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Adverse maternal-fetal outcomes among mothers with obstructed labor delivered at a tertiary care hospital in Central Uganda: A descriptive retrospective cross-sectional study.

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Abstract

Background:

Obstructed labor is the single most common cause of adverse maternal and fetal outcomes, including urinary bladder trauma, ruptured uterus, sepsis, post-partum hemorrhage (PPH), birth asphyxia, septicemia, and stillbirth, among others. This study aimed to determine the frequency and types of adverse maternal and fetal outcomes associated with obstructed labor at Kayunga Regional Referral Hospital, a tertiary care hospital located in Central Uganda.

Methods:

A descriptive retrospective cross-sectional study was conducted at Kayunga Regional Referral Hospital in Uganda that involved a review of 2,176 hospital records of mothers who delivered from 1st January to 31st December 2023. A pretested data extraction tool was used for data collection from the patient charts. Variables with p-values <0.2 in the bivariate analysis were included in a multivariate analysis using a Modified Poisson Regression model to identify determinants of adverse maternal-fetal outcomes of obstructed labor.

Results:

The most commonly reported adverse maternal outcome was puerperal sepsis (21, 55.4%), while birth asphyxia (65, 70.7%) was the commonest adverse fetal outcome. Being referred from a lower health center, non-use of partograph during labor, history of herbal medicine use, and visiting a traditional birth attendant were strongly correlated with the adverse maternal-fetal outcomes (p-value = <0.001).

Conclusions:

This study revealed a high prevalence of adverse maternal-fetal outcomes associated with obstructed labor. Being referred from a lower health facility, non-use of partograph during labor, history of herbal medicine use, and visiting a traditional birth attendant were associated with adverse maternal-fetal outcomes among women with obstructed labor. Sepsis, perineal tears, birth asphyxia, and stillbirth were the commonest adverse outcomes of obstructed labor.

Recommendation:

This calls for improving the referral system from lower health facilities, improving infrastructure to support timely access to critical emergency obstetric care, and emphasizing the need for patrograph use during labor.

Keywords: *Obstructed labor, Adverse maternal outcomes, Adverse fetal outcomes, Uganda.*
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Background

Labor is considered obstructed when the presenting part of the fetus fails to descend into the birth canal despite having strong and adequate uterine contractions [1,2]. Obstructed labor is predominant in settings where access to critical lifesaving maternal health services is a challenge, typical in low- and middle-income countries. Globally, statistics show that an estimated 5% of all pregnancies experience obstructed labor, and this contributes to about 8% of maternal deaths [3,4].

The 2021 global burden of disease study showed that 13,471,093 (95% uncertainty interval [UI] 8,938,373, 19,008,282) cases of obstructed labor with uterine rupture were reported worldwide, which caused 1,067,270 (95% UI 896,161, 1,275,042) disability-adjusted life-year (DALYs) [3]. A systematic review and meta-analysis study in Ethiopia had an overall prevalence of obstructed labor at 11.79% [5]. A study conducted in six hospitals in the southwestern part of Uganda found the prevalence of obstructed labor was 10.5 % [6].

Obstructed labor is the single most common cause of significant maternal and perinatal complications, including urinary bladder trauma, ruptured uterus, sepsis, and post-partum hemorrhage (PPH) as maternal complications. Among the newborns, complications like birth asphyxia, jaundice, septicemia, meconium aspiration syndrome, and stillbirth have been documented. A cross-sectional study done at a tertiary care hospital in Pakistan found the prevalence of bladder trauma at 8.3%, ruptured uterus at 15.5%, sepsis at 19.2% and PPH at 6.2% among women diagnosed with obstructed labor (OL), while birth asphyxia and stillbirth were reported at 56.5% and 33.2% respectively [7].

Another study conducted at a tertiary care hospital in India showed the prevalence of maternal related complications of OL like ruptured uterus at 4.16, sepsis at 15.1%, urinary tract infection at 7%, and PPH at 9.7% while neonatal complications were reported at 21.3% for still birth rate, 28.8% for birth asphyxia, 16.9% for jaundice, 14.75 for septicemia and 9.9% for meconium aspiration syndrome [8]. A study from Southwestern Uganda showed higher perinatal death rates among babies born to mothers with OL [6].

Despite the critical nature of the adverse maternal-fetal events associated with OL, there remains a notable gap in the existing literature about specific adverse outcomes of obstructed labor in Uganda. At our tertiary care hospital (Kayunga Regional Referral Hospital), no such study was conducted previously, and thus, our study provides insight into maternal and fetal complications of mothers with obstructed labor. The objective of this study was to determine the frequency and types of adverse maternal and fetal outcomes associated with obstructed labor at Kayunga Regional Referral Hospital, a tertiary care hospital located in Central Uganda.

Methods

Study setting and study design

A descriptive retrospective cross-sectional study that involved the collection of data from patient records was conducted at Kayunga Regional Referral Hospital (Kayunga RRH), a tertiary Hospital located in Kayunga District, in Central Uganda, approximately 69.1 km by road via Kampala-Jinja highway northeast of Kampala. This hospital serves 7 districts: Buikwe, Kayunga, Buvuma, Luweero, Mukono, Nakasongola, and Nakaseke. It is a government-run, not-for-profit, charge-free, with nine labor suite beds and forty-two post-natal beds in the Department of Obstetrics and Gynecology. Annually, about 3,270 deliveries occur in the hospital. The hospital has a functional Neonatal Intensive Care Unit (NICU) where neonates with birth complications associated with obstructed labor, including birth asphyxiation, can be managed.

Study population

All records of pregnant women admitted, who went into labor and delivered at Kayunga RRH from 1st January to 31st December 2023, were included in the study. The data was collected for a period of three months. The diagnosis for obstructed labor among these study participants was made by either the medical officer, senior house officer (SHO), or obstetrician using the American College of Obstetricians and Gynecologists (ACOG) guidelines for arrest of labor [9] alongside local protocols.

Sample size and sampling

We used the Kish-Leslie formula of sample size estimation for a single proportion [10] by considering a 95% confidence interval (CI), the maximum possible prevalence of obstructed labor to be 50% and a margin of error of 0.021 which is one-fifth of the prevalence of obstructed labor as was in South Western Uganda study 10.5% (Kabakyenga JK2011), hence giving a sample size of 2,178. We reviewed all medical records/patient files from 1st January to 31st December 2023 of pregnant women, irrespective of age,

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who delivered from Kayunga RRH. A total of 2,182 medical records (files) were sampled using consecutive sampling. This was achieved in a 3-month data collection period.

Inclusion criteria

All patient records or files of pregnant women admitted, who went into labor and delivered at
Kayunga RRH.

Exclusion criteria

All patient records or files of pregnant women with insufficient information, for instance, where there is a lack of information about the diagnosis and or outcome of labor, were excluded. Patient records whose information was illegible were also excluded, regardless of the presence of an adverse outcome captured or not.

Study variables

The socio-demographic factors that were collected in our study included age, marital status, employment status, level of education, and area of residence. The obstetric factors included parity, antenatal attendance, a history of being referred from a lower health facility, a history of visiting a traditional birth attendant, and use of herbal medications during labor. Maternal-fetal outcomes of patient records with a diagnosis of obstructed labor were also captured. The outcome variable was having a diagnosis of obstructed labor as documented under the indication for the cesarean section.

Data collection and management

A standardized data extraction tool was designed and pre-tested to collect socio-demographic and maternal variables from the patient files. Trained research assistants who were qualified midwives collected this data from all eligible patient files. All research assistants were blinded to the hypothesis of the study. Available records, such as the antenatal cards, facility registers, and case report files, were reviewed by the research assistants to cross-check some of the retrieved information from the patient files. The extracted data was uploaded to a password-protected server to which only the PI or his designee had access, and on a daily basis, was reviewed for completeness. The data was downloaded into an Excel spreadsheet and exported to STATA version 18.5 for further cleaning and analysis.

Data analysis

Statistical analysis was conducted using STATA version 18.5. Descriptive statistics were used to summarize sociodemographic, obstetric, and birth outcomes. Categorical variables were presented as frequencies and proportions, while continuous variables were summarized using medians and interquartile ranges. Associations between the dependent variables and the outcome variable (diagnosis of obstructed labor: yes/no) were assessed using chi-square or Fisher's exact tests for categorical variables, and the Mann-Whitney U test for continuous variables. Similar tests were used to evaluate associations between obstetric characteristics and poor maternal or neonatal outcomes. Variables with p-values <0.2 in the bivariate analysis were included in a multivariate analysis using a Modified Poisson Regression model. Backward elimination was applied to identify significant predictors. Statistical significance was set at $p<0.05$.

Ethical approval and consent to participate

The study received clearance from the Mildmay Uganda Research Ethics Committee (MUREC) on 13th September 2024, with a REC clearance number of MUREC-2024-427, and the Uganda National Council for Science and Technology (UNCST) on 14th March 2025, with a research registration number with the UNCST of HS5564ES. In addition, administrative clearance from Kayunga Regional Referral Hospital to access patients' files was sought and granted. The study sought waiver of consent from MUREC, as we used already existing health facility data with no direct interaction with the patients.

Results

Social demographic characteristics of the sample population

The median age of the participants was 24.0 years with an IQR of 20.0,28.0. More than one-third (36.8%) of participants were aged 20–24 years. One thousand sixty-two (1062, 48.8%) of the participants were employed, and one thousand two hundred two (1202, 55.4%) of the participants were urban residents. One thousand nine hundred two (1902, 87.8%) of the participants were married, and in terms of education level, six hundred thirty-one (631, 47.1%) of the participants attended secondary education.

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Table 1: Social demographic characteristics of the sample population

Variable	Category	Frequency N(Col %)
Age (years)	Median (IQR)	24.0 (20.0, 28.0)
Employment Status (N=2,175)		
	Employed	1,062 (48.8)
	Unemployed	1,113 (51.2)
Type of Residence (N=2,171)		
	Rural	969 (44.6)
	Urban	1,202 (55.4)
Marital Status (N=2,168)		
	Divorced	5 (0.2)
	Married	1,902 (87.8)
	Single	152 (7.0)
	Unknown	109 (5.0)
Level of Education (N=1,338)		
	Primary	530 (39.6)
	Secondary	631 (47.1)
	Tertiary	77 (5.8)
	Uneducated	100 (7.5)

Col% % stands for column percentages, and IQR stands for inter-quantile range.

Prevalence of adverse maternal outcomes among women with obstructed labor

Out of the 405 women with obstructed labor recruited in our study, 38 (3.2%) experienced some form of complication. The most commonly reported adverse maternal outcome was puerperal sepsis (21, 55.4%).

Table 2: Prevalence of adverse maternal outcomes among women with obstructed labor.

Adverse maternal outcomes	N(%)
Anemia	1 (2.6)
Exhaustion	1 (2.6)
Maternal death	1 (2.6)
Obstetric palsy	1 (2.6)
Perineal tear	10 (26.4)
Puerperal psychosis	1 (2.6)
Post-partum hemorrhage (PPH)	1 (2.6)
Puerperal sepsis	21 (55.4)
Uterine rupture	1 (2.6)

Association between any obstetric characteristics and adverse maternal outcomes

Adverse maternal outcomes were associated with being referred from lower health facilities and cesarean section delivery (p-value = <0.001).

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Table 3: Association between any obstetric characteristics and adverse maternal outcomes

Characteristic	Overall, N(Col%)	Maternal Outcomes Adverse maternal outcomes, N(Col%)	Normal labor, N(Col%)	p-value
Overall	1,191	38(3.2%)	1,153(96.8%)	
Referral Status				<0.001[C]
Not Referred	882 (74.9)	18 (47.4)	864 (75.8)	
Referred	295 (25.1)	20 (52.6)	275 (24.2)	
Parity				0.167[C]
1	496 (41.7)	21 (55.3)	475 (41.3)	
2 to 3	438 (36.8)	9 (23.7)	429 (37.2)	
>=4	256 (21.5)	8 (21.0)	248 21.5)	
Pregnancy Gestation weeks				>0.999[F]
<37 weeks	121 (10.6)	3 (9.1)	118 (10.6)	
37-42 weeks	1,023 (89.3)	30 (90.9)	993 (89.3)	
>42 weeks	1 (0.1)	0 (0.0)	1 (0.1)	
Attended ANC				0.425[F]
No	57 (4.8)	3 (7.9)	54 (4.7)	
Yes	1,121 (95.2)	35 (92.1)	1,086 (95.3)	
Number of ANC Visits				0.115[C]
<=4 visits	776 (70.2)	28 (82.4)	748 (69.8)	
>4 visits	330 (29.8)	6 (17.6)	324 (30.2)	
Mode of Delivery				<0.001[F]
Caesarean section	523 (43.9)	27 (71.1)	496 (43.1)	
SVD	667 (56.1)	11 (28.9)	656 (56.9)	
Vacuum extraction	0 (0.0)	0 (0.0)	0 (0.0)	
Partograph use during labor				0.767[F]
No	464 (39.8)	16 (42.1)	448 (39.7)	
Yes	702 (60.2)	22 (57.9)	680 (60.3)	
Baby Presentation				>0.999[F]
Breech	1 (0.1)	0 (0.0)	1 (0.1)	
Cephalic	1,190 (99.9)	38 (100.0)	1,152 (99.9)	
History of TBA Use				0.305[F]
No	1,131 (97.1)	36 (94.7)	1,095 (97.2)	
Yes	34 (2.9)	2 (5.3)	32 (2.8)	
Use of Herbal Medicines				0.572[F]
No	1,054 (90.5)	36 (94.7)	1,018 (90.4)	
Yes	110 (9.5)	2 (5.3)	108 (9.6)	

Adverse Maternal Outcomes include: Anemia, Maternal Death, Obstetric Palsy, PPH, Puerperal Sepsis, Exhaustion, Perineal Tear, Puerperal psychosis, and Uterine Rupture. Col% % stands for column percentage. [M] stands for Mann-Whitney U test, [C stands] for Pearson Chi-square, and [F]stands for Fisher's Exact test. A statistically significant association is considered for variables with p-values <0.05.

Prevalence of adverse fetal outcomes among women with obstructed labor

Out of the 405 neonates delivered by women diagnosed with obstructed labor and recruited in our study, 92 (7.5%) of the newborns experienced some form of complication. The most

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prevalent adverse fetal outcome was birth asphyxia (65, 70.7%).

Table 4: Prevalence of adverse fetal outcomes among women with obstructed labor

Adverse fetal outcome	N (%)
Birth Asphyxia	65 (70.7)
Deformed parietal bone	1 (1.1)
Gastroschisis	1 (1.1)
Neonatal sepsis	2 (2.1)
Still birth	23 (25)

Association between any obstetric characteristics and adverse fetal outcomes

Adverse fetal outcomes were strongly associated with the mother being referred from a lower health facility, delivery by cesarean section, non-use of partograph during labor, history of herbal medicine use, and visiting a traditional birth attendant (p-value <0.001).

Table 5: Association between any obstetric characteristics and adverse fetal outcomes

Characteristics	Overall, N(Col%)	Fetal Outcomes		p-value
		Adverse fetal outcomes, N(Col%)	Good fetal outcome N(Col%)	
Overall	1,221	92(7.5%)	1,129(92.5%)	
Referral Status				<0.001[C]
Not Referred	903 (74.8)	39 (42.9)	864 (77.4)	
Referred	304 (25.2)	52 (57.1)	252 (22.6)	
Parity				0.920[C]
1	509 (41.7)	40 (43.5)	469 (41.6)	
2 to 3	447 (36.6)	32 (34.8)	415 (36.8)	
>=4	264 (21.6)	20 (21.7)	244 (21.6)	
Pregnancy Gestation weeks				0.026[F]
<37 weeks	124 (10.6)	17 (19.1)	107 (9.8)	
37-42 weeks	1,050 (89.4)	72 (80.9)	978 (90.1)	
>42 weeks	1 (0.1)	0 (0.0)	1 (0.1)	
Attended ANC				0.797[F]
No	59 (4.9)	5 (8.5)	54 (91.5)	
Yes	1,149 (95.1)	85 (7.4)	1,064 (92.6)	
Number of ANC Visits				0.121[C]
<=4 visits	793 (70.2)	63 (77.8)	730 (69.6)	
>4 visits	337 (29.8)	18 (22.2)	319 (30.4)	
Mode of Delivery				<0.001[F]
Caesarean section	537 (44.0)	69 (75.0)	468 (41.5)	
SVD	683 (56.0)	23 (25.0)	660 (58.5)	
Instrument delivery	0 (0.0)	0 (0.0)	0 (0.0)	
Partograph use during labor				<0.001[C]

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No	472 (39.4)	56 (61.5)	416 (37.6)	
Yes	725 (60.6)	35 (38.5)	690 (62.4)	
Baby Presentation				>0.999[F]
Breech	1 (0.1)	0 (0.0)	1 (0.1)	
Cephalic	1,220 (99.9)	92 (100.0)	1,128 (99.9)	
History of TBA Use				0.010[C]
No	1,147 (97.1)	81 (92.0)	1,066 (97.5)	
Yes	34 (2.9)	7 (8.0)	27 (2.5)	
Use of Herbal Medicines				0.003[C]
No	1,069 (90.6)	71 (81.6)	998 (91.3)	
Yes	111 (9.4)	16 (18.4)	95 (8.7)	

Adverse fetal outcomes include: Birth Asphyxia, Deformed parietal bone, Gastroschisis, Neonatal sepsis, and Still Birth. Col% stands for column percentage. [M] stands for Mann-Whitney U test, [C stands] for Pearson Chi-square, and [F]stands for Fisher's Exact test. A statistically significant association is considered for variables with p-values <0.05.

Discussion

Obstructed labor is a life-threatening obstetrical complication associated with significant maternal as well as fetal morbidity and mortality. This study aimed to assess the adverse maternal-fetal outcomes among mothers with obstructed labor delivered at a tertiary care hospital in Central Uganda. Our study found that the most commonly reported adverse maternal outcome was puerperal sepsis, and it accounted for 21(55.4%) of the cases. These findings are consistent with results from other studies done in Uganda-3.4%, Nigeria-57% and the United States-12.97% [6,12,13].

This observation could be because these mothers often reside in rural areas, which are distant from health facilities, resulting in delays in coming into the health facilities for deliveries. Studies from Sub-Saharan Africa have shown pregnant women opting to delay coming in physically at the health facilities until near the final stages of labor: during this time, many indulge in local herbs and other practices that tend to increase the risk of intrapartum infections (14,15).

This study also showed that women with obstructed labor who had adverse maternal outcomes were more likely to be referred from lower health facilities and delivered by cesarean section (p-value = <0.001). This is explained by the accumulation of delays that occur along the cascade of health care seeking from the onset of labor for the pregnant women, delays within the health facility in decision making, and delays in patient management due to stockouts of medical supplies, among others [16,17]. The accumulation of these delays ultimately influences the quality of care provided and may challenge the management of such obstetric emergencies.

Perineal tears accounted for 10 (26.4%) of adverse maternal outcome cases. This observation may be because the cephalo-pelvic disproportion, being the major cause of obstructed labor, causes a barrier (obstruction) to the fetal descent in a setting where herbs to augment uterine contractions have been used. This, therefore, increases the risk of perineal tears.

The most prevalent adverse fetal outcome was birth asphyxia (65, 70.7%). The prolonged stay of the fetus in the birth canal, coupled with the interruption of blood flow during obstructed labor, exposes the unborn baby to deprivation of oxygen and nutrients, resulting in birth asphyxia.

One (2.6%) maternal death was reported from our study, this shockingly very low figure is certainly an underestimation of the problem, because deaths due to obstructed labor are often classified under other complications (such as sepsis, postpartum hemorrhage or ruptured uterus), of which many of these could as well possibly be themselves outcomes of an obstruction during the labor process. The prevalence of birth asphyxia in our study was quite high compared to findings from Northern Uganda (5.3%) and Ethiopia (15.1%) [18,19]. Despite the fact that there are differences in these findings, this could still be explained by the variations in study design, study population, sample size, and available resources, among others. This therefore suggests that the need to assess the status and functionality of comprehensive Emergency Obstetric Care (EMOC) at the health facility is of utmost relevance.

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This study also revealed that obstructed labor resulted in 25% of the stillbirth cases, which is in line with studies from Ethiopia [4], Massachusetts, United States [13], and Uganda [20].

This study showed that adverse fetal outcomes were strongly associated with non-use of partographs during labor (p-value <0.001). This is explained by the fact that comprehensive documentation of partographs can help notify a health worker when obstructed labor is likely to happen and be able to intervene at an early stage before complications set in, hence preventing adverse fetal outcomes. The poor usage of partographs within this study setting mirrors other studies where factors, including health worker attitudes, knowledge, and workload, have been pointed out as possible drivers (Ayele 2023). These observations call for a need to strengthen obstetric care at Kayunga RRH and other facilities affected by the same through on-the-job training and intensive monitoring to ensure the use of essential obstetric tools like the patrograph, relevant in the determination of outcomes for both the mother and the baby.

These findings, considering that the target population was in a referral hospital in Uganda, can be generalized to the extent of Uganda as a nation, since most of the significantly associated factors with the adverse outcomes are consistent within the population across the nation of Uganda.

Conclusions

This study revealed a high incidence of adverse maternal-fetal outcomes associated with obstructed labor at a tertiary care hospital in Central Uganda. Being referred from a lower health facility, non-use of partograph during labor, history of herbal medicine use, and visiting a traditional birth attendant were contributing factors to the adverse maternal-fetal outcomes among women with obstructed labor. Sepsis, perineal tears, birth asphyxia, and stillbirth were the commonest adverse outcomes of obstructed labor among mothers and neonates delivered at Kayunga RRH.

Limitations

This study was limited in that it was a retrospective study, implying that files with missing data, even though they were captured, would not have the missing information retrieved. Nonetheless, this was prepared for by excluding all patient files with insufficient and unclear information.

The study also had a limited generalizability, considering that the target population was a referral hospital in Central Uganda, which could have different or varied associations from other populations in other nations, for instance, poor referral systems, and use of labor monitoring guides like partographs.

Recommendations

Improving the referral system from lower health facilities to reduce the severity of occurrence of adverse maternal-fetal outcomes associated with obstructed labor.

Improving infrastructure to support timely access to critical emergency obstetric care. Emphasizing the need for patrograph use during labor for better outcomes of both the mother and the unborn baby.

Conflict of interest

The authors declare having no conflict of interest at all.

Availability of data and materials

All data generated and analysed during this study are included in this published article [and its supplementary information files].

Funding

The study was funded by the government of Uganda through the Ministry of Health.

List of abbreviations

ACOG- American College of Obstetricians and Gynecologists
ANC- Antenatal Care
C-section- Caesarean section
DALYs- Disability-adjusted life-years
EMOC - Emergency Obstetric Care
LMICs- Low and middle-income countries
OL- Obstructed labor
PPH- Postpartum Hemorrhage
SHO- Senior House Officer
SVD- Spontaneous Vertex Delivery

Authors' contributions

SEB conceptualized the research idea, participated in data collection, cleaning and analysis, and wrote the first and revised drafts of the paper; BK participated in the manuscript writing and review; RO participated in data cleaning and manuscript writing; PB participated in conceptualizing the research idea, data cleaning and review

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of the manuscript; JN, SN and RS contributed to the conceptualization of research idea, provided general oversight to the research study administration and provided review comments to both the initial and final drafts of the manuscripts; as well as mentorship throughout the process; ST participated in the data collection, and cleaning and provided comments to the initial review of the paper; MK participated in the data collection, and cleaning and provided comments to the initial review of the paper; PO participated in the data collection, and cleaning and provided comments to the initial review of the paper and MN participated in the data collection, and cleaning and provided comments to the initial review of the paper.

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