Maternal and Child Health Journal (2023) 27:2091–2098
https://doi.org/10.1007/s10995-023-03782-6

BRIEF REPORT

Maternal Profiles and Pregnancy Outcomes: A Descriptive Cross-Sectional Study from Angola

Dinamene Oliveira[1] · José Martinez de Oliveira[2] · Maria do Rosário Martins[1] · Maria Rosalina Barroso[3] · Rita Castro[1] · Lemuel Cordeiro[4] · Filomena Pereira[1]

Accepted: 26 September 2023 / Published online: 10 October 2023

Abstract

Objectives To characterize pregnant women admitted to Irene Neto Maternity Hospital, Lubango city, Huíla province, and their pregnancy outcomes.

Methods We conducted a descriptive cross-sectional facility-based survey between October 2016 and September 2017, involving 500 pregnant women, followed from admission in labor until the end of delivery. Mean (SD) was computed for quantitative variables, while relative and absolute frequencies were determined for categorical variables. Additionally, confidence intervals were estimated.

Results Among pregnant women 18.3% were adolescents (≤ 19 years) and 14.5% had advanced maternal age (≥ 35 years). Illiteracy was reported by 8.2%. One in three (33.6%) had a short stature (< 1.55 m). Malaria was the most frequent infection during pregnancy (16.3%). Upon admission, 18.1% were anemic (Hb < 11 g/dl) and 36.0% had hypertension (SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg), contrasting with the few cases reported of chronic hypertension and pregnancy-induced hypertension. There were 15 twin pregnancies. Cesarean section was performed in 25.2% of the women, although there was no medical indication for 23.0% of women having cesareans. Two maternal deaths occurred in our sample. Among live births from singleton pregnancies (97.1%), birth asphyxia (Apgar < 7 at 5 min) was observed in 22.7% and 10.3% had low birth weight (< 2.5 kg).

Conclusions There are very few studies reporting pregnancy outcomes in Angola. This analysis presents data from Huíla province, the second most populous province. We identified characteristics for higher risk of adverse pregnancy outcomes: adolescence, illiteracy, and short stature. Among newborn outcomes, birth asphyxia and low birth weight demand special attention. Further research is needed to explore the non-medical indications for cesarean section and to better understand the twinning rate in Lubango.

Significance

The significance of this paper is that it is one of the very few reports contributing for the knowledge of detailed maternal, obstetric and newborn outcomes in Angolan women. Although our study only addresses the outcomes descriptively, it can be used as a first step in monitoring and improving outcomes of Angolan women. Maternal and child health is a key issue to address sustainable development in Angola.

Keywords Angola · Maternal characteristics · Pregnancy outcomes

✉ Dinamene Oliveira
odinamene@gmail.com

[1] Global Health and Tropical Medicine, Instituto de Higiene e Medicina Tropical-Universidade Nova de Lisboa, Lisboa, Portugal

[2] Health Sciences Faculty, Universidade da Beira Interior, Covilhã, Portugal

[3] Unidade de Cuidados Intensivos Neonatais, Hospital Professor Doutor Fernando Fonseca, Amadora, Portugal

[4] Gabinete de Ensino, Pesquisa e Pós-graduação, Clínica Girassol, Luanda, Angola

Introduction

Maternal health is a key issue to sustainable development (Graham et al., 2016). Maternal and infant mortality are indicators of a country's social and economic development, and also reflect how women and children are valued, and how human rights are respected (Nimi et al., 2016). Monitoring maternal mortality, stillbirths, and neonatal mortality is part of the global health and development agenda. While mortality data is often monitored, maternal and neonatal morbidity data is scarce (Moller et al., 2019). Angola´s maternal and child mortality rates are among the highest in the world (U.S. Agency for International Development, 2019). In 2015, maternal mortality ratio and stillbirth and neonatal mortality rates were estimated to be 514.3 per 100,000 live births, 26.9 per 1,000 live births and 23.5 per 1,000 live births, respectively (GBD 2015 Maternal Mortality Collaborators, 2016; GBD 2015 Child Mortality Collaborators, 2016). Undoubtedly, higher numbers exist for morbidity.

There are very few recent studies addressing detailed maternal, obstetric, and newborn outcomes of Angolan women (Nimi et al., 2016, 2019; Umar & Kabamba, 2016; Rosário et al., 2019). Monitoring and evaluating data at country, district, and facility levels are essential to track progress and support decentralized planning (Moller et al., 2018). The aim of the present study is to characterize pregnant women admitted to Irene Neto Maternity (INM), Lubango city, Huíla province, Angola, and to describe their pregnancy outcomes.

Methods

Study Design, Setting and Participants

An observational, descriptive, cross-sectional facility-based survey was conducted among 500 pregnant women admitted to INM, from October 2016 to September 2017 (Oliveira et al., 2020a). As previously described (Oliveira et al., 2020a), the study population was 15,126 childbirths, based in the 2014 INM statistics (N). Sample size was estimated using the following formula $n \geq NZ^2P(1 - P)/d^2(N - 1) + Z^2P(1 - P)$: n is the required sample size; Z (0.975 quantile of a normal distribution for a CI of 95%) = 1.96; P the estimated prevalence of the studied infections from previous studies in Angola = 0.3; precision (margin error) d is equal to 0.04; 488 pregnant women was the estimated minimum size sample. Women were proportionally included per month, according to population stratification, and using consecutive sampling to select who would be observed. INM is the reference provincial maternity hospital in Huíla, the second most populous province of Angola. In Huíla, there are other maternity hospitals and several health centres, where only vaginal births can take place. In this province, only 30% of births occur in a health facility (INE, MINSA, MINPLAN and ICF 2017). Antenatal care (ANC) of the studied pregnant women was previously characterized (Oliveira et al., 2020b). A questionnaire was developed for this study, including maternal characteristics and maternal, obstetric, and newborn outcomes (see supplementary material).

Data Collection

Pregnancy cards were consulted whenever available and pregnant women were interviewed to collect data on sociodemographic characteristics (age, education, area of residence), alcohol and tobacco use, obstetric and pathological history, consanguinity, and outcomes during their current pregnancy. Pregnant women with 19 or less years of age were considered adolescents, while when 35 years or more were considered as having advanced maternal age (WHO, 2020; Lean et al., 2017). Rural or urban residence was determined as previously described (Oliveira et al., 2020b). Regarding obstetric history, miscarriages, stillbirths, and preterm births were not reported due to missing data on gestational age, which made it impossible to classify the occurrence of these outcomes.

At admission in labor, pregnant women´s height (Microtoise Heightmeter Rollmessband, Comed, France), blood pressure (Blood Pressure Monitor BU 535, Medisana GmbH, Deutschland), capillary glycemia (MediTouch, Medisana AG, Germany), hemoglobin level (HemoCue® Hb 301 System, HemoCue AB, Sweden) and temperature (Infrared Thermometer TM 750, Medisana AG, Deutschland) were evaluated. To our knowledge, cut-offs for Angolan women's height are not defined. We reduced to three (short stature < 1.55 m, average height 1.55–1.59 m and tall stature ≥ 1.60 m), the six cut-offs previously defined in a study that used the most recent Demographic and Health Survey (DHS) for 34 countries from Sub-Saharan Africa (SSA) (Arendt et al., 2018). Hypertension was defined as a systolic blood pressure (BP) ≥ 140 mmHg and/or a diastolic BP ≥ 90 mmHg (Berhe et al., 2020). According to manufacturer's instructions for interpretation of capillary glycemia of adults that had not fasted, a value ≥ 140 mg/dL was considered hyperglycemia. Women were considered anemic (hemoglobin level < 11 g/dl) or non-anemic (≥ 11 g/dl), the first ones being classified as having mild (10.0-10.9 g/dl), moderate (7.0-9.9 g/dl) or severe anemia (< 7.0 g/dl), according to the WHO reference values for pregnant women adjusted for the altitude (WHO, 2011a), as Lubango is 1786 m above sea level. It is important to highlight the absence of information on existing haemoglobinopathies and that a screening for

malaria was not performed at admission in labor. Fever was defined as a temperature ≥ 38ºC (Towers et al., 2017).

Data on obstetric and newborn outcomes of each pregnant woman were collected through the follow-up from admission in labor until the end of delivery, in collaboration with the midwife and the doctor that were assisting her. As in Angola there is not a norm to classify medical indications for cesarean section (CS), we decided to use the Portuguese norm for registration of CS indications (DGS 2015). Regarding newborn data, birth asphyxia (BA) was defined as an Apgar score < 7 at 5 min (Wosenu et al., 2018). Resuscitation included at least one of the following procedures: oxygen administration, insufflations by self-inflating bag-mask device and chest compressions. For newborn weight evaluation, a Digital Baby Scale Seca 354 (Seca gmbh & co. kg, Germany) was used. A birth weight < 2.5 kg and ≥ 4 kg was considered low birth weight (LBW) and macrosomia, respectively (WHO, 2014; ACOG 2020). As the result of an ultrasound scan at the end of the first trimester of pregnancy, a reliable menstrual history or data on serial fundal height measurements during ANC was not available for every pregnant woman, the occurrence of preterm birth (PB) was not possible to be determined.

Table 1 Maternal characteristics

Variable		Value*
Age (years), n = 491		26.1 (6.6)
	≤ 19	18.3 (90)
	20–34	67.2 (330)
	≥ 35	14.5 (71)
Formal education (years), n = 499		8.0 (4.0)
	Illiteracy	8.2 (41)
Area of residence, n = 500		
	Urban	86.6 (433)
	Rural	13.4 (67)
Height (m), n = 321		
	Short stature (< 1.55 m)	33.6 (108)
	Average height (1.55–1.59 m)	31.5 (101)
	Tall stature (≥ 1.60 m)	34.9 (112)
Alcohol use, n = 499		9.4 (47)
Tobacco use, n = 499		0.0 (0)
Gravidity, n = 498		
	Nulliparous primigravida	25.7 (128)
	2nd − 4th pregnancy	48.0 (239)
	≥ 5th pregnancy	26.3 (131)
History of ectopic pregnancy, n = 370		1.1 (4)
Previous cesarean section (at least once), n = 371		19.9 (74)
History of neonatal death, n = 359		2.5 (9)
Consanguinity, n = 498		6.6 (33)
Chronic hypertension, n = 498		1.2 (6)
Pregestational diabetes, n = 498		0.2 (1)

*Values are given as mean (SD) or percentage (number)

Data Analysis

Mean (standard deviation) was computed to characterize quantitative variables, while relative and absolute frequencies were determined for categorical variables. Analyses were performed with the Statistical Package for Social Science version 26 (IBM, Armonk, NY, USA). Confidence intervals were estimated at a level of 95% (Wilson method by EpiTools).

Ethical Considerations

Pregnant women had to sign an informed consent form to be included in this study, which was approved by the Angola Ethics Committee (reference 35/2017). Whenever they could not read or write, pregnant women's fingerprints and witness signatures were required, after informed consent was read aloud. If Portuguese was not understood and/or spoken, a local nurse acted as an interpreter and if younger than 18 years of age, parents/guardians consent was also requested.

Results

The mean (SD) age of the pregnant women was 26.1 (6.6), ranging from 13 to 48 years (Table 1). Regarding age groups, 18.3% (90/491) were adolescents and 14.5% (71/491) had advanced maternal age. Illiteracy was reported by 8.2% (41/499) of the women and the majority (86.6%, 433/500) was residing in an urban area. A short stature was observed in 33.6% (108/321). None reported tobacco use, and 9.4% (47/499) assumed alcohol use. Almost 74% of the pregnant women (74.3%, 370/498) had been pregnant between two to 12 times and among women with a previous pregnancy, approximately two in every ten had a previous CS (19.9%, 74/371). Consanguinity was observed in 6.6% (33/498) of the pregnant women, including half-brother, first cousin, uncle and great uncle. Chronic hypertension was referred by six women and one reported pregestational diabetes.

Malaria was the most frequent infection during pregnancy (16.3%, 81/498, Table 2), followed by urinary tract infection (11.4%, 57/498) and typhoid (3.2%, 16/498). Pregnancy-induced hypertension (PIH) was detected in six pregnant women, while none was diagnosed with gestational diabetes. At admission in labor, 36.0% (178/494) of the pregnant women were hypertensive and 18.1% (90/497) anemic, mostly mild (10.3%, 51/497) and moderate (7.4%, 37/497).

Table 2 Maternal outcomes

Outcomes			% (n)	95% CI*
During pregnancy, n = 498				
	Malaria		16.3 (81)	13.3–19.8
	Urinary tract infection		11.4 (57)	9.0-14.5
	Typhoid fever		3.2 (16)	NA
	Pregnancy-induced hypertension		1.2 (6)	NA
	Anemia		1.2 (6)	NA
	Antepartum hemorrhage		0.6 (3)	NA
	Gestational diabetes		0.0 (0)	NA
	Hospitalization		3.8 (19)	NA
At admission in labor				
	Hypertension, n = 494		36.0 (178)	31.9–40.4
	Hyperglycemia, n = 498		2.2 (11)	NA
	Anemia, n = 497		18.1 (90)	15.0-21.7
		Mild	10.3 (51)	7.9–13.2
		Moderate	7.4 (37)	5.5–10.1
		Severe	0.4 (2)	NA
	Fever, n = 498		0.0 (0)	NA

*Confidence intervals were estimated only for relative frequencies ≥ 30

Table 3 Obstetric outcomes

Outcomes		% (n)	95% CI*
Twin pregnancies, n = 500		3.0 (15)	NA
Amniotic fluid, n = 500			
	Meconium-stained	25.0 (125)	21.4–29.0
	Foul-smelling	1.0 (5)	NA
	Meconium-stained and foul-smelling	0.8 (4)	NA
Vaginal birth complications, n = 374			
	Vaginal/perineal laceration	13.4 (50)	10.3–17.2
	Syncope	1.1 (4)	NA
	Intrapartum hemorrhage	1.1 (4)	NA
	Fever	0.5 (2)	NA
	Retained placenta	0.5 (2)	NA
	Premature rupture of membranes	0.5 (2)	NA
	Hypotension	0.3 (1)	NA
Cesarean section (CS), n = 500		25.2 (126)	21.6–29.2
	Medical indication, n = 126	77.0 (97)	69.0-83.5
	Previous uterine surgery (two or more previous CS)	23.0 (29)	NA
	Fetal distress	19.8 (25)	NA
	Abnormal fetal lie or malpresentation	10.3 (13)	NA
	Multiple pregnancy	9.5 (12)	NA
	Failed induction of labor	9.5 (12)	NA
	Suspected cephalo-pelvic disproportion	1.6 (2)	NA
	Prolonged labor	1.6 (2)	NA
	Maternal disease	0.8 (1)	NA
	Maternal disorder related to pregnancy	0.8 (1)	NA
	Non-medical indication, n = 126	23.0 (29)	NA
	One previous CS	12.7 (16)	NA
	Other	10.3 (13)	NA
Maternal Death, n = 500		0.4 (2)	NA

*Confidence intervals were estimated only for relative frequencies ≥ 30

There were 15 twin pregnancies among the 500 pregnant women (3.0%, Table 3). Meconium-stained amniotic fluid was detected in 25.8% (129/500), with a vaginal breech birth in 1.4%. Vaginal/perineal laceration was the most frequent complication of vaginal birth (13.4%, 50/374). CS was performed in 25.2% (126/500) of the women, the most frequent medical indication being two or more previous CS (23.0%, 29/126), followed by fetal distress (19.8%, 25/126), abnormal fetal lie or malpresentation (10.3%, 13/126), multiple pregnancy (9.5%, 12/126) and failed induction of labor (9.5%, 12/126). According to the norm that we used to classify its medical indications, in 23.0% (29/126) of the pregnant women a medical indication was not identified, including 12.7% (16/126) that had one previous CS. Two maternal deaths occurred in our sample. The suspected causes of death were acute pulmonary edema during surgery and amniotic fluid embolism after vaginal birth.

Stillbirth occurred in 2.9% (14/485, Table 4) of the singleton pregnancies. Among live births (97.1%), BA was observed in 22.7% (107/471) and resuscitation was performed in 8.5% (40/471). One in every ten newborns (10.3%, 50/485) and 4.1% (20/485) had LBW and macrosomia, respectively.

Discussion

Maternal and child morbidity and mortality remain high in Angola, with very few recent studies addressing detailed maternal, obstetric, and newborn outcomes in Angolan women (Nimi et al., 2016, 2019; Umar & Kabamba, 2016; Rosário et al., 2019). This evidence should be used to drive decision making and accountability nationwide, from the lower to the highest level with respect to health.

In this study, 18.3% of the pregnant women were adolescents. Low and middle-income countries host the majority of adolescent births (WHO, 2019), with a systematic review and meta-analysis estimating an adolescent pregnancy prevalence of 19.3% in SSA (Kassa et al., 2018). A study conducted in 29 countries from Africa, Latin America, Asia and Middle East showed higher risks of adverse pregnancy outcomes in adolescent mothers, namely eclampsia, puerperal

Table 4 Newborn outcomes (singleton pregnancies)

Outcomes		% (n)	95% CI*
Sex, n = 484			
	Female	48.1 (233)	43.7–52.6
	Male	51.9 (251)	47.4–56.3
Stillbirth, n = 485		2.9 (14)	NA
Birth asphyxia, n = 471		22.7 (107)	19.2–26.7
Resuscitation, n = 471		8.5 (40)	6.3–11.4
Low birth weight, n = 485		10.3 (50)	7.9–13.3
Macrosomia, n = 485		4.1 (20)	NA
Signs and symptoms, n = 485			
	Pallor	1.0 (5)	NA
	Hepatosplenomegaly	0.6 (3)	NA
	Suffusions	0.6 (3)	NA
	Jaundice	0.4 (2)	NA
	Anasarca	0.2 (1)	NA
Congenital malformations, n = 485			
	Genital birth defect (underdeveloped male genitals)	0.2 (1)	NA
	Cleft lip	0.2 (1)	NA
	Clubfoot	0.2 (1)	NA

*Confidence intervals were estimated only for relative frequencies ≥ 30

endometritis, systemic infections, LBW, PB and severe neonatal conditions (Ganchimeg et al., 2014).

Illiteracy was reported by 8.2% of the studied pregnant women, which could lead to a higher number of adverse pregnancy outcomes. Education is a structural determinant of health, with specific interpretations that explain its association with health outcomes: education reflects material, intellectual and other resources of the family of origin and is also a strong determinant of future employment and income (WHO, 2010). On the other hand, knowledge and skills attained through education make people more receptive to health education messages or better enable them to communicate with and to access appropriate health services (WHO, 2010). In previous studies conducted in Angola, women with lower education were less likely to use maternal health care (Rosário et al., 2019; Shibre et al., 2020) and their children experienced a higher risk of neonatal and infant death (Shibre, 2020; Yaya et al., 2020).

One in three pregnant women had a short stature. Maternal stature is a cumulative outcome of environmental exposures from fetal to adult life, involving nutritional, infectious, sociocultural and economic influences (Christian, 2010). In a study that used data of the most recent DHS for 34 countries from SSA, short stature was associated with an increased prevalence of CS and neonatal mortality (Arendt et al., 2018).

Malaria was the most frequent infection during pregnancy (16.3%). This is in accordance with previous studies conducted in Luanda province, Angola, that highlighted the high prevalence of malaria in pregnant women (Valente et al., 2011; Campos et al., 2012). It is known that maternal malaria is associated with adverse birth outcomes, including LBW and PB (Tshotetsi et al., 2019). A study that took place in a regional maternity in the Kuando Kubango province, Angola, revealed that malaria accounted for 14% of all maternal deaths (Umar & Kabamba, 2016).

At admission in labor, hypertension was frequent among studied pregnant women (36.0%), in contrast with the reported few cases of chronic hypertension and PIH, which may indicate an antenatal subdiagnosis of hypertension. Hypertensive disorders are major cause of severe morbidity, long-term disability and death among both mothers and their babies, being responsible for nearly one tenth of all maternal deaths in Africa (WHO, 2011b). Additionally, the development of a hypertensive pregnancy, especially preeclampsia, increases future risks for cardiovascular and renal diseases (Reddy & Jim, 2019). In a study from Ethiopia, women with PIH gave birth to babies with a higher risk of LBW, BA, small for gestational age (SGA), PB, stillbirth, admission to neonatal intensive care unit and perinatal death, compared to normotensive pregnant women (Berhe et al., 2020).

There were 15 twin pregnancies among the 500 studied pregnant women, which may indicate a very high twinning rate in Lubango. Very high twinning rates of above 18 per 1,000 are found in most Central-African countries (Smits & Monden, 2011). If the high twinning rate found in this study would prove more common in Lubango city, it would imply an additional maternal and newborn health challenge, as the risk of complications and adverse pregnancy outcomes is higher in women and fetuses of a multiple pregnancy when compared with a singleton pregnancy (Dodd & Crowther, 2005).

CS can effectively prevent maternal and newborn mortality when used for medically indicated reasons, but is associated with short and long-term risks that affect women and child health and future pregnancies, beyond substantial costs (WHO, 2018). CS was performed in 25.2% of our sample, a value below the 44.0% reported in a study that took place in Lucrécia Paím Maternity Hospital, the national reference centre for maternal health care located in Luanda (Nimi et al., 2019). Both prevalences are overrated, as women giving birth at home were not included, which is very frequent in Angola. It is known that to establish if CS prevalence in a population is appropriate, one should focus on the life-threatening causes for the mother and child (Belizán et al., 2018). The challenge is to reduce unnecessary CSs and retain those that are needed to save lives and decrease morbidity (Lundgren et al., 2015). In 23.0% of the

studied pregnant women submitted to CS, a medical indication for it was not identified, namely the 12.7% that only had one previous CS. In the 1970s, the following dogma used to be said: "once a cesarean always a cesarean" (Christmann-Schmid et al., 2016). Currently it is recognized that, after one previous CS, pregnant women can deliver by elective repeat CS or have a labor trial which can end in a vaginal birth or an unplanned CS (Vankan et al., 2019).

In the Angola's Multiple and Health Indicators Survey 2015–2016 the global national maternal mortality ratio was estimated to be 2.39 per 1,000 live births (INE, MINSA, MINPLAN and ICF 2017). Two maternal deaths occurred in our sample of 500 women, which may indicate a higher maternal mortality ratio in Lubango. Although, it is important to acknowledge that this study was not designed to assess the referred indicator, limiting a possible direct comparison between the two values.

Among studied live births from singleton pregnancies, BA was observed in 22.7% and one in every ten (10.3%) had LBW. Perinatal asphyxia accounts for 34% of all neonatal deaths in SSA (AMANHI Mortality Study Group 2018). The LBW prevalence found in the present study is in line with findings of previous ones from other African countries (He et al., 2018). In cases of LBW, there are two possible pathways: babies can be born preterm or they can be SGA (Tshotetsi et al., 2019). In low and middle-income countries, relative risks for preterm were 6.8 for neonatal mortality and 2.5 for post-neonatal mortality, while relative risks for babies who were SGA were 1.8 for neonatal mortality and 1.9 for post-neonatal mortality (Katz et al., 2013).

The main limitation of this study was the absence of data on gestational age that did not allow assessing the occurrence of PB, the major cause of neonatal morbidity and mortality worldwide (Menon et al., 2019), especially in countries like Angola, where the availability of adequate neonatal intensive care is very limited.

Although this study only addresses the maternal characteristics and pregnancy outcomes descriptively, it is one of the few reports contributing for the knowledge of maternal, obstetric and newborn outcomes in Angolan women. It can be used as a first step in monitoring and improving outcomes of women assisted in INM.

Conclusions and Recommendations

We identified characteristics of pregnant women that could put them in a higher risk of adverse pregnancy outcomes, namely adolescence, illiteracy, and short stature. An antenatal subdiagnosis of hypertensive disorders was revealed. Among newborn outcomes, BA and LBW demand special attention. Further research is needed to explore non-medical indications for CS and twinning rate in Lubango. These findings are actionable knowledge that needs to be delivered to policies makers to be incorporated in public health standards, priorities and policies in an innovative, integrated and sustainable fashion, in order to promote maternal and child health in Angola.

Authors' Contributions DO, FP, MRM, RC and MRB designed the research; DO collected the data; DO, MRM and JMO analysed the data; DO and FP wrote the paper; all authors commented on previous versions of the manuscript; all authors approved the final version.

Funding The Calouste Gulbenkian Foundation, Lisbon, Portugal, supported this work through a scholarship assigned to the corresponding author [grant number 135499].

Data Availability All relevant data are within the manuscript.

Code Availability Not applicable.

Declarations

Conflicts of interest The authors declare that they have no conflict of interest.

Ethics Approval The Angola Ethics Committee (reference 35/2017) approved this study.

Consent to Participate Pregnant women had to sign an informed consent form to be included in this study.

Consent for Publication Not applicable.

References

Alliance for Maternal and Newborn Health Improvement (AMANHI) Mortality Study Group. (2018). Population-based rates, timing, and causes of maternal deaths, stillbirths, and neonatal deaths in South Asia and sub-saharan Africa: A multi-country prospective cohort study. *Lancet Glob Health*, *6*(12), e1297–e1308.

American College of Obstetricians and Gynecologists (ACOG). (2020). Macrosomia: ACOG Practice Bulletin, Number 216. *Obstetrics and Gynecology*, *135*(1), e18–e35.

Arendt, E., Singh, N. S., & Campbell, O. M. R. (2018). Effect of maternal height on caesarean section and neonatal mortality rates in sub-saharan Africa: An analysis of 34 national datasets. *PLoS One*, *13*(2), https://doi.org/10.1371/journal.pone.0192167.

Belizán, J. M., Minckas, N., McClure, E. M., Saleem, S., Moore, J. L., Goudar, S. S., et al. (2018). An approach to identify a minimum and rational proportion of caesarean sections in resource-poor settings: A global network study. *Lancet Glob Health*, *6*(8), e894–e901.

Berhe, A. K., Ilesanmi, A. O., Aimakhu, C. O., & Mulugeta, A. (2020). Effect of pregnancy induced hypertension on adverse perinatal outcomes in Tigray regional state, Ethiopia: A prospective cohort study. *Bmc Pregnancy and Childbirth*, *20*(7), https://doi.org/10.1186/s12884-019-2708-6.

Campos, P. A., Valente, B., Campos, R. B., Gonçalves, L., Rosário, V. E., Varandas, L., et al. (2012). Plasmodium falciparum infection in pregnant women attending antenatal care in Luanda, Angola.

Revista Da Sociedade Brasileira De Medicina Tropical, *45*(3), 369–374.

Christian, P. (2010). Maternal height and risk of child mortality and undernutrition. *Journal of the American Medical Association*, *303*(15), 1539–1540.

Christmann-Schmid, C., Raio, L., Scheibner, K., Müller, M., & Surbek, D. (2016). Back to ''once a caesarean: Always a caesarean''? A trend analysis in Switzerland. *Archives of Gynecology and Obstetrics*, *294*(5), 905–910.

Direção-Geral da Saúde (DGS). (2015). *Norma nº 001/2015 de 19/01/2015: Registo de indicações de cesariana*. DGS.

Dodd, J. M., & Crowther, C. A. (2005). Evidence-based care of women with a multiple pregnancy. *Best Pract Res Clin Obstet Gynaecol*, *19*(1), 131–153.

Ganchimeg, T., Ota, E., Morisaki, N., Laopaiboon, M., Lumbiganon, P., Zhang, J., et al. (2014). Pregnancy and childbirth outcomes among adolescent mothers: A World Health Organization multicountry study. *Bjog*, *121*(Suppl. 1), 40–48.

GBD 2015 Child Mortality Collaborators. (2016). Global, regional, national, and selected subnational levels of stillbirths, neonatal, infant, and under-5 mortality, 1980–2015: A systematic analysis for the global burden of Disease Study 2015. *Lancet*, *388*(10053), 1725–1774.

GBD 2015 Maternal Mortality Collaborators. (2016). Global, regional, and national levels of maternal mortality, 1990–2015: A systematic analysis for the global burden of Disease Study 2015. *Lancet*, *388*(10053), 1775–1812.

Graham, W., Woodd, S., Byass, P., Filippi, V., Gon, G., Virgo, S., et al. (2016). Diversity and divergence: The dynamic burden of poor maternal health. *Lancet*, *388*(10056), 2164–2175.

He, Z., Bishwajit, G., Yaya, S., Cheng, Z., Zou, D., & Zhou, Y. (2018). Prevalence of low birth weight and its association with maternal body weight status in selected countries in Africa: A cross-sectional study. *British Medical Journal Open*, *8*(8), https://doi.org/10.1136/bmjopen-2017-020410.

Instituto Nacional de Estatística (INE), Ministério da Saúde (MINSA), Ministério do Planeamento e do Desenvolvimento Territorial (MINPLAN), ICF. (2017). *Inquérito de Indicadores Múltiplos e de Saúde em Angola 2015–2016*. Luanda and Rockville.

Kassa, G. M., Arowojolu, A. O., Odukogbe, A. A., & Yalew, A. W. (2018). Prevalence and determinants of adolescent pregnancy in Africa: A systematic review and Meta-analysis. *Reprod Health*, *15*(195), https://doi.org/10.1186/s12978-018-0640-2.

Katz, J., Lee, A. C. C., Kozuki, N., Lawn, J. E., Cousens, S., Blencowe, H., et al. (2013). Mortality risk in preterm and small-for-gestational-age infants in low-income and middle-income countries: A pooled country analysis. *Lancet*, *382*(9890), 417–425.

Lean, S. C., Derricott, H., Jones, R. L., & Heazell, A. E. P. (2017). Advanced maternal age and adverse pregnancy outcomes: A systematic review and meta-analysis. *PLoS One*, *12*(10), https://doi.org/10.1371/journal.pone.0186287.

Lundgren, I., Smith, V., Nilsson, C., Vehvilainen-Julkunen, K., Nicoletti, J., Devane, D., et al. (2015). Clinician-centred interventions to increase vaginal birth after caesarean section (VBAC): A systematic review. *Bmc Pregnancy and Childbirth*, *15*(16), https://doi.org/10.1186/s12884-015-0441-3.

Menon, R., Williams, S. M., & Lamont, R. F. (2019). Research to achieve a reduction in the global rate of preterm birth needs attention: Preface to the special issue by the Preterm Birth International Collaborative (PREBIC). *Placenta*, *79*, 1–2.

Moller, A. B., Newby, H., Hanson, C., Morgan, A., El Arifeen, S., Chou, D., et al. (2018). Measures matter: A scoping review of maternal and newborn indicators. *PLoS One*, *13*(10), https://doi.org/10.1371/journal.pone.0204763.

Moller, A. B., Patten, J. H., Hanson, C., Morgan, A., Say, L., Diaz, T., et al. (2019). Monitoring maternal and newborn health outcomes globally: A brief history of key events and initiatives. *Tropical Medicine & International Health: Tm & Ih*, *24*(12), 1342–1368.

Nimi, T., Fraga, S., Costa, D., Campos, P., & Barros, H. (2016). Prenatal care and pregnancy outcomes: A cross-sectional study in Luanda, Angola. *International Journal of Gynaecology and Obstetrics*, *135*(Suppl 1), S72–S78.

Nimi, T., Costa, D., Campos, P., & Barros, H. (2019). Sociodemographic determinants of caesarean delivery in the Largest Public Maternity Hospital in Angola. *Acta Medica Portuguesa*, *32*(6), 434–440.

Oliveira, D., Martins, M. R., Castro, R., Cordeiro, L., Barroso, M. R., Nazaré, M. A., et al. (2020a). Seropositivity rate and sociodemographic factors associated to HIV, HBV, HCV and syphilis among parturients from Irene Neto Maternity of Lubango city, Angola. *Sexually Transmitted Infections*, *96*(8), 587–589.

Oliveira, D., Martins, M. R., Castro, R., Cordeiro, L., Barroso, M. R., Nazaré, M. A., et al. (2020b). HIV, HBV and syphilis screening in antenatal care in Lubango, Angola. *Sexually Transmitted Infections*, *96*(8), 621–622.

Reddy, S., & Jim, B. (2019). Hypertension and pregnancy: Management and future risks. *Advances in Chronic Kidney Disease*, *26*(2), 137–145.

Rosário, E. V., Gomes, M. C., Brito, M., & Costa, D. (2019). Determinants of maternal health care and birth outcome in the Dande Health and demographic Surveillance System area, Angola. *PLoS One*, *14*(8), https://doi.org/10.1371/journal.pone.0221280.

Shibre, G. (2020). Social inequality in infant mortality in Angola: Evidence from a population based study. *PLoS One*, *15*(10), https://doi.org/10.1371/journal.pone.0241049.

Shibre, G., Zegeye, B., Idriss-Wheeler, D., Ahinkorah, B. O., Oladimeji, O., & Yaya, S. (2020). Socioeconomic and geographic variations in antenatal care coverage in Angola: Further analysis of the 2015 demographic and health survey. *Bmc Public Health*, *20*(1243), https://doi.org/10.1186/s12889-020-09320-1.

Smits, J., & Monden, C. (2011). Twinning across the developing World. *PLoS One*, *6*(9), https://doi.org/10.1371/journal.pone.0025239.

Towers, C. V., Yates, A., Zite, N., Smith, C., Chernicky, L., & Howard, B. (2017). Incidence of fever in labor and risk of neonatal sepsis. Am J Obstet Gynecol, 216(6), 596.e1-596.e5.

Tshotetsi, L., Dzikiti, L., Hajison, P., & Feresu, S. (2019). Maternal factors contributing to low birth weight deliveries in Tshwane District, South Africa. *PLoS One*, *14*(3), https://doi.org/10.1371/journal.pone.0213058.

Umar, A. S., & Kabamba, L. (2016). Maternal mortality in the Main Referral Hospital in Angola, 2010–2014: Understanding the context for maternal deaths amidst poor documentation. *Int J MCH AIDS*, *5*(1), 61–71.

U.S. Agency for International Development (2019). Angola: Global Health. Retrieved April 15, 2021, from https://www.usaid.gov/angola/global-health.

Valente, B., Campos, P. A., Rosário, Varandas, V. E., & Silveira, L., H (2011). Prevalence and risk factors of Plasmodium falciparum infections in pregnant women of Luanda, Angola. *Tropical Medicine & International Health: Tm & Ih*, *16*(10), 1206–1214.

Vankan, E., Schoorel, E., van Kuijk, S., Nijhuis, J., Hermens, R., Scheepers, H., et al. (2019). The effect of the use of a decision aid with individual risk estimation on the mode of delivery after a caesarean section: A prospective cohort study. *PLoS One*, *14*(9), https://doi.org/10.1371/journal.pone.0222499.

WHO. (2011a). *Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity*. WHO.

WHO. (2011b). *WHO recommendations for prevention and treatment of pre-eclampsia and eclampsia*. WHO.

WHO. (2018). *WHO recommendations non-clinical interventions to reduce unnecessary caesarean sections*. WHO.

WHO (2010). A conceptual framework for action on the social determinants of health: social determinants of health discussion paper 2 (policy and practice). Geneva: WHO.

WHO (2014). Global Nutrition Targets 2025: Low birth weight policy brief. Retrieved April 15, 2021, from https://www.who.int/nutrition/publications/globaltargets2025_policybrief_lbw/en/.

WHO (2019). Adolescent pregnancy: Evidence brief. Retrieved April 15, 2021, from https://www.who.int/reproductivehealth/publications/adolescent-pregnancy-evidence-brief/en/.

WHO (2020). Adolescent pregnancy. Retrieved April 15, 2021, from https://www.who.int/news-room/fact-sheets/detail/adolescent-pregnancy.

Wosenu, L., Worku, A. G., Teshome, D. F., & Gelagay, A. A. (2018). Determinants of birth asphyxia among live birth newborns in University of Gondar referral hospital, northwest Ethiopia: A case-control study. *PLoS One*, *13*(9), https://doi.org/10.1371/journal.pone.0203763.

Yaya, S., Zegeye, B., Ahinkorah, B. O., Oladimeji, O., & Shibre, G. (2020). Regional variations and socio-economic disparities in neonatal mortality in Angola: A cross-sectional study using demographic and health surveys. *Family Practice*, *37*(6), 785–792.