**SOCIODEMOGRAPHIC DETERMINANTS OF CAESAREAN DELIVERY IN THE LARGEST PUBLIC MATERNITY OF ANGOLA**

**DETERMINANTES SOCIODEMOGRÁFICOS DO PARTO POR CESARIANA NA MAIOR MATERNIDADE PÚBLICA DE ANGOLA**

**RESUMO**

**Introdução:** Este estudo teve como objetivo descrever as características socioeconómicas e demográficas associadas ao parto por cesariana em Angola.

**Material e Métodos:** Foi conduzido um estudo transversal que incluiu 995 participantes puérperas no período compreendido entre Dezembro de 2012 a Fevereiro de 2013 na Maternidade Lucrécia Paim, em Luanda, Angola. A informação foi recolhida através de um questionário estruturado aplicado por entrevistadores treinados. A regressão logística foi utilizada para estimar a magnitude da associação (Odds Ratios – Intervalos de Confiança a 95%) entre o tipo de parto e as covariáveis.

**Resultados:** A prevalência de cesariana neste estudo foi de 44%. As mulheres que fizeram cesariana eram menos escolarizadas, residiam mais frequentemente em zonas periurbanas e com rendimentos mais baixos quando comparadas com as mulheres que tiveram parto vaginal. Residir numa área periurbana estava significativamente associado ao parto por cesariana independentemente de outros fatores, (OR ajustado para mulheres primíparas, IC95% = 2,14, 1,27-3,62) e mulheres multíparas (1,78, 1,26-2,51). Hipertensão durante a gravidez atual associou-se ao parto por cesariana tanto em primíparas (3,96; 1,57-9,98) como em multíparas (1,68; 1,03-2,74).

**Conclusão:** Diferenças sociodemográficas foram observadas de acordo com o tipo de parto. O parto por cesariana foi mais frequente entre mulheres com rendimentos mais baixo e residentes em áreas periurbanas.

**Palavras-chave:** Cesariana, determinantes, Luanda, Angola

# ABSTRACT

**Introduction: T**his study aimed to describe demographic, socioeconomic and pregnancy-related characteristics associated with a caesarean delivery in Luanda.

**Material and** **Methods:** Weconducted a cross-sectional study, 995 women undergoing deliveries were assessed between December 2012 and February 2013 in Luanda. Data was collected using a structured questionnaire administered by trained interviewers. Logistic regression models were fitted to estimate the magnitude of associations (Odds Ratios - 95% Confidence Intervals) between the type of delivery and variables showing a significant association in the bivariate analysis.

**Results:** The prevalence of caesarean was 44%.Women with caesarean delivery were less educated, resided more often in a periurban area and were likely to declare lower family income when compared with women who had vaginal delivery.A periurban residency was significantly associated with a caesarean delivery independently of all covariates considered, for primiparous women (adjusted OR, 95%CI=2.14, 1.27-3.62) and for multiparous women (1.78, 1.26-2.51). Among multiparous women, a lower family income was also significantly associated with caesarean delivery. Hypertensive disorders during the current pregnancy were associated with a caesarean delivery in the multivariate models fitted for primiparous (3.96, 1.57-9.98) and for multiparous women (1.68, 1.03-2.74).

**Conclusion:** Sociodemographic differences were observed according to the type of delivery. Cesarean was more prevalent among women with lower income and residents in periurban areas.

**Key Words:** Caesarean delivery, determinants, Luanda, Angola

**Introduction**

A report from the Millennium Development Goals (MDGs) show that, between 1990 and 2015, mortality ratio has declined by 45 per cent worldwide, and 49 per cent in sub-Saharan Africa[1].

Despite that, the sharp increase in caesarean rates in the last decades, especially in low and middle-income countries[2, 3], exceeding the upper limit proposed by the World Health Organization (WHO) (10-15%) has become a public health problem worldwide[4]. Unnecessary caesarean results in avoidable suffering and wasted health care resources from unduly allocated staff, surgery procedures and longer hospital stays[5]. Previous studies showed that in developing countries, the caesarian section has increased among women from the richest classes[6], although in the developed countries this increase was observed among poor and less educated women[7].

Although some clinical well-established indicators for caesarean are available, non-clinical factors often become key elements in decision-making. At the basis of such a decision is the encounter between the woman and her caregiver, in which the woman’s preferences and views regarding childbirth and the clinician’s subjective interpretation of her obstetric risks and the perception of the desired mode of delivery are likely to influence the decision to proceed with a caesarean[8]. A large body of research has shown a clear association between caesarean rates and socioeconomic factors apart from the woman´s obstetric risk even where access to health care services is not an issue[9, 10].These findings suggest that a woman’s preference or her ability to engage in the decision-making process concerning the mode of delivery, are likely shaped by her socioeconomic context.

Since the independence of Angola, in 1992, it was created the National Health System based on equity, universality and gratuity[11]. Moreover, the National Health System care in Angola includes 2,356 unities, of which 1,981 primary care services, 210 hospitals and 43 centers of maternal and child health [12]. According to the “Inquérito de Indicadores Múltiplos” (IIMS) of Angola, 82% of women with one child born alive in the five years prior to the survey received pre-natal consultation. Nearly half of births (46%) occur in a health facility (44% in the public sector and 2% in the private sector). Nevertheless, more than half of births (53%) occurred outside the hospital with no assistance of health professionals[11, 13].

However, there is a lack of studies focused on maternal health in this African context. Thus, the aim of this study was to describe demographic, socioeconomic and pregnancy-related characteristics associated with a caesarean delivery in the largest maternity of Luanda, Angola.

**Material and Methods**

*Setting*

A cross-sectional study conducted in the public Maternity Lucrécia Paím (MLP) located in Luanda (Angola), a national reference for maternal health care and also for research and training of future health professionals. As a tertiary health facility, the maternity is dedicated to the most complicated cases referred from other health facilities in lower levels of care. The maternity performs an average of 100 deliveries per day. It performs caesarean delivery, provides intensive health care to women and new-borns has specialized areas for complicated pregnancies or puerperal women and has on site laboratory support. According to hospital internal records, during the study period (December 2012 to February 2013), there were 5.442 births deliveries in this hospital, of which 1.686 were caesarean deliveries and 3.756 vaginal deliveries.

*Participants*

Recruitment of participants occurred from December 2012 to February 2013. Women were invited to participate in the study after delivery and before hospital discharge. Women having a vaginal delivery were usually discharged after 6 hours and women undergoing caesarean delivery have a longer stay, from 3 to 7 days. Women having a vaginal delivery remained in two specific rooms of the maternity ward where trained staff introduced the study’s aims, while women having a caesarean delivery remained in a separate ward and received the same invitation. Invitations occurred mainly during daytime (from 8 a.m. to 5 p.m.), and women were visited in specific days of the week, according to the delivery type, to maximize chances of recruitment: Mondays, Wednesdays and Fridays for vaginal deliveries and Tuesdays and Thursdays for caesarean.

Exclusion criteria were severe conditions complicating delivery (e.g. Eclampsia/ pre-eclampsia, complicated malaria, haemorrhage post-partum), foreign nationality, residency in Luanda for less than 6 months and twin pregnancy. Data was collected by face to face interviews using a structured questionnaire administered by six trained interviewers (three males and three females). Written or verbal informed consent (according to women’s literacy) was obtained from all participants.

The questionnaire comprised total of 77 questions assessing demographic and socioeconomic characteristics, pathological and gynaecological history, history of present pregnancy, prenatal care, nutrition, smoking and alcohol consumption. Variables related to hospital admission, delivery and newborn data were drawn from the clinical charts. During the recruitment period, 1040 women meeting criteria were invited to participate. Of these, 40 refused participation and 5 had missing information in their clinical files. Thus, for the present study were considered 995 participants.

As a strategy to involve women, the research team gave betnets after completing the questionnaire, which was sponsored by the National Program Against Malaria. The project was approved by the Ethics Committee of the Faculty of Medicine of the University Agostinho Neto.

*Outcomes and Covariates*

The study outcome was the mode of delivery, categorized as vaginal or caesarean. The following variables were considered potential sociodemographic determinants of the mode of delivery: maternal age (categorized in <18, 18-34 and >=35 years old); completed years of schooling (<9, 9-12 and >12); marital status (married or in cohabitation and single); residency in an urban (Luanda municipality) or periurban area (municipalities outside Luanda, specifically Viana, Cazenga, Belas, Cacuaco, Icolo E Bengo and Kissama); current household income per month (<100; 100- 300 and >300 USD or other that includes those women who do not know/ prefer not to disclose). Smoking during pregnancy was recorded as “yes or no” and alcohol consumption according to the question “Have you taken any type of alcoholic beverage during this pregnancy?” (yes, no).

The following variables related to current pregnancy and antenatal care were considered: year of the first intercourse (<15 years old, >=15 or does not know); first antenatal care visit (1st trimester, 2nd trimester, 3rd trimester); frequency of antenatal care visits (1, 2-4, >=5); hospitalization during pregnancy (yes or no); satisfaction with antenatal care (rated in a 5 point scale further dichotomized in >=3 as “satisfied” and <3 as unsatisfied); type of antenatal care (only public services or at least one visit to a private doctor or service); complication or diseases during current pregnancy (hypertension, malaria, urinary infections, haemorrhage and threat of abortion).

The number of previous pregnancies was considered for the codification of two variables categorizing women according to history of caesarean (primiparous, multiparous with no previous caesarean and multiparous with at least one previous caesarean) and according to history of pregnancy complications, i.e., self-reported history of diabetes, hypertension, urinary infection or hemorrhage (primiparous, multiparous with no complications history and multiparous with previous complications).

*Statistical Analysis*

Analysis of data was performed with SPSS 21. Chi-square or Fisher exact tests were used to compare the prevalence of vaginal deliveries and caesarean sections according to demographic, socioeconomic, lifestyle, reproductive health related characteristics and pregnancy complications.

Logistic regression models were fitted to estimate the magnitude of associations (Odds ratios, 95% Confidence Intervals – OR, 95%CI) between the type of delivery (vaginal vs. caesarean) and variables showing a significant association in the bivariate analysis. Models were fitted separately for primiparous and for multiparous and adjusted for potential confounders.

**Results**

In our study, the prevalence of caesarean section was 44%. Table 1 shows the characteristics studied in our population according to the type of delivery (vaginal and caesarean). Women with caesarean delivery were less educated, resided more often in a periurban area and were likely to declare lower family income when compared with women who had vaginal delivery.

Regarding the characteristics related to previous pregnancy, current pregnancy and antenatal care, we found that 33% of women with a caesarean delivery were multiparous with a history of previous caesarean while this proportion was 9% among women with a vaginal delivery. Also, 25% of women with a caesarean delivery and 18% of women with vaginal delivery reported previous pregnancy complications. Overall few women reported dissatisfaction with the antenatal care provided, less frequent among women with a caesarean delivery compared to women with a vaginal delivery (4% *vs* 8%, respectively, p=0.022). No statistically significant differences were observed between vaginal and caesarean deliveries according to the place, frequency and time of first antenatal care visits, nor according to hospitalization during pregnancy.

According to the complications assessed during the current pregnancy, we observed a higher proportion of hypertensive disorders women among those with a caesarean delivery compared to vaginal deliveries (16% vs. 10%, p=0.004). We did not find statistically significant differences regarding smoking habits and consumption of alcohol.

[Insert Table 1]

Table 2 presents the associations between the type of delivery and the factors shown statistically significant in the bivariate analysis, stratified for primiparous and multiparous women. A periurban residency (vs. urban) was significantly associated with a caesarean delivery independently of all covariates considered, for primiparous women (adjusted OR, 95%CI=2.14, 1.27-3.62) and for multiparous women (1.78, 1.26-2.51). Hypertensive disorders during the current pregnancy was also significantly associated with a caesarean delivery in the multivariate models fitted for primiparous (3.96, 1.57-9.98) and for multiparous women (1.68, 1.03-2.74). Among multiparous women, a family income <100 was also significantly associated with caesarean delivery, compared to a family income of >300 dollars in the fully adjusted model (1.90, 1.00-3.60). Expectably, a history of previous caesarean was positively associated with a current caesarean among multiparous women (5.68, 3.82-8.46).

[Insert Table 2]

**Discussion**

The caesarean delivery was highly prevalent in this sample of Angolan women. Moreover, higher rates of caesarean were observed in women with lower family income and living in a peri urban area, independent of parity status and even after additional adjustment for health condition as hypertension. These results are consistent with previous studies in African contexts, that report associations between low socioeconomic position and a high risk of caesarean delivery[14].

We hypothesize that poorer and less educated women, who live far from health facilities, have few antenatal care visits and often arrive with complicated conditions, justifying a caesarean delivery. Furthermore, the lack of qualified human resources and materials to manage emergencies in peripheral health centers and the delay in the reference system resources, also leads to an increase in the number of caesareans performed in this particular maternity.

A study using data from the most recent DHS survey from countries in Sub-Saharan Africa, South and Southeast Asia, Latin America and the Caribbean for which information on caesarean and the wealth index were available, contrasts with our results. It showed that the richest classes have the highest rates of caesarean section [6]. The expansion of medical indications, such as the liberalization of the threshold for these indications appear to have occurred over time. As a result, an increase in non-medically indicated cesarean section was noted among the wealthier[6]. However, some studies show that in poorer countries, particularly in sub-Saharan Africa, large segments of the population have almost no access to potentially life-saving caesareans and women are likely to die for lack of access to the procedure[6, 15]. In the African context, we should find lower rates of caesarean delivery, because culturally, regardless of socioeconomic class that this woman may belong "African women refuse to surgery because of fear and the perception of the importance of vaginal delivery that defines your womanhood”. Both one side (rich African women) as of another (poor African women), this explanation cannot explain our results [16].

In this study a caesarean delivery was associated with a history of previous caesarean section, with complications in previous pregnancies and with hypertensive disorders in the current pregnancy. A review showed that maternal complications account for 3-18% of caesarean rates[17]. A study done in five low-income countries (Bangladesh, Guinea, Mali, Niger and Uganda), among the indications for a caesarean delivery, previous caesarean ranged between 0.7 and 18.7% and severe preeclampsia or eclampsia ranged between 0 and 11.1% [18]. In fact, hypertensive disorders during pregnancy induces metabolic changes that lead to a high-risk pregnancy and, consequently a caesarean delivery[19].

When we analyze the relationship between the type of delivery and the variables that were significant in the bivariate analysis, we found an association between caesarean delivery and place of residence, family income and hypertensive disorder in the current pregnancy in primiparous and in multiparous. Although several studies show that women living in remote areas with a low income[6, 15], had no access to a caesarean delivery, considered as a means to save lives of both mother and babies, these women when referenced to this facility do have access to caesarean delivery. But, in many situations, the state in which they arrive to maternity often leads to the decision of a cesarean delivery.

In this study the prevalence of caesarean delivery was 44%, above the values ​​established by the World Health Organization (10-15%)[4]. Although the literature confirm an increase in rates of caesarean in middle and high income countries, these figures contrast with the rates found in low-income areas in particular, the region of Sub-Saharan Africa, where rates below the values established are often found [20]. But in our reality, this maternity is one of the largest in the country, with more qualified staff and receives all cases referenced by the health system from Luanda and outside. Thus, this may justify a higher caesarean prevalence. Other explanation lies in the way recruitment was done: women with caesarean deliveries had more time to be surveyed, taking into account their stay in the maternity compared to women who had vaginal deliveries that had only six hours after delivery to be discharged.

As expected, a previous caesarean section was associated with caesarean delivery as described in several studies. A study including medical records of Southeastern Brazil shows caesarean delivery in the current pregnancy was associated with past caesarean delivery [21] The literature reports that women who had a previous cesarean tend to increase the risk of uterine rupture, placenta previa and placental abruption in their next pregnancies[22].

Few women in our study who had caesarean delivery were dissatisfied with the antenatal care. Probably because these women presented some obstetric risk, they received greater attention. The literature states that the determinants of satisfaction with antenatal care are too complex to be studied because it not only includes clinical indications but also economic and organizational factors, the attitude of the physician in the management of labour, social and cultural attitudes of the woman herself. To be satisfied involves multiple objectives and subjective aspects [23] .

*Study limitations*

This is a cross-sectional study, so causality cannot be determined. A selection bias is present, since the maternity is not the typical place to deliver in Angola. Most women give birth at home with the help of traditional birth attendants or experienced women in the community, so our sample does not represent the experience of Angolan women in general, but only those who have a hospital birth. This also means that a large proportion of women, particularly those in a socioeconomically disadvantaged situation, are probably underrepresented. Also, women with severe conditions at delivery and multiple childbirth were excluded during the recruitment, which may lead to a selection bias, once we could have excluded women with the different socioeconomic profile.

 The institutional coverage of births is very low. It is estimated that 69% of pregnant women visiting a health facility at least one time in some point in pregnancy [24]. Moreover, according to WHO data in 2012, only 49% of births were attended by skilled personnel in Angola[12].

Conclusion

Sociodemographic differences were observed according to the type of delivery. Cesarean was more prevalent among women with lower income and residents in periurban areas.

Antenatal care should be available to everyone, the equipping of health services in the periphery and availability of skilled human resources should exist to give responses to cesarean deliveries on site, thus avoiding increasing the number of cases. The improvement of the socioeconomic condition of the population is an aspect to take into account that may benefit the health of this population. Further studies exploring the delivery experience, among women who gave birth at home, with no help from a health professional, would contribute to a more comprehensive understanding of the maternal health care in the Angola context.

# Competing interests

The authors declare that they have no competing interests.

# Author’s contributions

TN participated in the study design, drafted the manuscript and participated in analysis and interpretation of data, and reviewed the manuscript for important intellectual content. DC participated in analysis and interpretation of data, and reviewed the manuscript for important intellectual content. PC participated in the study design and reviewed the manuscript for important intellectual content. HB conceived the study and participated in the design, analysis and the interpretation of data, and reviewed the manuscript for important intellectual content.

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# References

1. UNICEF, U.N., *The millennium development goals report*. 2015, UN New York.

2. Zhao, Y., et al., *Increases in Caesarean Delivery Rates and Change of Perinatal Outcomes in Low- and Middle-Income Countries: A Hospital-Level Analysis of Two WHO Surveys.* Paediatric and Perinatal Epidemiology, 2017. **31**(4): p. 251-262.

3. Betrán, A.P., et al., *The Increasing Trend in Caesarean Section Rates: Global, Regional and National Estimates: 1990-2014.* PLOS ONE, 2016. **11**(2): p. e0148343.

4. World Health Organization, W.H.O., *WHO statement on caesarean section rates. 2015.* Geneva, Switzerland: WHO, 2015.

5. Betrán, A.P., et al., *Interventions to reduce unnecessary caesarean sections in healthy women and babies.* The Lancet, 2018. **392**(10155): p. 1358-1368.

6. Stanton, C., C. Ronsmans, and B.G.o. Cesarean, *Recommendations for routine reporting on indications for cesarean delivery in developing countries.* Birth, 2008. **35**(3): p. 204-211.

7. Tollanes Mette C, et al., *Cesarean section and maternal education; secular trends in Norway, 19672004.* Acta Obstetricia et Gynecologica, 2007. **86**: p. 840-848.

8. Nguyen, M.T., L.B. McCullough, and F.A. Chervenak, *The importance of clinically and ethically fine-tuning decision-making about cesarean delivery.* Journal of perinatal medicine, 2017. **45**(5): p. 551-557.

9. Ye, J., et al., *Searching for the Optimal Rate of Medically Necessary Cesarean Delivery.* Birth, 2014. **41**(3): p. 237-244.

10. Soto-Vega, E., et al., *Rising Trends of Cesarean Section Worldwide: A Systematic Review.* Obstet Gynecol Int J, 2015. **3**(2): p. 00073.

11. Queza, A.J., *Sistema de saúde em Angola: Uma proposta à luz da reforma do serviço nacional de saúde em Portugal.* Mestrado Integrado em Medicina, Universidade do Porto, 2009.

12. World Health Organization, *Relatório síntese sobre a situação financeira da saúde em Angola*. 2012, Ministério da Saúde: Tunis.

13. Angola, *Inquérito de Indicadores Múltiplos e de Saúde (IIMS) 2015-2016*. 2017, Instituto Nacional de Estatística e Ministério da Saúde: Luanda.

14. Tavares Hamilton dos Prazeres, T.S.B.M.P., Capingana Daniel Pires, Gama Silvana Granado Nogueira and Silva Luiz Guilherme Pessoa, *Obstetric, Sociodemographic, and Psychosocial Problems of Postpartum Adolescents of Huambo.* Clinical Medicine Insights: Women’s Health 2016. **9** p. 13-19.

15. Ronsmans, C., S. Holtz, and C. Stanton, *Socioeconomic differentials in caesarean rates in developing countries: a retrospective analysis.* The Lancet, 2006. **368**(9546): p. 1516-1523.

16. A Shah, et al., *Cesarean delivery outcomes from the WHO global survey on maternal and perinatal health in Africa.* Int J Gynaecol Obstet., 2009. **107**(3): p. 191-7.

17. Dumont, A., et al., *Caesarean section rate for maternal indication in sub-Saharan Africa: a systematic review.* The Lancet, 2001. **358**(9290): p. 1328-1333.

18. Landry Evelyn Landry, et al., *Assessing the quality of record keeping for cesarean deliveries: results from a multicenter retrospective record review in five low-income countries.* BMC Pregnancy and Childbirth, 2014. **14**: p. 139.

19. Penfield, C.A., M.P. Nageotte, and D.A. Wing, *346: Disparate rates of cesarean delivery in term nulliparous women with hypertensive disorders of pregnancy.* American Journal of Obstetrics and Gynecology, 2018. **218**(1, Supplement): p. S215.

20. Balachandran Lekshmi, Vaswani Poo ja R , and T.R. Mogo, *Pregnancy Outcome in Women with Previous One Cesarean Section.* Journal of Clinical and Diagnostic Research., 2014. **8**(2): p. 99-102.

21. OsavaI Ruth Hitomi, et al., *Cesarean sections in a birth center.* Rev Saúde Pública 2011. **45**((6)): p. 1036-43.

22. Getahun, D., et al., *Previous cesarean delivery and risks of placenta previa and placental abruption.* Obstet Gynecol, 2006. **107**(4): p. 771-8.

23. Alejandro., A., *Health reform and cesarean sections in the private sector: The experience of peru.* Health Policy, 2011. **99**: p. 124-130.

24. World Health Organization, W.H.O., *Estratégia de Cooperação da OMS 2015-2019 Angola*. 2016: Angola.

**Table 1:** Participants characteristics’ according to type of delivery.

|  |
| --- |
|  |
|  |  |  | **Vaginal** | **Cesarean** |  |
|  |  |  | **N=560** | **N=435** | **p-value\*** |
|  |  |  | **n (%)** | **n (%)** |
| ***Sociodemographic characteristics*** |   |   |   |   |
| **Maternal age (years)** |  |   |  |
|  | <18 |  | 65 (11.6) | 40 (9.2) | 0.096 |
|  | 18-34 |  | 431 (77.1) | 327 (75.3) |  |
|  | >=35  |  | 653 (11.3) | 67 (15.4) |  |
|  No information |  | 2 |
| **Woman education (years)** |  |  |  |
|  | <9 |  | 255 (45.9) | 249 (57.6) | **0.001** |
|  | 9-12 |  | 240 (43.2) | 141 (32.6) |  |
|  | >=12 |  | 60 (10.8) | 42 (9.7) |  |
|  No information |  | 8 |
| **Marital Status** |  |  |  |  |
|  | Married (or in cohabitation) |  | 417 (74.5) | 347 (79.8) | 0.059 |
|  | Single |  | 143 (25.5) | 88 (20.2) |  |
| **Place of residence** |  |  |  |  |
|  | Urban |  | 328 (58.9) | 178 (41.2) | **<0.001** |
|  | Periurban |  | 229 (41.1) | 254 (58.8) |  |
|  | No information |  | 6 |
| **Household Income (dollars)** |  |  |  |  |
|  | < 100 |  | 34 (6.2) | 50 (11.8) | **0.001** |
|  | 100-300 |  | 128 (23.4) | 126 (29.9) |  |
|  | > 300 |  | 175 (32.1) | 112 (26.5) |  |
|  | Do not know/ prefers not to disclose |  | 209 (38.3) | 134 (31.8) |  |
|  | No information |  | 27 |
| **Previous pregnancies and caesarean** |  |  |  | **<0.001** |
|  | Primiparous |  | 160 (28.6) | 121 (27.8) |
|  | Multiparous no c-section |  | 351 (62.7) | 170 (39.1) |
|  | Multiparous previous c-section |  | 49 (8.8) | 144 (33.1) |
| **Previous pregnancies and complications during last pregnancy**† |  |  |  |
|  | Primiparous |  | 160 (28.6) | 121 (27.8) | 0.026 |
|  | Multiparous no previous complication |  | 297 (53.0) | 204 (46.9) |  |
|  | Multiparous with previous complication |  | 103 (18.4) | 110 (25.3) |  |
| **Place of antenatal visits** |  |  |  |  |
|  | Private |  | 60 (10.8) | 45 (10.5) | 0.982 |
|  | Public |  | 496 (89.2) | 382 (89.5) |  |
|  | No information |  | 12 |  |  |
| **1st sexual relation (Years)** |  |  |  |  |
|  | < 15 |  | 52 (9.3) | 47 (10.8) | 0.189 |
|  | ≥ 15 |  | 476 (85.2) | 353 (81.1) |  |
|  | Does not know |  | 31 (5.5) | 35 (8.0) |  |
|  | No information |  | 1 |
| **Satisfaction in antenatal care** |  |  |  |  |
|  | No |  | 42 (7.7) | 17 (4.0) | **0.022** |
|  | Yes |  | 504 (92.3) | 413 (96.0) |  |
|  | No information |  | 19 |
| **First antenatal care visit** |  |  |  |  |
|  | 1st trimester |  | 280 (52.3) | 218 (52.4) | 0.831 |
|  | 2nd trimester |  | 233 (43.6) | 184 (44.2) |  |
|  | 3rd trimester |  | 22 (4.1) | 14 (3.4) |  |
|  | No information |  | 44 |  |  |
| **Frequency antenatal care visit** |  |  |  |  |
|  | < 2 |  | 31 (5.8) | 23 (5.8) | 0.262 |
|  | 2-4 |  | 299 (55.5) | 200 (50.3) |  |
|  | ≥ 5 |  | 209 (38.8) | 175 (44.0) |  |
|  | No information |  | 58 |
| **Hospitalization during pregnancy** |  |  |  |  |
|  | No |  | 526 (93.9) | 394 (90.6) | 0.062 |
|  | Yes |  | 34 (6.1) | 41 (9.4) |  |
| ***Current pregnancy complications*** |
| **Malaria** |  |  |  |  |
|  | No |  | 455 (81.2) | 363 (83.4) | 0.415 |
|  | Yes |  | 105 (18.8) | 72 (16.6) |  |
| **Urinary infection** |  |  |  |  |
|  | No |  | 356 (63.6) | 293 (67.4) | 0.239 |
|  | Yes |  | 204 (36.4) | 142 (32.4) |  |
| **Haemorrhage** |  |  |  |  |
|  | No |  | 527 (94.1) | 413 (94.9) | 0.666 |
|  | Yes |  | 33 (5.9) | 22 (5.1) |  |
| **Hypertensive Disorders** |  |  |  |  |
|  | No |  | 504 (90.0) | 364 (89.7) | **0.004** |
|  | Yes |  | 56 (10.0) | 71 (16.3) |  |
| **Threat abortion** |  |  |  |  |
|  | No |  | 533 (95.2) | 418 (96.1) | 0.589 |
|  | Yes |  | 27 (4.8) | 17 (3.9) |  |
| ***Lifestyle*** |
| **Smoking** |  |  |  |  |
|  | No |  | 559 (99.8) | 433 (99.5) | 0.584 |
|  | Yes |  | 1 (0.2) | 2 (0.5) |  |
| **Alcohol consumption** |  |  |  |  |
|  | No |  | 463 (82.7) | 346 (79.5) | 0.239 |
|   | Yes |   | 97 (17.3) | 89 (20.5) |   |

\*chi-square test; †Diseases or complications during the last pregnancy (categorized in yes or no, if the woman has been diagnosed with any of the following: diabetes, hypertension, urinary infection, hemorrhage or complications from obstetric causes including placenta praevia, open cervix and threat of abortion).

**Table 2:**  Association between sociodemographic characteristics and type of delivery

|  |  |
| --- | --- |
|  | **Type of delivery (vaginal vs. caesarean)** |
| **Primiparous****OR (95%CI)** | **Adjusted OR (95%CI)** | **Multiparous (95%CI)** | **Adjusted OR (95%CI)** |
| **Women education (years)** | <9 | 1.10 (0.50-2.44) | 0.79 (0.33-1.90) | 1.51 (0.90-2.53) | 1.10 (0.61-1.97) |
| 9-12 | 1.01 (0.46-2.24) | 0.78 (0.33-1.86) | 0.76 (0.44-1.30) | 0.63 (0.34-1.15) |
| >=12 | 1.00 | 1.00 | 1.00 | 1.00 |
| **Place of residence** | Urban | 1.00 | 1.00 | 1.00 | 1.00 |
| Periurban | 2.01 (1.24-3.25) | 2.14 (1.27-3.62) | 2.06 (1.53-2.79) | 1.78 (1.26-2.51) |
| **Family Income (dollars)** |  <100 | 2.26 (0.73-6.94) | 3.09 (0.94-10.21) | 2.31 (1.33-4.02) | 1.90 (1.00-3.60) |
| 100-300 | 1.97 (0.90- 4.33) | 2.06 (0.87-4.91) | 1.44 (0.98-2.11) | 1.21 (0.79-1.88) |
| >300  | 1.00 | 1.00 | 1.00 | 1.00 |
| other | 0.99 (0.51-1.92) | 1.08 (0.52-2.27) | 1.02 (0.69-1.50) | 0.83 (0.53-1.30) |
| **Satisfaction in antenatal care** | No | 0.42 (0.11-1.58) | 0.50 (0.13-1.99) | 0.51 (0.27-0.97) | 0.61 (0.30-1.24) |
| Yes | 1.00 | 1.00 | 1.00 | 1.00 |
| **Hypertensive Disorders (current pregnancy)** | No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 2.79 (1.25-6.26) | 3.96 (1.57-9.98) | 1.53 (1.00-2.34) | 1.68 (1.03-2.74) |
| **Previous caesarean**  | No |  |  | 1.00 | 1.00 |
| Yes |  |  | 6.07 (4.18-8.81) | 5.68 (3.82-8.46) |
| **Diseases or complications during the last pregnancy** | No |  |  | 1.00 | 1.00 |
| Yes |  |  | 1.56 (1.13-2.15) | 1.20 (0.83-1.75) |

OR (95%CI) = Odds ratio (95% Confidence Interval); \*adjusted for all variables listed except previous caesarean and diseases during last pregnancy; \*\*adjusted for all variables listed; †Diseases or complications during the last pregnancy (categorized in yes or no, if the woman has been diagnosed with any of the following: diabetes, hypertension, urinary infection, hemorrhage or complications from obstetric causes including placenta praevia, open cervix and threat of abortion).

**Supplementary Table 1**: Association between sociodemographic characteristics and type of delivery.

|  |  |
| --- | --- |
|  | **Type of delivery (vaginal vs. caesarean)****OR (95%CI)** |
|  | **Model 0** | **Model 1** | **Model 2** |
| **Women education (years)** | <9 | 1.39 (0.91-2.15) | 1.11 (0.68-1.81) | 1.12 (0.62-2.02) |
| 9-12 | 0.84 (0.54-1.31) | 0.80 (0.49-1.31) | 0.54 (0.29-1.00) |
| >=12 | 1.00 | 1.00 | 1.00 |
| **Place of residence** | Urban | 1.00 | 1.00 | 1.00 |
| Periurban | 2.04 (1.58-2.64) | 1.93 (1.47-2.53) | 1.69 (1.17-2.46) |
| **Family Income (dollars)** |  <100 | 2.30 (1.40-3.77) | 2.06 (1.23-3.47) | 1.92 (0.95-3.89) |
| 100-300 | 1.54 (1.09- 2.16) | 1.42 (0.99-2.04) | 1.08 (0.68-1.74) |
| >300  | 1.00 | 1.00 | 1.00 |
| other | 1.00 (0.73-1.38) | 0.89 (0.64 - 1.26) | 0.70 (0.44-1.13) |
| **Satisfaction in antenatal care** | No | 0.52 (0.30-0.92) | 0.52 (0.29-0.93)1.00 | 0.35 (0.15-0.78) |
| Yes | 1.00 |  | 1.00 |
| **Hypertensive Disorders (current pregnancy)** | No | 1.001.73 (1.17-2.54) | 1.001.75 (1.16 - 2.66) | 11.35 (0.84-2.17) |
| **Women education\*Primiparous** | <99-12>=12 |  |  | 0.43 (0.16-1-14)0.69 (0.26-1.79)1.00 |
| **Place of residence\*Primiparous** | UrbanPeriurban |  |  | 1.001.20 (0.59-2.45) |
| **Family income\*Primiparous** |  <100100-300>300other |  |  | 1.07 (2.33-4.94) 1.54 (0.51-4.66) 1.001.66 (0.33-8.41) |
| **Hipertensive disorders\*Primiparous** | NoYes |  |  | 1.003.17 (1.11-9.09) |

OR (95%CI) = Odds ratio (95% Confidence Interval); Model 0= crude; Model 1=adjusted for all variables listed; Model 2= includes interaction primiparous/multiparous X independent variables.