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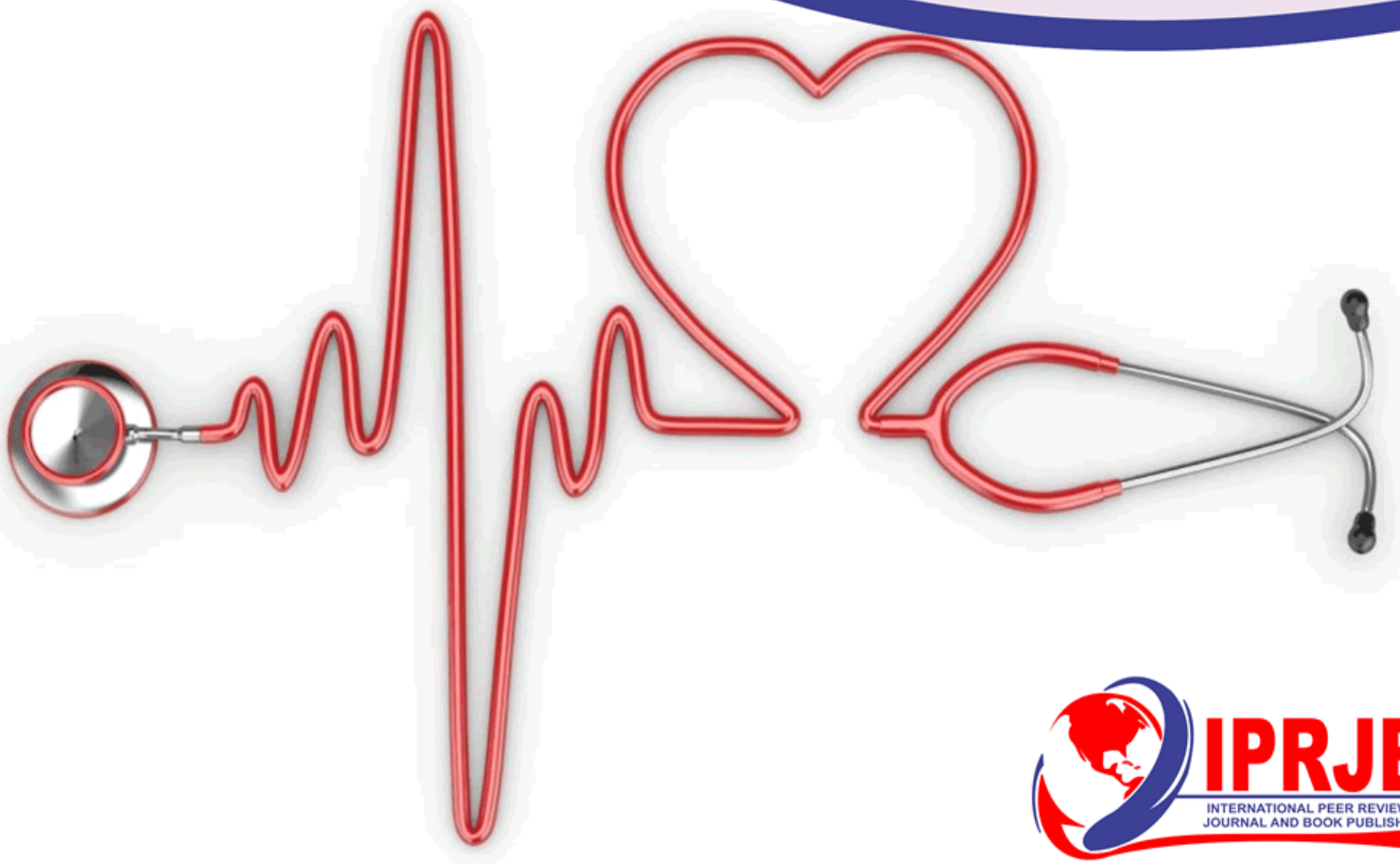

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Accessibility and Health Facility Factors Influencing Maternal and Fetal Outcomes among Mothers Referred with Obstetric Emergencies in Baringo County Referral Hospital, Kabarnet, Kenya

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Abstract

Purpose: To determine the accessibility to a health facility and health facility factors influencing maternal and fetal outcomes among mothers referred with obstetric emergencies in Baringo County referral Hospital.

Methodology: A descriptive cross-sectional study which employed a mixed method approach of data collection was adopted. Simple Random technique was used in selecting 284 respondents into the study. The study population also included nurses, gynaecologist and medical officers who were purposively sampled. Qualitative data collection was analysed through content analysis while descriptive and inferential statistics were used to analysed quantitative data.

Findings: results show that mothers who are accompanied by nurse are 4.3 times more likely to have complications than those accompanied by relatives (AOR:4.3;95% CI:1.2-16.1;p=0.03). Moreover, mothers who were coming from distant health facilities were 70% less likely to have experience complications than those who live closer to the referral hospital (AOR: 0.3; 95%CI: 0.1-1.1; *p*=0.07). Neonates whose mothers received treatment within 30 min (OR: 0.5; 95% CI: 0.3 – 0.8; p = 0.005) were 50% less likely to have had abnormal outcome. In contrast, the risk of abnormal outcome was higher for neonates whose mothers received treatment before referral (OR: 2.3; 95% CI: 1.4 – 3.8; p = 0. 001) suggesting possible delay in providing treatment as a possible cause of deteriorating condition of the foetus. Mothers who stated that nurses listened and explained things (3.9%) or those seen within less than 30 minutes to be attended to (p = 0.3) experienced complications. On the other hand, the odds of complications increased where the main reason for referral was lack of expertise and equipments at the referring health facility (p = 0.09) though the result was not statistically significant.

Unique Contribution to Theory, Practice and Policy: This study has identified accessibility and health facility factors influencing the obstetric emergencies in a marginalized county. The study will provide insight to policy maker's hence evident-based interventions will be made. No literature review has been published on this topic at the study site therefore, this study will form a basis for other researchers.

Keywords: *Obstetric Emergencies, Accessibility Factors, Health Facility Factors, Maternal and Fetal Outcomes*

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INTRODUCTION

Over 2.5 million children die in the first month of life most of which occur around the first week. (UN,2018) According to Gopinath (2016) 75% of maternal deaths are of obstetric etiology these are due to hemorrhage, hypertension unsafe abortion and obstructed labour. Obstetric is unique in that there are two patients to consider, a mother and a baby. Identification and referral of obstetric emergencies are an integral part of maternal and child health (Prasad *et al.,* 2018). proper knowledge about identification of signs, emergency measures taken and well-equipped obstetric unit will reduce maternal mortality and morbidity (Verma *et al.,* 2016)

Sub-Saharan Africa suffers from the highest maternal mortality ratio of 546 maternal deaths per 100,000 live births. A study undertaken in Nigeria by Ntoimo, *et al.,* (2018) on prevalence and risk factors of maternal mortality in referred hospitals revealed that there was a MMR of 2,085 per 100,000 live births in the hospitals. In Benin in 2015, out of100, 000 live births, 405 women died from obstetric complications. Delays in decision making, access to health care worsened the maternal and perinatal prognosis (Obossou *et al.,* 2017)

Developing countries accounted for 99% of the 10.7 million women who died between 1990 and 2015 due to obstetric complications (WHO, 2015). Many countries in the region are projected to miss Sustainable Development Goal (SDG) neonatal mortality target by 2030 with modest trends in reducing neonatal mortality and the high levels of mortalities. (Masaba, & Mmusi-Phetoe, 2020)

In Kenya, birth asphyxia, sepsis, jaundice and anemia accounts for 80% of the newborn deaths (MOH, 2016) Gacheri (2016) identified hemorrhage, hypertensive disorders, and sepsis as being responsible for more than half of maternal deaths. In addition, complications of abortion and obstructed labour respectively account for 13% and 8% of the deaths**.** The current Kenyan health referral system is weak and this affects the overall performance of the health system hence this contributes to negative health outcomes (Gitonga, 2013).

According to KDHS (2014) the Maternal Mortality Rate (MMR) at Baringo County is 374/1000000 live births. There is sparce data on the contribution of obstetric emergencies to adverse maternal and fetal outcomes in the county's Referral hospital hence the need to undertake the study.

Statement of the Problem

Globally, 2.6 million newborns die every year from preventable causes (Masaba &Mmusi-Photoe, 2020). Many countries worldwide have made progress in increasing the proportion of women to give birth in a health facility, however, this increase in coverage does not translate to the expected reduction of maternal and fetal mortality and morbidity (WHO,2016). A dysfunctional referral system contributes to poor obstetric outcomes (Chaturvedi *et al.,* 2014). In most parts of Kenya, maternal mortality and morbidity results from limited access to life saving interventions (Echoka, 2014). Baringo county referral hospital admits mothers with obstetric emergencies from near and far sub-county health facilities. The referral hospital contributed to 80.8% of the total perinatal deaths reported in all the facilities in Baringo county (Serech, Githuku, Gura, Warfa and Ochieng, 2018). According to KDHS (2014) the maternal mortality in Baringo County is 374/100 000 live births which is higher compared to the national MMR of 362/100000 live births. Thaddeus and Maine (1994) three delay model proposed that, accessibility to a health facility and the quality of care given to a mother when she reaches a

health facility influence obstetric outcomes. Based on the reported cases of maternal and fetal mortalities and morbidities in the health facility it is important to determine the factors associated with outcomes This study therefore sought to determine the accessibility and health facility factors influencing maternal fetal outcomes among mothers referred with obstetric emergencies.

Objective

To determine the accessibility to a health facility and health facility factors influencing maternal and fetal outcomes among mothers referred with obstetric emergencies in Baringo County referral Hospital.

Research Hypothesis

Ho1: There is no association between accessibility and heath facility factors and maternal and fetal outcomes.

LITERATURE REVIEW

Theoretical Framework

This study was based on the Three delay model (Thaddeus and Maine,1994). The model identifies three group of factors which prevent women in their child bearing age from accessing the maternity health care they need. It proposes that the outcomes of pregnancy are influenced by delays in: deciding to seek care; reaching the health facility and receiving care. This study focused on the second and the third delay; which are delay in accessing a health facility and delay in receiving care once the mother reaches a health facility.

Conceptual Framework

Figure 1 shows the conceptual framework which was adopted from the three-delay model. It conceptualizes maternal and fetal outcomes as dependent variable while factors influencing the outcomes as the independent variables. Maternal and fetal outcomes would be either good or adverse. Accessibility to a health facility (delay 2) and health facility factors (delay 3) would delay or limit access to obstetric emergency care and subsequently influence the maternal and fetal outcomes negatively. (Thaddeus and Maine, 1994). The converse is that good patient outcome is likely to result if any of these factors does not limit access to obstetric care or if delays are not experienced.

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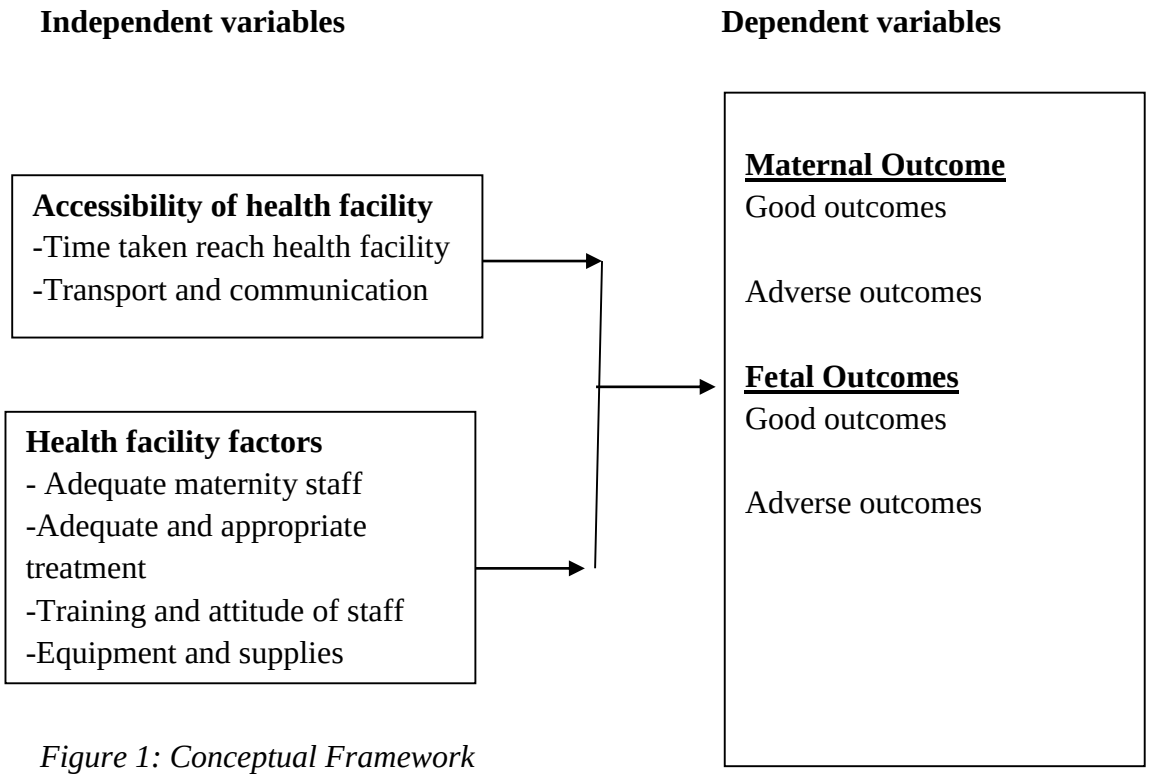

Figure 1: Conceptual Framework

Source: Adopted from the three-delay model Thaddeus and Maine (1994)

Empirical Review

Accessibility and Health Facility Factors Influencing Maternal and Fetal Outcomes

Studies clearly indicate that countries with high maternal, perinatal and neonatal mortality have inadequate and poor-quality health services and this can be associated with reduced utilization of health care services (WHO, 2015). Clinical quality of care measures for maternal health which have been widely discussed in the literature, focus primarily on safety and effectiveness, and are constantly evolving. Gabrysch, Civitelli, Edmond, Mathai, Ali and Bhutta, (2012) argued that an expansion of the traditional focus on Emergency Obstetric Care (EmOC) indictors include routine maternal care and newborn emergency (EmNC) routine care. Diamond and Smith, (2012) stated that more and more women globally are delivering in facilities. However, the quality of care and services available to these women when they reach a facility is not uniform, nor is it close to reaching the level of care recommended by WHO and other standard-setting agencies. A study by Kumsa *et al.*, (2016) concluded that, availability of essential equipment's and drugs, had positive association with client satisfaction with emergency obstetric and newborn care services. This in turn could affect utilization of emergency obstetric and newborn care services and play a role in contribution to maternal and newborn mortality.

Various studies have been done on maternal and fetal outcomes, Gopianath (2016) examined the outcome of referred obstetric emergencies at a tertiary center. Yeshialem, Alemnew, Abera, Tesfay (2017) did a study to determine the factors of adverse Pregnancy Outcomes among mothers, Jyotsana and Kapadia (2017) undertook a study on maternal and perinatal outcome of

referred patients in tertiary health centre. Anju, Rashmi and Latha, (2018) did a study on maternal outcomes among emergency obstetric admissions at a tertiary care teaching hospital in Chitradurga, South India. Despite the wide body of research done in respect of maternal and fetal outcomes, no specific research has been done to determine the accessibility and health facility factors influencing the maternal and fetal outcomes among mothers referred with obstetric emergencies to a marginalized county hospital and in Baringo county referral hospital, Kabarnet Kenya in particular.

METHODOLOGY

Study Design a cross sectional study, which employed a mixed method approach of data collection. The study took place between September 2019 to February 2020.

Study Area. This study was conducted in Baringo County one of the 47 counties situated in the Rift valley region. Kabarnet Town is the headquarters. It has an estimate population of 555,561 people with an area of 11,015 square kilometer. The county is classified as Arid and semi-arid. Most parts of East Pokot, Baringo central. The county does not have a good road network and they are mainly earth and mixed type. These roads are usually impassible during rainy season. This impedes livestock marketing business community, which is the main source of livelihood for majority of the residents.

The health facilities are distributed across the sub counties and enable the population to access health care in places nearest to where they reside. There is one level 5 facility; Baringo County Referral Hospital located in Kabarnet town. 4 level four facilities located in Eldama Ravine, Marigat, Kabartojo and Chemolingot town. Level 3 facilities are health centers while level 4 facilities are dispensaries. Level one represents the community units which is the lowest level of health care.

Baringo county referral hospital is the main referral hospital in the county. It has a 180-bed capacity offering surgical, medical, and maternity services. It offers all the comprehensive emergency obstetric care (CEmOC) components in addition to intensive neonatal and newborn care. The maternity unit contains 50 beds and 2 delivery couches and an operating room and diagnostic equipment including ultrasound and cardiotocography (CTG). The newborn unit attends to an average of 30 new born per day. The unit conducts over 2800 spontaneous vaginal deliveries and over 600 caesarian sections per year. In the year 2018, the hospital attended to 750 obstetric emergencies that presented as referrals. The maternity team is composed of midwives/nurses, obstetrician, and/or pediatrician, medical officer, medical officer interns and clinical officers' interns. Baringo county hospital was chosen for the study it had a higher MMR compared to the national MMR of 362/100,000 Live births

Study Population. The study populations were mothers with obstetric emergencies admitted at Baringo county Referral Hospital. The study also targeted midwives /nurses, clinical officers and medical officers, a gynecologist and a pediatrician working at the maternity section of Baringo county referral hospital

Inclusion criteria and exclusion criteria. The study included All Mothers referred with obstetric emergencies that have already delivered and willing to participate in the study after giving informed consent, Midwives/nurses, gynecologist, obstetricians' medical officers and clinical officers who were on duty during the study period. The study excluded all mothers referred with obstetric emergencies not willing to participate in the study, Women meeting the

inclusion criteria but mentally unstable, Midwives/nurses, a gynecologist, obstetrician, medical officers and clinical officers working in the maternity unit and were not on duty during the study period.

Sampling Procedure. Simple random sampling technique was used in selecting respondents in to the study. The Register of the mothers admitted in the postnatal who were admitted as referrals to Baringo county hospital was used as the sampling frame. Lottery method of sampling was used to pick those mothers who met the inclusion criteria. Those who picked yes and met the inclusion criteria were sampled. Purposive sampling was used to select 3 midwives/ nurses, 3 medical officers, 2 Clinical officers, a gynecologist and a pediatrician working in the maternity unit for qualitative interviews.

3Sample Size calculation. The study sample was computed using Slovin's formula. Ten percent was added (10%) to the sample to cater for those who will not respond and for incomplete questionnaires.

In addition, the 3 nurses/midwives, 3 medical officers, 2 clinical officers, 1 pediatrician and 1 gynecologist working in the maternity were included in the study. To make a total of 10 key informants.

Research Instruments. The study adopted the use of questionnaires and interview schedule to collect data.

Pre-testing of Research Instruments. A pilot test was done before embarking on actual data collection activity. Pilot study was undertaken at Iten County referral hospital because it shares the same characteristics with the study area. Permission was sought to engage the employees of the county hospital working at the maternity Unit. A formal letter was sent to the hospital management and an approval letter was obtained.

Reliability of the Research Instruments. Reliability test was conducted as a test of whether data collecting instrument yield the same result on repeated trials. A statistical coefficient - Cronbach 's alpha (α) was used as a measure of internal reliability (Cronbach, 1971).

Validity of the Research Instruments. The study used content validity to test the accuracy of data collecting instruments.

Development of Research Instrument. Development of research instrument was done for both quantitative and qualitative data collection methods.

Quantitative data collection instrument. The study used structured questionnaires to collect data from respondents. The study adopted and modified the Thaddeus and Maine (1994) three delay model questionnaire.

Qualitative Data Collection Instrument. Qualitative data was collected using semi structured interview guide.

Data Collection Procedure.The research assistants were trained for two days on how to collect data.

Data Management. The data collected was coded to make the data entry easy. All raw data was reviewed by the principal investigator and crosschecked to ensure completeness; any clarifications to be made were sought out immediately. The filled questionnaires and filled

interview schedule forms were kept in a safe and confidential place that was accessible only to the principal investigator, ready for the data entry.

Data Analysis. The data was cleaned coded, entered and analyzed using SPSS version 24. Descriptive and inferential statistics were used for quantitative data analysis. Descriptive statistics consisted of frequencies, means and standard deviation. This was used to describe the distribution of data. In addition, inferential statistics using Chi Square was used to test the association between independent and dependent variables and odds ratio used to assess the strength of the relationship between the explanatory and outcome variables. A $p \leq 0.05$ was used to reject null hypothesis where significant association exists.

Qualitative information collected through key informant interviews was analyzed through content analysis using emerging themes and issues highlighted by different key stakeholders to generate a detailed report. Qualitative data was transcribed, summarized and thematically analyzed according to the specific objectives. Key analytic findings were linked to factors that influence maternal and fetal outcomes.

Ethical considerations. clearance was sought from the Institutional Ethical Review Committee of Masinde Muliro University of Science and Technology. The researcher obtained a research permit from the National Commission for Science, Technology, and Innovations (NACOSTI). Permission to conduct the study was sought from Baringo County Referral Hospital. Consent from the participants was sought after informing them of the purpose of the study, the tool to be used and information needed. Participation was on a voluntary basis and no one was coerced. The study participants were informed of their freedom to withdraw from the participation at any stage.

FINDINGS AND DISCUSSIONS

Relationship between Accessibility and Maternal Outcomes

Access to skilled birth attendant for routine care and management of complications is important for pregnant women. Table 1presents bivariate logistic regression analysis on association between access to the referral health facility and maternal outcome. Three factors stand out although the results are not statistically significant. A higher proportion of mothers who covered less than 30 Km (8.6%) experienced complications than those who travelled longer distance (5.3%). On the contrary, a smaller proportion of women who spent less than KSh. 200 to the referral hospital had complication (3.7%) than those who paid more (8.1%). Similarly, use of ambulance was associated with a smaller proportion of case with complications (4.8%) unlike those who used other means of transport.

"*Mothers travel from far and near and the road networks are poor and some use "Boda boda" which is a risky means of transport for expectant mothers and may lead to adverse maternal and fetal outcomes*." (Respondent 2).

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Table 1: Relationship between Accessibility to Health Facility and Maternal Outcomes

Variable	Categories	N	Complications		OR	95%CI	p value
			Yes (%)	No (%)			
Distance to hospital (in km)	<30	58	8.6	91.4	1.7	0.6 – 4.9	0.3
	≥30	225	5.3	94.7			
Fare to referral hospital (in KSh.)	<200	134	3.7	96.3	0.4	0.2 – 1.3	0.1
	≥200	149	8.1	91.9			
Mode of transport	Ambulance	189	4.8	95.2	0.5	0.2 – 1.4	0.2
	Other means	94	8.5	91.5			
Hospital contacted before referral made	Yes	86	7.0	93.0	1.3	0.5 – 3.5	0.6
	No	197	5.6	94.4			
Time taken to reach the referral hospital	Less than 1 hr	214	6.1	93.9	1.1	0.3 – 3.3	0.9
	≥ 1 hr	69	5.8	94.2			

Association between health facility factors and Maternal Outcomes

Table 2 shows health facility factors associated with maternal outcome. Two stood out as determinants of maternal complications. The odds of complications decreased for women who benefitted from procedure for treatment being explained to them (OR: 0.2; 95%CI: 0.1 – 0.7; p = 0.01) and those who were given information on symptoms or health problem at referral hospital (OR: 0.2; 95%CI: 0.1 – 0.5; p = 0.005). Who accompanied the client (p = 0.09) and client's perception about care in the referral hospital (p = 0.09) decreased the odds of maternal complications, but neither of these association was statistically significant? A smaller proportion of women who were accompanied by nurse/midwife (4.3%), who stated that nurses listened and explained things (3.9%) or those seen within less than 30 minutes to be attended to (p = 0.3) experienced complications. The odds of complications increased where the main reason for referral was lack of equipment at the referring health facility (p = 0.09) though the result was not statistically significant.

"The reason why most of the mothers get referred is that, peripheral facilities lack equipment and theaters. In case a mother needs to undergo caesarian section, it becomes tricky so those facilities just choose to refer and the problem is that they refer at a complicated stage especially the primigravids" (Respondent 3).

The odds of complications were lower for those referred by medical doctors than that of other referring health professionals such us clinical officers or nurses albeit non-significant association (p = 0.4). The odds of complications increased up to 4.5 times where the mother received treatment before referral but result was not significant (p = 0.4).

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Table 2: Health Facility Factors Influencing Maternal Outcomes

Variable	Categories	N	Complications		OR	95%CI	p value
			Yes (%)	No (%)			
Referred	Yes	279	5.7	94.3	0.2	0.01 – 1.85	0.2
	No	4	25.0	75.0			
Referred by medical doctor	Yes	128	4.7	95.3	0.6	0.2 – 1.8	0.4
	No	155	7.1	92.9			
Who accompanied client	Nurse or Midwife	208	4.3	95.7	0.4	0.1 – 1.0	0.09
	Others	75	10.7	89.3			
Type of referring health facility	Hospital	143	5.6	94.4	0.9	0.3 – 2.3	0.8
	Other	140	6.4	93.6			
Reason for referral	Lack of equipments	30	13.3	86.7	2.8	0.9 – 9.3	0.09
	Other	253	5.1	94.9			
Indication for referral	Prolonged labour	72	2.8	97.2	0.4	0.1 – 1.7	0.3
	Other	211	7.1	92.9			
Received treatment before referral	Yes	174	6.9	93.1	1.5	0.5 – 4.5	0.4
	No	109	4.6	95.4			
Explained procedure for treatment	Yes	247	4.4	95.6	0.2	0.1 – 0.7	0.01
	No	36	16.7	83.3			
Given information on symptoms or health problem at referral hospital	Yes	253	4.3	95.7	0.2	0.1 – 0.5	0.005
	No	30	20.0	80.0			
Perception about the hospital staff	Extremely good	86	4.7	95.3	0.7	0.2 – 2.2	0.5
	Other	197	6.6	93.4			
Perception about care in the hospital	Nurses listen and explain things	155	3.9	96.1	0.4	0.2 – 1.2	0.09
	Doctors listen and explain things	128	8.6	91.4			
Time taken to be attended to	Less than 30 minutes	263	5.7	94.3	0.5	0.1 – 2.6	0.3
	≥30 minutes	20	10.0	90.0			

Relationship between Accessibility and Fetal Outcome

Table 3 illustrates bivariate logistic regression analysis on the association between access to health facility and fetal outcome. None of the variables examined had significant association with fetal outcome. Nonetheless, results show a decrease in risk for neonates with mothers covering less than 30 Km (37.9%), spending less than KSh. 200 as fare to the referral hospital

(41.8%) or taking less than one hour to reach the hospital (45.3%) compared to their counterparts. A higher proportion of neonates whose mothers used ambulance had a higher risk of presenting with abnormal outcome (47.1%) than those whose mother used other mode of transport (44.7%) though the association was not statistically significant.

Table 3: Relationship between Accessibility to Health Facility and Foetal Outcome

Variable	Categories	N	Abnormal		OR	95%CI	p value
			Yes (%)	No (%)			
Distance to hospital (in km)	<30	58	37.9	62.1	0.7	0.4 – 1.2	0.2
	≥30	225	48.4	51.6			
Fare to referral hospital (in KSh.)	<200	134	41.8	58.2	0.7	0.4 – 1.1	0.2
	≥200	149	50.3	49.7			
Mode of transport	Ambulance	189	47.1	52.9	1.1	0.7 – 1.8	0.7
	Other means	94	44.7	55.3			
Hospital contacted before referral made	Yes	86	48.8	51.2	1.2	0.7 – 1.9	0.6
	No	197	45.2	54.8			
Time taken to reach the referral hospital	Less than 1 hr	214	45.3	54.7	0.9	0.5 – 1.5	0.6
	≥ 1 hr	69	49.3	50.7			

Association between Health Facility Factors and Fetal Outcome

Table 4 resents health facility factors associated with fetal outcome. Neonates whose mothers had a positive perception about the hospital staff (OR: 0.5; 95% CI: 0.3 – 0.8; p = 0.005) were 50% less likely to have had abnormal outcome. In contrast, the risk of abnormal outcome was higher for neonates whose mothers' received treatment before referral (OR: 2.3; 95% CI: 1.4 – 3.8; p = 0. 001) suggesting possible delay in providing treatment as a possible cause of deteriorating condition of the fetus. Neonates whose mothers were accompanied by nurse/midwife were equally at a higher risk of presenting with abnormal outcome (OR: 1.8; 95% CI: 1.0 – 3.1; p = 0.04). The risk was up to 3.1 times higher compared to cases where mothers were accompanied by relatives. Though not statistically significant, neonates whose mothers were attended to within 30 minutes in the referral hospital were less likely to have had abnormal outcome (p = 0.08).

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Table 4: Health Facility factors Influencing Fetal Outcome

Variable	Categories	N	Abnormal		OR	95%CI	p value
			Yes (%)	No (%)			
Referred	Yes	279	46.2	53.8	0.9	0.1 – 6.2	1.0
	No	4	50.0	50.0			
Referred by medical doctor	Yes	128	45.3	54.7	0.9	0.6 – 1.5	0.8
	No	155	47.1	52.9			
Who accompanied client	Nurse or Midwife	208	50.0	50.0	1.8	1.0 – 3.1	0.04
	Others	75	36.0	64.0			
Type of referring health facility	Hospital	143	46.1	53.9	1.0	0.6 – 1.6	1.0
	Other	140	46.4	53.6			
Reason for referral	Lack of expertise	30	50.0	50.0	1.2	0.6 – 2.5	0.7
	Other	253	45.9	54.1			
Received treatment before referral	Yes	174	54.0	46.0	2.3	1.4 – 3.8	0.001
	No	109	33.9	66.1			
Explained procedure for treatment	Yes	247	44.5	55.5	0.6	0.3 – 1.2	0.1
	No	36	58.3	41.7			
Given information on symptoms or health problem at referral hospital	Yes	253	44.7	55.3	0.5	0.2 – 1.2	0.1
	No	30	60.0	40.0			
Perception about the hospital staff	Extremely good	86	33.7	66.3	0.5	0.3 – 0.8	0.005
	Other	197	51.8	48.2			
Perception about care in the hospital	Nurses listen and explain things	155	47.1	52.9	1.1	0.7 – 1.7	0.8
	Doctors listen and explain things	128	45.3	54.7			
Time taken to be attended to	Less than 30 minutes	263	44.9	55.1	0.4	0.2 – 1.1	0.08
	≥30 minutes	20	65.0	35.0			

DISCUSSION

Relationship between Accessibility to a Health Facility and Maternal Outcome

Accessibility of health services has been shown to be an important determinant of maternal outcomes. According to our study's findings three factors stand out although the results are not statically significant**.** In our current study, results show that a smaller proportion of women who spent less than 200ksh to the referral hospital had complications than those who paid more. This could be because the women in our current study who spent a lesser amount of fare could

be coming from near the hospital hence the time taken to reach the health facility is shorter and it is possible that they were able to access care on time. This finding was supported by a study by Galeto *et al.,* (2018) who pointed out that prevention of maternal mortality and morbidity can be realized through making pregnancy and childbirth safer by ensuring that the women who face obstetric complications have access to timely obstetric care. Similarly, use of ambulance was associated with a smaller proportion of cases with complications unlike those who used other means of transport. This finding agrees with research undertaken by Mucunguzi *et al.,* (2014) which concluded that reliable transport services increased access to and utilization of maternal health services.

Relationship between Health Facility Factors and Maternal Outcomes

According to WHO (2015) countries with high maternal, mortality have inadequate and poor quality of health services and this can be associated with reduced utilization of health care services. This agrees with our study findings which reveal that health facility factors are associated with maternal outcome. Mothers who benefited from explanation on procedure for treatment and those who were given information on symptoms or health problem at the referral hospital were less likely to have had complications. These results were in line with study findings by Kumsa *et al.,* (2016) who found a positive association between health workers communication, health care provided and attitude of health worker, client satisfaction and reduction of maternal complications. Mannava *et al*., (2015) also reported that communication with mothers by health care providers influence health care seeking behavior of the clients.

Though not statically significant our current study's findings show that the odds of complications increased where the main reason for referral was lack of equipments at the referring health facility. This finding was supported by research undertaken by Uone, *et al., (*2015) which revealed that provision of enabling environment could improve performance of EmOC signal functions. The increased odds of complications on such mothers could also be because the mothers had to be referred and time taken to reach the referring health facility could have been long hence contributed to adverse maternal outcomes.

Relationship between Accessibility to Health Facility and Fetal Outcomes

Access to skilled birth attendant for routine care and management of complications is important for pregnant women. Lule *et al.,* (2015) indicated that Lack of access to appropriate obstetric care, especially during labor, compounds the risk of adverse fetal outcomes such as death or disability. Though not statically significant, our study results show that mothers who covered less than 30 km had a decreased risk of adverse neonatal outcome compared to their counterparts. This result agrees with findings by Gopianath (2016) who indicated that maternal morbidity and mortality is directly proportional to the distance travelled and time taken to reach the hospital. It is possible that the mothers in our study arrived at the health facility on time and were able to receive timely care hence the decreased risk of adverse neonatal outcomes. Results in our current study also show that mothers who spent less amount of fare or who took less than an hour to reach the health facility had a decreased risk of adverse neonatal outcome compared to their counterparts. The lesser amount of fare spent is associated with a shorter distance to the health facility hence mothers are able to receive timely obstetric care. Our study's results also show that neonates whose mothers used ambulance as a mode of transport had a higher risk of presenting with abnormal outcome than those whose mothers used other modes of transport. This was in contrary to a study by Mucunguzi *et al*., (2014) who reported

that reliable transport services increased access to and utilization of maternal health services hence better outcomes. The reason why the neonates in our study had a higher risk of presenting with abnormal outcomes as evidenced by the results could be because of the and poor road conditions in our study area. This could have made it extremely difficult for mothers to reach the health facility on time despite the reliable means of transport.

Association between Health Facility Factors and Fetal Outcomes

Neonates whose mothers had a positive perception about the hospital staff were 50% less likely to have had abnormal outcomes. This finding agrees with a study by Jebet and Oyore, (2015) who found out that when a mother has a positive perception about a health facility, she will want to come back to the facility again hence better utilization of maternal health service. In contrast, abnormal outcomes were higher for neonates whose mothers' received treatment before referral suggesting probable inappropriate treatment received by the mother.

This study findings show that neonates whose mothers were accompanied by a nurse/midwife were equally at a higher risk of presenting with abnormal outcome compared to cases where mothers were accompanied by relatives. The risk was up to 3.1 times higher compared to cases where mothers were accompanied by relatives. This could be because the mothers who were accompanied by a midwife were cases of admission at the referring health facility and had started having obstetric complications. It is possible that the referring facility delayed referring the mothers on time to access advanced care. This could be because the health care personnel delayed on timely decision about intervention and referral. Timely referral is crucial for a satisfactory fatal outcome (Jakhar & Choudhary, 2019)

Though not statically significant, this study's findings show that neonates whose mothers were attended to within 30 minutes in the referral hospital were less likely to have had abnormal outcomes. This finding was in line with a study by Galeto *et al.,* (2018) who concluded that Prevention of maternal mortality can be realized through making pregnancy and childbirth safer by ensuring that the women who face obstetric complications have access to timely obstetric care

CONCLUSION AND RECOMMENDATIONS

Conclusion

Distance to the referral hospital, the type of transport used and the amount of fare used. use of ambulance was associated with a smaller proportion of cases with complications unlike those who used other means transport. spending less amount of fare to reach the referral hospital or taking less time to reach the hospital are associated with decrease in risk for adverse maternal and fetal outcome. Positive perception about the hospital, who accompanied the mother, time taken to be attended to and the reason for referral influenced the maternal and fetal outcomes. The odds of complication decreased for women who benefitted from procedure of treatment being explained to and in where mothers were given information on symptoms at the referral hospital, positive perception about the hospital staff was associated with less likelihood of having abnormal fetal outcomes, neonates of mothers accompanied by a midwife were at a higher risk of presenting with abnormal outcomes, neonates of mothers who were attended to within less than 30 mins were less likely to have abnormal outcomes. The odds of complication increased where the main reason for referral was lack of expertise at Referring health facility.

Recommendations

This study recommends that the referral system should be strengthened by the county government by ensuring that ambulance services are available in the peripheral facilities for transportation of referral cases to ensure timely arrivals. Mobile clinics in areas where that are hard to reach due to poor road networks should be considered and should be organized by the county government in collaboration with Non-governmental organizations.Health care workers should be trained in essential and emergency obstetric care to reduce unnecessary referrals that would delay emergency care hence help in reducing preventable morbidity and mortality. Political leaders like the county governors should ensure that the lower-level facilities are provided with medical supplies and equipment for provision of emergency obstetric care and to be distributed with specialized personnel.

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