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Research Article

Obstructed labor as an underlying cause of maternal mortality in Kalukembe, Angola, 2017

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Background

The goal of this study was to examine the primary and contributing causes of maternal mortality in Angola.

Methods

This retrospective case series was conducted at Kalukembe IESA Mission Hospital, Huila province, Angola, southwestern Africa. We reviewed the charts of all 865 deliveries at the hospital and all women admitted for postnatal care after delivery in 2017.

Results

The primary classifications for the 18 pregnancy-related fatalities were hemorrhage or anemia (n=5), sepsis and other maternal infections (n=5), hypertensive disorders (n=4), uterine rupture (n=2), and metastatic gestational trophoblastic neoplasia (n=2). Obstructed labor was a major contributor to seven of the 18 fatalities, including three anemia cases, one sepsis case, and one eclampsia case. Five of the seven gave birth outside the hospital. None of the seven had a live birth.

Conclusions

Obstructed labor remains a common obstetric complication leading to maternal death in low-income countries, but it is often hidden in statistics that focus solely on the most immediate causes of death. Current estimates of the global burden of maternal mortality may significantly undervalue the preventable burden from obstructed labor and the need for increased investment in interventions to address it.

The perinatal period extends from approximately the twenty-second week of gestation through the week after delivery. While the number of women dying from perinatal causes each year has significantly decreased at the global level in recent years, progress has not been uniform. Perinatal maternal mortality remains a public health crisis in Angola. The United Nations estimates that the maternal mortality ratio (MMR) in 2015 was 477 per 100 000 live births, which places Angola among the 25 countries with the worst maternal survival rates.[1] However, there is significant uncertainty about the on-the-ground reality. The 80% confidence interval for the MMR in Angola ranges from a low of 221 per 100 000 to a high of 988 per 100 000. There is also uncertainty about which perinatal conditions are currently the leading contributors to maternal mortality in Angola. The lack of recent data about the causes of maternal mortality in Angola makes it difficult to make evidence-based decisions about which maternal survival interventions to prioritize.

HUILA PROVINCE, ANGOLA

In this paper, we present an evaluation of the obstetric complications and fatalities at a district hospital in Huila province, Angola, in 2017. Angola is a country in southern Africa that has a population of approximately 24 million.[2] One-quarter of the national population of Angola resides in the Luanda province, which includes the national capital city. The second most populous province is Huila province, which is located in the south-central part of Angola and is home to about 2.4 million residents. Within Huila province, Kalukembe (Caluquembe) is the fourth largest municipality, with a population of approximately 240 000. About half of women in Angola (47%) give birth at a health facility rather than at home, but in Huila only 30% of births occur in healthcare facilities.[3] The majority (75%) of reproductive-aged women living in Huila province report significant barriers to accessing healthcare services for serious health problems, including lacking the money to access care (67%) and living far from a health facility (56%).[3]

Only about 2.6% of deliveries in Huila province are via caesarean section.[3] A population-level caesarean section

rate of less than 10% generally indicates that too few women are receiving high-quality emergency obstetric care.[4] The low caesarean section rate in Huila – and the large number of Angolan patients requiring surgery for obstetric fistulas caused by obstructed labor[5] – suggests that many preventable maternal deaths are occurring outside the hospital when complications arise during home deliveries and emergency services cannot be accessed quickly.[6]

KALUKEMBE IESA MISSION HOSPITAL

The Angolan government has been working to improve health system infrastructure since a long civil war ended in 2002. As part of this initiative, a women's and children's hospital with surgical capacity was opened in Kalukembe in 2014. However, scarce material resources and personnel have limited the ability of the government facility to care for seriously ill obstetric patients who travel from rural areas to seek care. The more established hospital in the city is the 230-bed multi-service Kalukembe IESA Mission Hospital, which was established in 1944 and has long served as the primary referral hospital for critically ill rural and low-income obstetric patients, including during the civil war. The hospital catchment area includes not only Kalukembe, but also adjacent municipalities such as Caconda (which has approximately 160,000 residents) and Chicomba (with approximately 130,000 residents).

In 2017, Kalukembe IESA Mission Hospital was staffed by several physicians and employed 113 nurses. The hospital conducted 17 096 patient consultations that year, including about 1730 outpatient obstetric consultations. A total of 2390 surgical procedures were performed at the hospital in 2017. Based on this large volume of surgical cases, Kalukembe IESA Mission Hospital performs a sizeable proportion of all surgical deliveries in Huila province.

There were 865 deliveries at Kalukembe IESA Mission Hospital in 2017, including 409 vaginal births and 456 operative deliveries. The operative deliveries included 351 caesarean sections and 44 laparotomies for ruptured uteruses. There were 61 operative vaginal deliveries. These included 34 forceps deliveries, 12 vacuum deliveries, eight craniotomy / fetal extractions, and seven symphysiotomies. Most of the obstetrical procedures were performed by surgical technicians. The hospital also provided surgical care for 57 women with obstetric fistula. Other gynecological procedures performed in 2017 included 111 extraction / curettage procedures and 14 laparotomies for ruptured ectopic pregnancies. No deaths from ruptured ectopic pregnancies occurred at the hospital in 2017.

The goal of this analysis was to examine the primary and contributing factors associated with perinatal maternal mortality at this district hospital in Huila province, Angola, in 2017.

METHODS

For this study, we reviewed hospital-wide maternity, mortality, and operation records to identify all registered maternity patients who died at Kalukembe IESA Mission Hospital during 2017. Individuals who were deceased at the time of arrival at the hospital were unable to be included in this analysis because they were not registered patients and their medical files were therefore not available. The case files for all deaths that might be classified as pregnancy-related were reviewed and independently coded by two medical doctors, one specializing in obstetrics and gynecology (PRC) and one specializing in emergency medicine (DBC). Both physicians are board certified in the United States but have been practicing full-time in Angola for several years.

ETHICAL CONSIDERATIONS

This research project was initiated after the provincial Department of Health invited submission of observations and insights about the underlying contributors to maternal mortality in the area. The protocol for this retrospective chart review was approved by the review board of Obra Medica da Igreja Evangélica Sínodal de Angola (OMIESA), the organization that administers the hospital, prior to initiation of the study. To ensure the privacy of patients, no names, birthdates, or other identifiable information about patients were extracted into the spreadsheets used for this study.

RESULTS

Eighteen women died of maternal causes at the hospital in 2017 (Table 1). The simplest way of classifying the deaths would be to report that five were due to hemorrhage or anemia, five to sepsis and other maternal infections, four to hypertensive disorders such as eclampsia, two to uterine rupture, and two to indirect causes. However, these numbers do not tell the complete story.

Obstructed labor was a major contributor to five of the cases that were not classified as uterine rupture deaths. Three of the women who died from hemorrhage and anemia had obstructed labor as a contributing cause, including one woman with a twin pregnancy suffering from complications of malaria. One grand multipara who had given birth to at least ten babies had sepsis for which obstructed labor was a contributing cause. One of the women with eclampsia had obstructed labor that delayed delivery of the fetus, prolonging pregnancy and increasing the risk of seizure. Thus, while only two women died from uterine rupture without obvious signs of sepsis, eclampsia, or anemia, obstructed labor was a major contributor to death for seven of the 18 fatalities.

Contributing factors that are not among the typical categories used to classify maternal deaths were also part of the causal pathway for some fatalities. Toxic traditional medicines that caused liver failure contributed to at least three fatalities. Malaria contributed to at least two of the deaths not placed in the sepsis and infection category. Two women had molar pregnancies and were found to have died from suspected metastatic gestational trophoblastic neoplasia (GTN). For almost all of the fatalities, multiple underlying causes contributed to the adverse outcome, and the stated cause of death does not capture the complexity of the classification.

Delayed access to advanced medical care likely played a role in most of these deaths. Of the 18 women who died from maternal causes at our hospital, eight had been trans-

Table 1. Summary of the 18 maternal mortality cases at Kalukembe Hospital, Angola, in 2017

Direct cause	Contributing factors	Medical history	Age	Days from arrival to death	Conscious on arrival?	Live birth?
Hemorrhage/ anemia	Obstructed labor	Transfer from outside hospital	40	<1	No	No
Hemorrhage/ anemia	Obstructed labor, sepsis	Cord prolapse	36	<1	Yes	No
Hemorrhage/ anemia	Malaria	Twins, home delivery (4 days prior to admission)	36	1	No	Unknown
Hemorrhage/ anemia	Malaria, obstructed labor, traditional medications	Home delivery (5 days prior to admission)	28	1	No	No
Hemorrhage/ anemia	Retained placenta	Home delivery	?	1	No	Unknown
Sepsis/infection	Obstructed labor, uterine rupture, anemia	–	39	21	Yes	No
Sepsis/infection	Retained placenta	Transfer from outside hospital	33	3	Yes	Yes
Sepsis/infection	Meningitis	Home delivery (2 days prior to admission)	32	5	No	Yes
Sepsis/infection	Liver failure from traditional medications, anemia	Home delivery (10 days prior to admission)	23	6	Yes	Unknown
Sepsis/infection	Typhoid perforation, anemia, traditional medications	Transfer from outside hospital	?	<1	No	No
Eclampsia	–	Transfer from outside hospital	18	<1	No	No
Eclampsia	–	–	17	1	No	Unknown
Eclampsia	Obstructed labor	Transfer from outside hospital	16	<1	No	No
Preeclampsia	Cardiac failure, liver failure from traditional medications	Transfer from outside hospital	20	1	Yes	No
Uterine rupture	Obstructed labor, sepsis	Transfer from outside hospital	35	2	Yes	No
Uterine rupture	Obstructed labor, sepsis	Transfer from outside hospital	29	4	No	No
Metastatic GTN	–	–	37	>10	Yes	Not applicable
Metastatic GTN	Anemia	–	19	<1	No	Not applicable

GTN – gestational trophoblastic neoplasia

ferred to our hospital from other healthcare facilities and four were home deliveries that had occurred 2–10 days prior to admission. Eleven of the women were obtunded upon arrival at the hospital, and most died within 24 hours of admission. Only two of the fetuses were known to have survived delivery.

DISCUSSION

SUMMARY OF KEY FINDINGS

Our data suggest that obstructed labor is a common underlying condition leading to maternal death in Angola. Among the 18 maternal fatalities at Kalukembe IESA Mission Hospital in 2017, obstructed labor contributed to three of five anemia cases, one of five sepsis cases, and one of four hypertensive cases, in addition to the two cases classified as having uterine rupture as the primary cause of death. The heavy burden from ruptured uterus is supported by previous research in Angola.[7–9] Obstructed labor has also been recognized as an underappreciated part of the causal pathway for many deaths in other low-income countries with high maternal mortality rates.[10–12] Global targets for increasing maternal survival rates and reducing stillbirth and neonatal mortality rates will not be met if the conditions that lead to obstructed labor and subsequent mortality are not addressed in low-income countries.

COMPARISON WITH BURDEN OF DISEASE ESTIMATES

For countries like Angola that have an almost complete absence of high-quality epidemiological data, the Global Burden of Disease (GBD) collaboration generates estimates of the burden from disability and premature mortality using a sophisticated mathematical model that incorporates sociodemographic information and epidemiological reports from neighboring countries. The GBD collaboration estimates that about one in ten of deaths of Angolan women aged 15–49 years are due to maternal disorders, with only HIV/AIDS (36.0%) causing more deaths of women in this age group each year.[13] More reproductive-age Angolan women die from pregnancy-related conditions (10.4%) each year than from tuberculosis and other respiratory infections (9.5%), cancers (8.3%), intentional and unintentional injuries (7.5%), or cardiovascular diseases (5.6%).

More specifically, the GBD collaboration estimates that about 2100 maternal deaths occurred in Angola in 2017, including approximately 82 deaths due to obstructed labor and uterine rupture.[13] The most common causes of maternal mortality are estimated to be maternal hemorrhage (31.4%), indirect causes (18.6%), maternal sepsis and other maternal infections (11.9%), maternal abortion and miscarriage (9.3%), and maternal hypertensive disorders (9.1%).[13] This distribution of causes of maternal morality closely aligns with World Health Organization (WHO) estimates, because both models use similar systematic review processes to gather the data for their maternal mortality models.[14]

Our observations of maternal mortality in Angola suggest that the burden of mortality from obstructed labor may be seriously underestimated by current burden of disease models. The GBD colboration's most recent estimate is that only 3.9% of maternal deaths in Angola are due to obstructed labor and uterine rupture.[13] Because obstructed labor may be an important part of the causal pathway for many maternal deaths that are ultimately attributed to other maternal conditions, this percentage undervalues the true burden of death and disability from obstructed labor. Obstructed labor is hidden as a secondary cause of death rather than being classified as a primary cause of death.

INADEQUATE DATA ABOUT CAUSAL PATHWAYS

Questions about where the chain of events leading to maternal deaths starts have been raised in both high-income and low-income countries,[15–17] but because the vast majority of reproduction-related deaths occur in low-income countries, misclassifications in low-income countries drive inaccuracies in global estimates. Overlapping causes of death made it nearly impossible for us to accurately assign the maternal fatalities at just one hospital. Scaling these classification challenges across hundreds of thousands of maternal deaths each year in low-income countries will amplify inaccuracies in the estimated burden from preventable causes of maternal death.

The GBD and United Nations system estimates are a valuable resource for countries without strong health information systems, but they are not a substitute for real clinical data collected from hospitals and clinics. Model outputs might not capture the heterogeneity in experiences between or within countries. They are also limited in their ability to represent the causal pathways that lead to mortality. In particular, the current classification systems may underestimate the true burden from obstructed labor. Without high-quality local data, it may be difficult to prioritize the clinical and public health interventions that will have the greatest impact on improving outcomes related to complex issues like maternal health.

IMPLICATIONS FOR PRACTICE

From a clinical perspective, awareness of obstructed labor and possible uterine rupture is critical for proper diagnosis and treatment of other maternal conditions. For example, if obstructed labor is the cause of sepsis or hemorrhage, then uterotonics and antibiotics—medications that are commonly used for obstetric complications—may be harmful rather than helpful. When clinics inappropriately give uterotonics to women with obstructed labor, they may inadvertently cause fetal hypoxia and uterine rupture. When clinics give antibiotics to women with obstructed labor and suspected sepsis, they may inappropriately delay transfer to a hospital as they wait to see whether the antibiotics are working.

Increasing access to emergency obstetric care at the nearest health facility is critical for saving maternal and neonatal lives, but only if those clinicians are trained and equipped to provide high-quality care. There is an urgent need for more investment in training nurses, midwives, physicians, and other clinicians who work at rural health clinics and other primary care settings to recognize complications. In particular, these clinicians need more training about which emergent conditions can be safely treated at

clinics and which require urgent transfers to higher levels of care before crises arise. It is also important to expand access to transportation from rural communities to hospitals and to ensure that hospital staff have the training and tools they need to surgically manage obstructed labor cases.

From a public health perspective, preventing morbidity and mortality from obstructed labor and uterine rupture requires increasing timely access to skilled birth attendants and to comprehensive emergency obstetric care, including caesarean sections. There is a critical need for more surgeons and surgical technicians in Angola and most other countries in sub-Saharan Africa, especially in rural areas. Economic analyses have shown that increased access to caesarean deliveries are highly cost-effective even in low-income countries.[18] Improved diagnosis and treatment of obstructed labor will improve maternal and neonatal survival and reduce the burden from nonfatal outcomes such as obstetric fistula.[19,20]

From an epidemiological perspective, obstructed labor highlights the challenges of trying to assign only one primary cause of death to each fatality. Current classification systems may be undercounting the burden from obstructed labor. A more accurate quantification of the proportion of maternal deaths with obstructed labor as a contributing cause will enable more resources to be allocated to addressing the burden from this condition.[16]

LIMITATIONS

Our study is limited by a small number of eligible cases and by incomplete medical records that often lacked full details about gravidity, parity, laboratory results, care prior to arrival at the hospital, and the distance from the home to the first treatment facility. However, our case series from rural Angola suggests that improving prevention, diagnosis, and timely treatment for obstructed labor will help reduce several types of maternal deaths, not just uterine rupture.

CONCLUSIONS

The case series highlights the challenges of classifying causes of death in ways that account for complex causal pathways and underlying contributors to maternal mortality. Reducing maternal mortality rates will require paying attention to all the factors that lead to maternal deaths, not just the most immediate causes of death. In Angola, obstructed labor is an underappreciated part of the causal pathway for perinatal maternal mortality.

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COMPETING INTERESTS

The authors completed the Unified Competing Interest form, and declare no conflicts of interest.

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