3)	2 (18.2)	2 (7.4)	31 (13.5)
Mean (±SD)	4.7 (±1.7)	4.2 (±1.4)	4.3 (±1.7)	3.9 (±1.3)	4.8 (±1.7)
Husband having another household					
Yes	23 (8.2)	24 (100)	2 (18.2)	1 (3.9)	20 (9.1)
No	258 (91.8)	0 (0)	9 (81.8)	25 (96.2)	200 (90.9)
Unknown	10 (3.4)	-	-	1 (3.7)	9 (3.9)
Religion					
Catholic	97 (33.3)	7 (29.2)	4 (36.4)	7 (25.9)	79 (34.5)
Protestant/Pentecostal/Adventist	181 (62.2)	15 (62.5)	7 (63.6)	20 (74.1)	139 (60.7)
Other (i.e. Muslim)	13 (4.5)	2 (8.33)	0 (0)	0 (0)	11 (4.8)
Ever attended school (n=291)					
Yes	277 (95.2)	23 (95.8)	9 (81.8)	27 (100)	218 (95.2)
No	14 (4.8)	1 (4.2)	2 (18.2)	0 (0)	11 (4.8)
Highest level of education completed (n=277)					
Incomplete primary	93 (33.6)	3 (12.5)	3 (27.3)	7 (25.9)	80 (34.9)
Primary complete	96 (34.7)	7 (29.2)	2 (18.2)	7 (25.9)	80 (34.9)
Some secondary and/or higher	88 (31.8)	13 (54.2)	4 (36.4)	13 (48.2)	58 (25.3)
Occupation (n=291)					
Housewife	259 (89.0)	21 (87.5)	10 (90.9)	25 (92.6)	203 (88.7)
Income generating jobs	32 (11.0)	3 (12.50)	1 (9.1)	2 (7.4)	26 (11.4)
Wealth category (Ubudehe) (n=291)					
Poorest	57 (19.6)	3 (12.5)	2 (18.2)	10 (37.0)	42 (18.3)
Poorer	145 (49.8)	9 (37.5)	4 (36.4)	12 (44.4)	120 (52.4)
Middle	85 (29.2)	10 (41.7)	5 (45.5)	4 (14.8)	66 (28.8)
Richer	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Not known/no answer	4 (1.4)	2 (8.3)	0 (0)	1 (3.7)	1 (0.4)
Insurance coverage (n=291)					
Yes	280 (96.2)	24 (100)	10 (90.9)	27 (100)	219 (95.6)
No	11 (3.8)	0 (0)	1 (9.1)	0 (0)	10 (4.4)
Number of children (n=291)					
1-3	226 (77.7)	23 (95.8)	8 (72.7)	25 (92.6)	170 (74.2)
≥ 4	65 (23.3)	1 (4.2)	3 (27.3)	2 (7.4)	59 (25.8)
Health center location					
Rural	141 (48.5)	19 (79.2)	2 (18.2)	18 (66.7)	102 (44.5)
Urban	150 (51.6)	5 (20.8)	9 (81.8)	9 (33.3)	127 (55.5)
Intention to have another child					
Yes	171 (58.8)	17 (70.83)	5 (45.5)	20 (74.1)	129 (56.3)
No	120 (41.2)	7 (29.17)	6 (54.5)	7 (25.9)	100 (43.7)

Table 2 Frequency distribution and Chi-sq test between background characteristics and Gestational Age at 1st ANC (within or above 12 weeks) by Health Center category, Gasabo district, Rwanda

	Rural (n=141)			Urban (n=150)		
	Delayed (n=120)	On-time (n=21)		Delayed (n=136)	On-time (n=14)	
Respondent attributes	n (%)	n (%)	*p*-value	n (%)	n (%)	*p*-value
Age in years						
18-25	38 (31.7)	5 (23.8)	0.4624	30 (22.1)	4 (28.6)	0.6678
26-34	61 (50.8)	10 (47.6)		73 (53.7)	8 (57.1)	
35-49	21 (17.5)	6 (28.6)		33 (24.3)	2 (14.3)	
Marital status						
Married or living with partner	107 (89.2)	21 (100)	0.1134)	127 (93.4)	14 (100)	0.3208
Divorced/single/widowed	13 (10.8)	0 (0)		9 (6.6)	0 (0)	
Religion						
Catholic	42 (35.0)	7 (33.3)	0.9839	44 (32.4)	4 (28.6)	0.8773
Protestant/Pentecostal/Adventist	73 (60.8)	13 (61.9)		86 (63.2)	9 (64.3)	
Other (i.e. Muslim)	5 (4.2)	1 (4.8)		6 (4.4)	1 (7.1)	
Occupation						
Housewife	110 (91.7)	19 (90.5)	0.8569	118 (86.8)	12 (85.7)	0.9123
Income generating jobs	10 (8.3)	2 (9.5)		18 (13.2)	2 (14.3)	
Education						
No education	5 (4.2)	1 (4.8)	0.0056	6 (4.4)	2 (14.3)	0.2488
Primary	87 (72.5)	8 (38.1)		87 (64.0)	7 (50.0)	
Some secondary and/or higher	28 (23.3)	12 (57.1)		43 (31.6)	5 (35.7)	
Wealth category (Ubudehe)						
Poorest	28 (23.3)	4 (19.1)	0.4089	24 (17.7)	1 (7.1)	0.0036
Poorer	66 (55.0)	9 (42.9)		66 (48.5)	4 (28.6)	
Middle	24 (20.0)	7 (33.3)		46 (33.8)	8 (57.1)	
Richer	0 (0)	0 (0)		0 (0)	0 (0)	
Not known/no answer	2 (1.7)	1 (4.8)		0 (0)	1 (7.1)	
Insurance coverage (%)						
Yes	116 (96.7)	21 (100)	0.396	130 (95.6)	13 (92.9)	0.6446
No	2 (1.7)	0 (0)		6 (4.4)	1 (7.1)	
Antenatal care service location						
Health center	118 (98.3)	21 (100)	0.5513	132 (97.1)	13 (92.9)	0.4043
Dispensary post/Referral/District Hospital/Private clinic	2 (1.7)	0 (0)		4 (2.9)	1 (7.1)	
Travel time to health center						
< 30 minutes	85 (70.8)	16 (76.2)	0.6154	86 (63.2)	9 (64.3)	0.9381
≥ 30 minutes	35 (29.2)	5 (23.8)		50 (36.8)	5 (35.7)	
Partner accompanying to any ANC						
Yes	92 (76.7)	20 (95.2)	0.0521	120 (88.2)	13 (92.9)	0.6034
No	28 (23.3)	1 (4.8)		16 (11.8)	1 (7.1)	
Delivery type						
Natural birth	97 (80.8)	14 (66.7)	0.1434	102 (75.0)	10 (71.4)	0.7699
Caesarean section	23 (19.2)	7 (33.3)		34 (25.0)	4 (28.6)	
Mode of transportation						
Walking	97 (80.8)	13 (61.9)	0.0533	112 (82.4)	10 (71.4)	0.3178
Public bus/motorcycle/bicycle/private car	23 (19.2)	8 (38.1)		24 (17.76)	4 (28.6)	

Table 3. Pregnancy related characteristics of the study participants (N=291)		
Respondent attributes	n	%
Previous pregnancies before the recent child (n=291)		
First time pregnancy	67	23
≥ 2 pregnancies	224	77
Birth order of last child (n=291)		
1	68	23.4
2	84	28.9
3	59	20.3
≥ 4	80	27.5
Antenatal care service location (n=291)		
Health center	284	97.6
Dispensary/Health post/Referral/District Hosp./private clinic	7	2.4
Accompanied by partner to one or more ANC visit (n=291)		
Yes	245	84.2
No	46	15.8
Travel time to health center (n=291)		
≤ 30 minutes	95	32.7
>30 minutes	196	67.4
Means of transportation (n=291)		
Public bus/motorcycle/bicycle/private car	59	20.3
Walking	232	79.7
Place of delivery for recent live child (n=291)		
At home	7	2.4
Health center or dispensary	148	50.9
District/referral hospital or private clinic	136	46.7
Decision maker for place of birth (n=290)		
Myself	153	52.8
Family members	22	7.6
Proposed by providers including CHWs	115	39.7
Delivery type (n=291)		
Natural delivery	223	76.6
Caesarean-section	68	23.4
Antenatal care visits (median=3) (n=291)		
1	42	14.4
2	95	32.7
3	103	35.4
4	46	15.8
5	5	1.7
Antenatal care (ANC) visits (n=291)		
≥ 4	51	17.5
< 4	240	82.5
Gestational age at 1st ANC (Self-report) (n=291)		
Within 3 months	47	16.2
After 3 months	244	83.9
Reasons for coming in after 3 months (n=244)		
Didn't know I was pregnant	85	34.8
Didn't have health insurance or money	40	16.4
No husband to accompany me	94	38.5
Didn't want others to know I was pregnant	6	2.5
I was sick/illness/out of town/childcare/ignored	19	7.8
Inter-pregnancy interval (n=228)		
≥ 12 months	209	91.7
< 12 months	19	8.3
Previous history of caesarean-section (n=220)		
No	169	76.8
	51	23.2
Previous history of miscarriages (n=224)		
No	192	85.7
Yes	32	14.3
Previous history of preterm birth (n=224)		
No	217	96.9
Yes	7	3.1
Previous history of stillbirth (n=223)		
No	207	92.8
Yes	16	7.2
Any previous birth weight < 2500g. (n=222)		
No	194	87.4
Yes	28	12.6

Table 4 Associations between obstetric factors and delayed first presentation for ANC services

Variables	OR	1st Model	2nd Model	3rd Model
Birth order of last child (n=291)				
1				
2	2.25 (0.87-5.79)	2.28 (0.88-5.93)	0.79 (0.25-2.50)	0.65 (0.20-2.17)
3	1.51 (0.58-3.93)	1.84 (0.64-5.29)	0.59 (0.16-2.14)	0.47 (0.12-1.84)
≥ 4	2.92 (1.04-8.15)	3.18 (1.06-9.56)	1.11 (0.30-4.08)	0.86 (0.22-3.34)
Means of transportation (n=291)				
Public bus/motorcycle/bicycle/private car				
Walking		2.33 (1.03-5.23	1.51 (0.58-3.91)	1.43 (0.55-3.77)
Antenatal care (ANC) visits (n=291)				
≥ 4				
< 4			21.16 (8.10-55.26)	20.42 (7.73-53.90)
Highest level of education completed (n=245)				
Primary incomplete				
Primary complete				0.74 (0.22-2.50)
Some secondary and/or higher				0.46 (0.14-1.50)

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