# Prenatal care and pregnancy outcomes: A cross-sectional study in Luanda, Angola

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## ARTICLE INFO

## ABSTRACT

*Objective:* To describe prenatal care in Angolan women delivered at a large tertiary care unit, and to explore the association between prenatal care and selected perinatal outcomes. *Methods:* We conducted a cross-sectional study between December 2012 and February 2013, involving 995 women aged 13–46 years, delivered at Lucrécia Paím Maternity, Luanda. Trained interviewers collected information on timing, frequency, place, and satisfaction with prenatal care; sociodemographic and clinical characteristics; birth weight; and gestational age. Logistic regression models were fitted, and odds ratios with 95% confidence intervals (OR, 95%CI) estimated. *Results:* Quantitatively inadequate prenatal care (<4 visits) was more common in younger, less educated, poorer women, followed in public institutions, and those who felt more dissatisfied with care. More visits, both in primiparas and multiparas, were independently associated with more cesarean deliveries. After adjustment, having fewer than four visits was significantly associated with low birth weight (OR 2.00; 95% CI, 1.15–3.50) and preterm delivery (OR 2.74; 95% CI, 1.69–4.44 for 2–4 visits); similar associations were found regarding late entrance into care. *Conclusion:* Early entrance into prenatal care and the recommended number of visits are major determinants of mode of delivery and pregnancy outcomes, constituting targets to improve perinatal health.

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## 1. Introduction

Maternal and infant mortality are subtle general indicators of social and economic development. More broadly they reflect how women and children are valued and human rights respected at a country level. Although evident improvements occurred during the last decade, as a response to the Millennium Development Goals (MDGs), maternal and infant health are major challenges in African countries [1–4]. Globally, the maternal mortality ratio fell by nearly 44% over the past 25 years, to an estimated 216 maternal deaths per 100 000 live births in 2015, from 385 in 1990. The annual number of maternal deaths decreased by 43% from approximately 532 000 in 1990 to an estimated 303 000 in 2015. The approximate global lifetime risk of a maternal death fell considerably from 1 in 73 to 1 in 180. Low-resource regions accounted for approximately 99% of maternal deaths in 2015, with Sub-Saharan Africa alone accounting for roughly 66% [5]. The risk of a child dying before completing five years of age is still highest in the WHO African Region (81 per 1000 live births), and many countries in the Region still have rates above 100 deaths per 1000 live births. It is essential to end preventable child deaths and there is a critical role to

expect from the continuity of care that prenatal visits and delivery in health institutions should promote [6].

The assessment of prenatal care uptake and quality are essential steps toward improving accessibility and birth outcomes [7,8]. The proportion of pregnant women initiating prenatal care during the first trimester of pregnancy is one of the standard clinical performance measures to assess the quality of maternal health care. One expects prenatal care to constitute an important moment of contact between the health workers and the women, ideally also the partners, and an opportunity for health education, including knowledge on how to prevent and detect pregnancy complications, and the development of a birth plan toward a safe delivery [9,10].

WHO recommends a minimum of four prenatal care visits [11,12] but in Angola only 47% of pregnant women reach that number, with a large variability between provinces [13,14]. A set of routine activities were adopted by the Ministry of Health of Angola to improve prenatal care uptake and content, including confirmation and monitoring of the progress of pregnancy, assessment of maternal and fetal well-being, detection of problems complicating pregnancy, tetanus immunization, anemia prevention, antimalarial intermittent preventive treatment, HIV counseling and testing, counseling on self-care at home, nutrition, and breastfeeding [13].

Prenatal care can be expected to influence the pregnancy outcome by changing attitudes toward mode of delivery or prevention of other

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birth-related complications. However, strong evidence is still lacking to guide the content and timing of prenatal care programs although there is a tendency to favor a model with reduced number of visits even if associated with some dissatisfaction by mothers [15].

In Angola maternal morbidity remains very high, demanding urgent improvement in the access and the performance of prenatal care [16]. WHO estimated for Angola in 2015 a maternal mortality ratio of 477, corresponding to 5400 maternal deaths, a 1 in 32 lifetime risk of maternal death, and 18.3% of deaths among women of reproductive age due to maternal causes [5]. Preterm birth and low birth weight are frequent outcomes in low-income countries and major determinants of early infant deaths. Although it is well recognized that prenatal care can influence such adverse pregnancy outcomes, it is important to understand how it is working in each particular context and the strength of the association or the effect, namely in relation to postnatal care [17,18].

The aim of the present study is to describe prenatal care in Angolan women delivered at a large tertiary care unit, and to explore the association between prenatal care and selected perinatal outcomes.

## 2. Materials and methods

A cross-sectional study was conducted in the largest public maternity of Angola, in Luanda. It is a national reference center for maternal health care, training of health professionals, and research. As a tertiary healthcare facility, the maternity receives the most complicated cases referred from facilities in lower levels of care. It performs cesarean and vaginal deliveries, provides intensive care to women and newborns, has specialized areas for eventful pregnancies and immediate puerperal complications, and has on-site laboratory support.

Recruitment of participants occurred from December 5, 2012, to February 22, 2013. During this period, 5442 deliveries were recorded, corresponding to 1686 cesarean deliveries and 3534 vaginal births. Women were invited to participate in the study after delivery and were interviewed during their hospital stay. Women who have had a vaginal delivery are usually discharged after 6 hours while women stay from 3–7 days after cesarean. Invitations occurred during daytime hours (from 8AM. to 5PM). To maximize the chances of recruitment and according to the resources available, women were visited on specific days of the week: Mondays, Wednesdays, and Fridays for vaginal deliveries, and Tuesdays and Thursdays for cesareans. Women were given insecticide impregnated bed nets after completing the questionnaire.

Women presenting severe conditions complicating delivery (such as eclampsia, complicated malaria, or postpartum hemorrhage), foreign nationality, residency in the Province of Luanda for less than 6 months, and twin pregnancy were not considered eligible to participate. The data were collected by face-to-face interviews using a structured questionnaire administered by six trained interviewers (three males and three females).

The questionnaire comprised 77 questions assessing demographic and socioeconomic characteristics, pathological and gynecological history, and history of present pregnancy, prenatal care, nutrition, and smoking and alcohol consumption. Information related to hospital admission, delivery, and the newborn was obtained from the clinical charts.

To measure the prevalence of inadequate prenatal care (defined as fewer than four visits) a sample size of 344 was estimated considering a 95% confidence level, a prevalence of inadequacy of 40%, and a 5% margin of error. However, a sample size of approximately 1000 was approached, using the same parameters and a power of 80%, to guarantee the required statistical power to assess the risk of adverse pregnancy outcomes, analyzing this cross-sectional survey as a case–control study. During the recruitment period, 1040 women were invited to participate. Of these, 40 refused, 5 had missing key information in their clinical files, leaving 995 participants for analysis. However, 11 women living with HIV infection were additionally excluded because of the particular relation between infection, prenatal care, and birth outcomes.

To characterize prenatal care we used four variables: the timing of the first prenatal care visit, the number of prenatal care visits, type of prenatal care provider (public hospital or healthcare center and private provider), and satisfaction with prenatal care (using a five-point scale, from 1 as very unsatisfied to 5 as very satisfied). The timing of the first visit was categorized as occurring in the first, second, or third trimester of pregnancy, and the frequency of prenatal care visits into fewer than four and four or more visits. Demographic and social characteristics considered in the present analysis included maternal age (categorized as ≤19, 20–24, 25–29, 30–34, and ≥35 years old), educational level (≤4, 5–8, 9–12, and >12 completed years of schooling), marital status (married or in cohabitation, single), place of residence (urban if living in Luanda, periurban if in other municipalities in the Province of Luanda), monthly family income (<100, 100–300, >300 US $, do not know/do not say). Pregnancy-related variables were: age at first sexual intercourse (<15, ≥15 years); number of previous pregnancies (0, 1, 2–4, ≥5); self-reported previous cesarean (no, yes); complications during previous pregnancy (categorized as no or yes if the woman had been diagnosed with any of the following: diabetes; hypertensive disorders, or urinary infection); maternal prepregnancy weight (≤50 kg, 51–60 kg, >60 kg); self-reported high risk pregnancy (no, yes); index pregnancy complications (no, yes); diagnosis of malaria in the index pregnancy (no, yes); and hospitalization during pregnancy (no, yes). Pregnancy-related outcomes considered were: cesarean delivery (no, yes); gestational age at birth (<37 weeks, ≥37 weeks, measured according to the date of the last menstrual period); fetal status (live birth, stillbirth); and birth weight (<2500 g, ≥2500 g).

The $\chi^2$ test was used to compare the trimester of the first prenatal care visit and the number of prenatal care visits according to demographic, socioeconomic, lifestyle, reproductive health-related characteristics, pregnancy complications, and outcome variables: cesarean delivery; gestational age (<37 weeks, ≥37 weeks); fetal status (live birth, stillbirth); birth weight (<2500 g, ≥2500 g).

Logistic regression models were fitted to estimate the association of birth weight, gestational age at birth, or fetal status, as dependent variables, with timing of the first prenatal care visit and the number of prenatal care visits, adjusting for the potential confounders such as maternal age, previous pregnancy, maternal prepregnancy weight, and type of prenatal care provider, or to assess the association of care with cesarean delivery. Analysis of data was performed using SPSS version 21 (IMB, Armonk, NY, USA).

The project was approved by the Ethics Committee of the Faculty of Medicine of Agostinho Neto University, and written informed consent was obtained from all participants

## 3. Results

Table 1 presents the timing of the first prenatal care visit and the number of visits according to sociodemographic and pregnancy-related characteristics. Compared with pregnant women who had their first visit in the first trimester, those who started prenatal care in the second or third trimester, more often had fewer than two visits (31.4% vs 7.1% and 2.3%, respectively), were significantly less educated, and more frequently primiparous (33.3% vs 23.0%). Pregnant women who began prenatal care in the third trimester were more dissatisfied (8.6% vs 4.1%) compared with those who initiated care during the first trimester.

As also shown in Table 1, pregnant women who had fewer than the recommended four prenatal care visits were younger (24.2% vs 15.3% younger than 20 years of age), were less educated (21.7% vs 10.6% with less than 5 years of schooling), and reported more often living with less than US $100 per month (11.0% vs 5.5%). Pregnant women followed in private clinics reported more often the recommended number of prenatal care visits (14.6% vs 5.0%). Women with fewer than four prenatal care visits were proportionally more dissatisfied (8.9% vs 4.3%).