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Original Research Article

Predictors of adverse pregnancy outcomes among postnatal women in a secondary hospital in Eastern Kenya

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ABSTRACT

Background: Adverse pregnancy outcomes remain a major public health concern in eastern Kenya, contributing to maternal and neonatal morbidity and mortality. These outcomes are influenced by socio-demographic, economic, intrapartum, and neonatal factors. This study examined their predictors at a County Referral Hospital in eastern Kenya to guide targeted interventions.
Methods: An analytical cross-sectional design combining quantitative and qualitative methods was used among a sample of 210 postnatal women selected through systematic sampling. Data from medical records, focus group discussions, and key informant interviews was collected. Quantitative data were analyzed using descriptive statistics, chi-square tests, logistic regression, and qualitative data was thematically analysed.
Results: Adverse outcomes occurred in 19.9% of participants, with stillbirth and neonatal asphyxia each accounting for 5.5%. Unmarried women had significantly higher rates (31.7% versus 15.1%, p=0.007). Prolonged third-stage labour (p=0.013), preterm delivery (p=0.008), abnormal birth weight (p<0.001), and low Apgar scores at 1, 5, and 10 minutes (p<0.001) were strongly associated. Logistic regression showed that longer first (p=0.050, AOR=1.002) and third (p=0.038, AOR=1.128) stages of labour increased the likelihood of adverse outcomes.
Conclusions: Stillbirth and neonatal asphyxia were the most frequent complications. Strengthening intrapartum care, ensuring timely management of prolonged labour, improving monitoring of preterm and low-birth-weight infants, and enhancing support for unmarried mothers are key to reducing adverse pregnancy outcomes.

Keywords: Adverse pregnancy outcomes, Eastern Kenya, Economic and intrapartum factors, Neonatal, Socio-demographic

INTRODUCTION

The pregnancy and postpartum periods are critical for maternal and neonatal health, with adverse pregnancy outcomes (APOs) remaining a significant public health concern globally.[1] Approximately 85% of women give birth at least once in their lifetime, and up to 30% experience an APO, defined as any health issue affecting the mother, the newborn, or both during pregnancy, delivery, or the postpartum period.[1-3] These outcomes include hypertensive disorders of pregnancy, postpartum haemorrhage (PPH), obstructed labour, antepartum haemorrhage (APH), premature rupture of membranes (PROM), preterm birth, stillbirth, low birth weight, puerperal sepsis, and uterine rupture. If untreated, APOs can result in maternal or neonatal morbidity and mortality.

Globally, maternal and perinatal mortality remain pressing challenges, with an estimated 289,000 maternal deaths, 2.6 million stillbirths, and 2.7 million neonatal deaths occurring annually.[4] Sub-Saharan Africa accounts for 66% (196,000) of maternal deaths, and southern Asia contributes approximately 20% (58,000).[3] In Kenya,

maternal mortality remains high at 362 deaths per 100,000 live births, while stillbirth rates are 23 per 1,000 live births, both above the global targets of 147 maternal deaths per 100,000 live births and 12 stillbirths per 1,000 live births.[5]

Low- and middle-income countries (LMICs) continue to report high rates of adverse pregnancy outcomes. Studies from Sub-Saharan Africa and other LMICs show prevalence rates ranging from 15% to 32%.[6-8] In Ethiopia, the prevalence was 32.5% in Dessie Referral Hospital, 24.5% in Hosanna town, and 18.3% in Hawassa town.[9,10] In north Gondar, 28.5% of women experienced obstetric complications, particularly excessive bleeding and prolonged labour.[11]

Kenya has a similar burden, with the Ministry of Health identifying PPH, eclampsia, sepsis, uterine rupture, and obstructed labour as leading causes of maternal mortality.[12] PPH accounts for 34% of maternal deaths and is more common in resource-poor settings where access to essential interventions such as oxytocin is limited.[13] Oxytocin, while recommended as the first-line drug for PPH treatment, has also been associated with preventable adverse events during childbirth when improperly administered.

Adverse pregnancy outcomes are used as indicators of maternal and child health service performance and reflect the quality of antenatal, intrapartum, and neonatal care.[13] Data on the predictors of adverse pregnancy outcomes remain limited in some regions, including Eastern Kenya.[14]

Problem statement

Adverse pregnancy outcomes remain a significant public health concern globally and in Eastern Kenya, contributing to maternal and neonatal morbidity and mortality. These outcomes are influenced by a range of factors, including socio-demographic, economic, intrapartum, and neonatal factors that vary across settings. However, limited evidence exists on how these factors specifically affect postnatal women in eastern Kenya. This study therefore, sought to examine and contextualize the predictors of adverse pregnancy outcomes at a County Referral Hospital in Eastern Kenya to inform targeted interventions.

Objectives of the study

To determine the prevalence of adverse pregnancy outcomes among postnatal women attending a secondary-level hospital in eastern Kenya.

To assess the socio-demographic and economic predictors of adverse pregnancy outcomes among postnatal women attending a secondary-level hospital in eastern Kenya.

To examine the association between intrapartum and neonatal factors associated adverse pregnancy outcomes among postnatal women attending a secondary-level hospital in eastern Kenya.

METHODS

This study employed an analytical cross-sectional design to examine predictors of adverse pregnancy outcomes among postnatal women at a secondary-level County Referral Hospital in eastern Kenya. The study used both quantitative and qualitative methods. Quantitative data were abstracted from postnatal women's records, while qualitative data were obtained through focus group discussions (FGDs) and key informant interviews (KIIs) to triangulate the findings.

The study population consisted of postnatal women aged 13-49 years who delivered at the hospital. Using Fisher et al formula, a minimum sample size of 191 was calculated, based on an estimated prevalence of adverse pregnancy outcomes of 14.53% from a similar setting in Sub-Saharan Africa. A 10% attrition adjustment was applied, to bring sample to 210. Systematic sampling was employed, where every 25th postnatal woman's record was selected from the admission register at discharge, starting with a randomly chosen number between 1 and 9. Women with pre-existing pregnancy-related adverse outcomes, those below 13 years, and those above 49 years were excluded. Data collection targeted the women admitted between October 2023 and October 2024. Actual data collection was done in October 2024.

Quantitative data were extracted using a structured tool aligned with study objectives, while three FGDs (8-12 participants each) and KIIs with maternity and labour ward specialists (nurse midwives, medical officers, gynecologist, and clinical officer obstetric specialist) were conducted using predesigned guides. Quantitative data were analyzed using IBM SPSS version 25.0. Descriptive statistics (frequencies, percentages) summarized demographic and clinical variables, while chi-square tests assessed associations between adverse pregnancy outcomes (dependent variable) and socio-demographic, economic, intrapartum, and neonatal predictors (independent variables). Multiple logistic regression was used to control for confounding and estimate adjusted odds ratios (AORs) with 95% confidence intervals. Qualitative data from FGDs and KIIs were transcribed and analyzed thematically to complement and explain quantitative findings. Statistical significance was set at $p<0.05$.

Ethical approval was obtained from the Mount Kenya University ethical review committee, NACOSTI, JKUAT Board of Post Graduate Studies (BPS), and relevant county and hospital authorities. Written informed consent was sought from all FGD and KII participants. For quantitative records, only de-identified coded data were used to maintain confidentiality and anonymity.

RESULTS

Prevalence of adverse pregnancy outcomes

In the current study, the prevalence of adverse pregnancy outcomes was 19.9%, defined as the proportion of women with at least one reported complication among the 201 postnatal women enrolled.

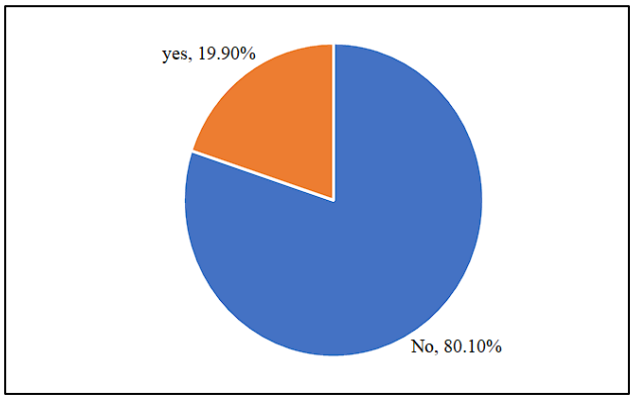

Figure 1: Adverse pregnancy outcome present.

As shown in Figure 2, the most frequent adverse pregnancy outcomes among postnatal women were stillbirth and neonatal asphyxia, each reported in 5.5% (n=11) of cases. These were followed by low birth weight and preeclampsia/eclampsia (3.5%, n=7 each), neonatal sepsis (2.5%, n=5), preterm delivery (1.5%, n=3), and postpartum hemorrhage (1.0%, n=2).

These findings were further supported by qualitative data from key informant interviews and focus group discussions, which identified birth asphyxia and low birth weight as commonly observed complications. One healthcare provider noted, "*Asphyxia happens in 6 out of 10 deliveries due to meconium-stained liquor, and low birth weight is seen in around 2 out of 10 cases*" (KII#1).

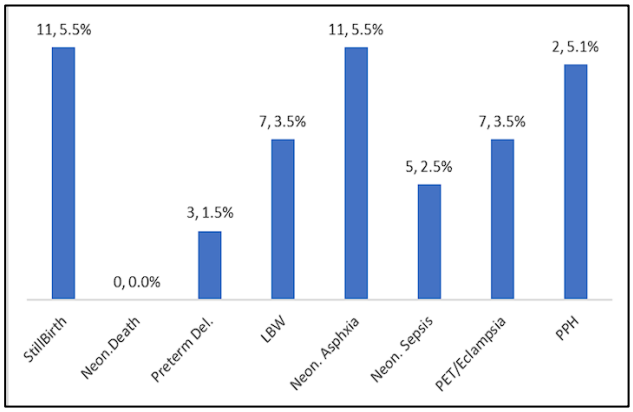

Figure 2: Distribution of selected adverse pregnancy outcomes.

Sociodemographic and economic predictors of adverse pregnancy outcomes

As shown in Table 1, the majority of participants were married (68.8%, n=143), with single (30.8%, n=64) and divorced (0.5%, n=1) women comprising the remainder. The mean age at delivery was 25.45 years (SD=6.59), with 87.8% (n=180) being under 35 years and 12.2% (n=25) classified as having advanced maternal age. In terms of education, nearly half (48.8%, n=101) had attained secondary education, followed by 31.4% (n=65) with primary and 18.8% (n=39) with tertiary-level education. Most participants were self-employed (68.1%, n=141), and the vast majority resided in rural areas (90.9%, n=189).

When sociodemographic and economic factors were cross-tabulated with adverse pregnancy outcomes (Table 2), marital status was significantly associated with adverse outcomes, with 31.7% of unmarried women affected compared to 15.1% of married women (p=0.007). Although not statistically significant, higher rates of adverse outcomes were observed among women of advanced maternal age (30.4% versus 19.1%, p=0.204), those with secondary or higher education (23.5% versus 13.6%, p=0.107), unemployed women (26.4% versus 17.9%, p=0.188), and urban residents (33.3% versus 18.8%, p=0.142).

These quantitative trends were further contextualized through qualitative insights. Regarding marital status, KII#1, a nurse in charge of MCH, remarked, "*Single mothers often lack support, and that takes a toll on their health"*. Similarly, KII#3, a nursing officer, emphasized, "*Addressing GBV issues improves maternal outcomes significantly*". In relation to age, KII#1 explained, "*Pregnancies in older women tend to be more complicated due to age-related risks*," and further observed, "*Both very young and older mothers face challenges but in different ways*". On the role of education and employment, KII#4, a clinical officer in the postnatal ward, stated, "*Lack of education is a big contributor to adverse pregnancy outcomes*," while KII#1 noted, "*Having a stable income makes pregnancy much smoother because they can afford care and proper nutrition*". Unemployment and financial insecurity were also cited as barriers, with KII#4 stating, "Unemployed women can't afford ANC care, leading to poor outcomes," and KII#3 adding, "*A lack of money causes stress that negatively impacts pregnancy*". Geographic accessibility further emerged as a challenge, with KII#4 noting, "*Mothers in remote areas face worse outcomes because of the long distance to facilities*," and KII#5 concluding, "*Long travel distances discourage mothers from seeking care, leading to complications*".

Table 1: Sociodemographic and economic characteristics of the postnatal women.

Sociodemographic characteristics		Frequency	Percent
Marital Status	Single	64	30.8
	Married	143	68.8
	Divorced	1	0.5
	Total	208	100.0
Age categories in years	≥35 (AMA)	25	12.2
	<35	180	87.8
	Total	205	100.0
Level of Education	None	2	1.0
	Primary	65	31.4
	Sec	101	48.8
	College/University	39	18.8
	Total	207	100.0
Occupation	Unemployed	56	27.1
	Self-Employed	141	68.1
	Casual	2	1.0
	Formal	8	3.9
	Total	207	100.0
Residence	Rural	189	90.9
	Urban	19	9.1
	Total	208	100.0

Table 2: Association between sociodemographic characteristics of postnatal women and adverse outcomes.

		Adverse pregnancy outcome present						P≤0.05
		No		Yes		Total		
		N	%	N	%	N	%	
Marital status	Unmarried (single or divorced)	41	68.3	19	31.7	60	100.0	χ^2=7.155, df=1, p=0.007
	Married	118	84.9	21	15.1	139	100.0	
Age categories	≥35 years (AMA)	16	69.6	7	30.4	23	100.0	χ^2=1.613, df=1, p=0.204
	<35 years (YMA)	140	80.9	33	19.1	173	100.0	
education level	≥Secondary	101	76.5	31	23.5	132	100.0	χ^2=2.647, df=1, p=0.107
	≤Primary	57	86.4	9	13.6	66	100.0	
Employment status	Unemployed	39	73.6	14	26.4	53	100.0	χ^2=1.733, df=1, p=0.188
	Employed (Informal or formal)	119	82.1	26	17.9	145	100.0	
Residence	Rural	147	81.2	34	18.8	181	100.0	χ^2=2.158, df=1, p=0.142
	Urban	12	66.7	6	33.3	18	100.0	

Table 3: Duration of labour by stage and gravidity category.

	Gravidity category	
	Multigravida (>1)	Primigravida (=1)
	Mean	Mean
1st stage length (Minutes)	643.56	705.97
2nd stage length (Minutes)	13.22	12.75
3rd stage length (Minutes)	7.63	10.13

Intrapartum predictors of adverse outcomes

Table 3 highlights the differences in the duration of labour across its stages for multigravida (more than one previous pregnancy) and primigravida (first pregnancy) women. During the first stage of labour, primigravida women experienced a longer mean duration (705.97 minutes) than multigravida women, who averaged 643.56 minutes. The second stage of labour showed minimal difference between the two groups, with multigravida women having an average of 13.22 minutes and primigravida women at 12.75 minutes. In the third stage, the duration was longer for primigravida women (10.13 minutes) than for multigravida women, who had a mean

of 7.63 minutes. This suggests that while the first and third stages of labour are longer for primigravida women, the second stage remains relatively similar in duration for both groups.

Further, as shown in Table 4, analysis was done to determine the association between labour duration and adverse pregnancy outcomes. The first stage of labour was longer among those with adverse outcomes compared to those without (719.08 versus 655.71 minutes), although the difference was not statistically significant (p=0.242). The third stage was also longer among those with adverse outcomes (14.79 versus 7.40 minutes), and this difference was statistically significant (p=0.013). The second stage duration was slightly shorter among those with adverse outcomes compared to those without (12.40 versus 13.09 minutes), but the difference was not significant (p=0.756). Thus, length of the 1st stage (p=0.050, AOR=1.002) and the 3rd stage (p=0.038, AOR=1.128) were significant, indicating that longer durations of these stages are associated with higher odds of adverse outcomes.

Table 4: Association between duration of labour by stage and adverse pregnancy outcomes.

Group statistics						
Adverse pregnancy outcome present		**N**	**Mean**	**SD**	**Std. error mean**	**P≤0.05**
1st stage length (minutes)	Yes	24	719.0833	279.92529	57.13951	t(129)=1.175, p=0.242
	No	107	655.7103	228.87761	22.12643	
2nd stage length (minutes)	Yes	25	12.4000	6.83740	1.36748	t(130)=-0.311, p=0.756
	No	107	13.0935	10.61819	1.02650	
3rd stage length (minutes)	Yes	24	14.7917	29.36129	5.99335	t(128)=2.519, p=0.013
	No	106	7.3962	4.08873	0.39713	

Table 5: Neonatal characteristics at birth among postnatal women attending Kitui County Referral Hospital.

Neonatal characteristic		N	%
Gestational age at delivery	Extremely preterm	1	0.5
	Very preterm	4	1.9
	Moderately preterm	35	16.9
	Term	167	80.7
	Total	207	100.0
Birth weight of baby	LBW	13	6.6
	Normal	175	88.8
	Macrosomia	9	4.6
	Total	197	100.0
Baby sex (index delivery)	Female	104	52.5
	Male	92	46.5
	2.00	2	1.0
	Total	198	100.0
Apgar score 1 minute	Poor	27	13.4
	Good	175	86.6
	Total	202	100.0
Apgar score at 5 minutes	Poor	14	6.9
	Good	188	93.1
	Total	202	100.0
Apgar score 10 minutes	Poor	11	5.4
	Good	191	94.6
	Total	202	100.0
Admitted NICU	No	202	99.5
	Yes	1	0.5
	Total	203	100.0

Table 6: Neonatal characteristics at birth versus adverse pregnancy outcome.

Neonatal characteristics		Adverse pregnancy outcome present						P≤0.05
		No		Yes		Total		
		N	%	N	%	N	%	
GA	Pre-term	23	63.9	13	36.1	36	100.0	P=0.008
	Term	136	83.4	27	16.6	163	100.0	
	Total	159	79.9	40	20.1	199	100.0	
BW	Abnormal	8	38.1	13	61.9	21	100.0	P<0.001
	Normal	142	84.5	26	15.5	168	100.0	
	Total	150	79.4	39	20.6	189	100.0	
Apgar@ 1 min	Poor	9	36.0	16	64.0	25	100.0	P<0.001
	Good	147	86.5	23	13.5	170	100.0	
	Total	156	80.0	39	20.0	195	100.0	
5 min	Poor	2	14.3	12	85.7	14	100.0	P<0.001
	Good	154	85.1	27	14.9	181	100.0	
	Total	156	80.0	39	20.0	195	100.0	
10 min	Poor	2	18.2	9	81.8	11	100.0	P<0.001
	Good	154	83.7	30	16.	184	100.0	
	Total	156	80.0	39	20.0	195	100.0	
Baby sex (index delivery)	Female	85	84.2	16	15.8	101	100.0	P=0.105
	Male	68	74.7	23	25.3	91	100.0	
	Total	153	79.7	39	20.3	192	100.0	

Neonatal characteristics and adverse pregnancy outcomes among postnatal women

The characteristics of the newborns at birth are presented in Table 5. Most were delivered at term (80.7%, n=167), with 16.9% (n=35) moderately preterm, 1.9% (n=4) very preterm, and 0.5% (n=1) extremely preterm. Birth weight was normal in 88.8% (n=175), low in 6.6% (n=13), and macrosomic in 4.6% (n=9). Females comprised 52.5% (n=104), males 46.5% (n=92), and 1.0% (n=2) were unspecified. Apgar scores were good in 86.6% (n=175) at 1 minute, 93.1% (n=188) at 5 minutes, and 94.6% (n=191) at 10 minutes, with the remainder in each category being poor. NICU admission was rare (0.5%, n=1).

Further, as shown in Table 6, an examination was done to determine the association between neonatal characteristics at birth and adverse pregnancy outcomes. Preterm deliveries were significantly associated with a higher prevalence of adverse outcomes (36.1% versus 16.6%, p=0.008) compared to term deliveries. Abnormal birth weight was also strongly associated with adverse outcomes (61.9% versus 15.5%, p<0.001) compared to normal birth weight. Poor Apgar scores at 1, 5, and 10 minutes were significantly associated with adverse outcomes (64.0% versus 13.5%, 85.7% versus 14.9%, and 81.8% versus 16.3%, respectively; p<0.001) compared to higher scores. However, neonatal sex was not significantly associated with adverse outcomes (25.3% versus 15.8%, p=0.105).

DISCUSSION

Prevalence

The prevalence of adverse pregnancy outcomes among postnatal women in this study was 19.9%, with stillbirth and neonatal asphyxia being the most frequent complications (5.5% each). This finding is comparable to the prevalence reported in Zimbabwe (15.6%) and slightly lower than those reported in Sub-Saharan Africa (29.7%), Ethiopia (28.3%), and Uganda (one-third of women).[6,8,15,16] It is, however, higher than rates documented in European settings, where adverse pregnancy outcomes are generally lower.[17] In Kenya, adverse pregnancy outcomes increased by 14.2% between 2016 and 2019 across different regions.[18] The proportion of stillbirths (5.5%) observed is also comparable to regional data, where stillbirths accounted for 4.1% of deliveries in Kenya and Uganda.[19] These findings align with reports from other Sub-Saharan African countries, where adverse pregnancy outcomes remain a significant contributor to maternal and neonatal morbidity and mortality.[16]

Sociodemographic and economic predictors

Unmarried women had significantly higher adverse pregnancy outcomes (APOs) compared to married women (31.7% versus 15.1%, p=0.007), with non-significant trends observed among older, less educated, unemployed, and urban-dwelling women. Studies have similarly reported that multiparity, early-age pregnancy,

and prolonged labour are linked to APOs alongside older maternal age, high-risk pregnancies, and chronic illnesses.[20,21] Low maternal education and age over 30 years have been associated with pre-eclampsia and eclampsia, while grand-multiparity contributes to high maternal morbidity.[22] Nulliparity, history of miscarriage or stillbirth, and unplanned pregnancies have also been linked to higher risk of obstetric complications.[23] Limited access to quality antenatal services, poor infrastructure, and financial dependence on partners exacerbate APO risks in low-resource settings.[24,25] Rural-urban disparities remain evident, as poor facility conditions and lack of skilled healthcare workers in rural areas limit care access.[26] Lack of preconception care and counselling further contributes to poor outcomes among women in vulnerable sociodemographic and economic groups.[27]

Intrapartum and neonatal predictors

Prolonged third-stage labour was significantly associated with adverse pregnancy outcomes (p=0.013), aligning with recent findings that extended third-stage durations (e.g., over 15 minutes) greatly elevate risks such as postpartum haemorrhage. [28] Preterm delivery (p=0.008), abnormal birth weight (p<0.001), and poor Apgar scores at 1, 5, and 10 minutes (all p<0.001) were similarly associated with adverse outcomes. A meta-analysis from Ethiopia demonstrated that prolonged labour increases the odds of perinatal asphyxia nearly threefold (OR=2.79), while low birth weight multiplies risk by approximately 6.5 (OR=6.52).[29] Poor Apgar scores- particularly at 5 minutes- are widely recognized as predictive of neonatal morbidity and mortality, especially among preterm infants.[30]

This study had several limitations that should be acknowledged. First, as an analytical cross-sectional design, it establishes associations between variables but cannot infer cause-and-effect relationships. Second, part of the data was obtained from medical records, which may have contained incomplete or inconsistent information, introducing possible information bias. Third, the study was limited to a single secondary-level hospital, which restricts the generalizability of the findings to other populations and healthcare settings in Kenya. Fourth, qualitative data obtained through focus group discussions may have been influenced by recall and social desirability bias. Finally, although multivariable analysis was used to control for confounders, some unmeasured factors- such as nutritional status, underlying maternal illnesses, and quality of antenatal care- may still have affected the outcomes.

CONCLUSION

In conclusion, the study revealed a 19.9% prevalence of adverse pregnancy outcomes, with stillbirth and neonatal asphyxia being the most frequent complications. Unmarried status emerged as a significant sociodemographic predictor, while prolonged third-stage labour, preterm delivery, abnormal birth weight, and poor Apgar scores were strongly associated with adverse outcomes.

Recommendations

This study recommends strengthening intrapartum care- including timely management of prolonged labour- for high-risk women, enhancing newborn monitoring and care particularly for preterms and underweight infants, and prioritizing support for unmarried mothers to reduce adverse outcomes.

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