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Maternal Factors Associated with Timely Referral and Safe Transport of Neonates in Makueni County Referral Hospital

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Abstract

The study sought to determine maternal factors associated with timely referral and safe transport of neonates in Makueni County Referral Hospital. The study employed a cross-sectional study design. The researcher collected data from 50 neonates through consecutive sampling. The researcher used a self-administered questionnaire, patient file reviews, and a structured data checklist. Patients condition on admission was obtained from the health record. The researcher analyzed the data quantitatively using the Statistical Package for the Social Sciences (SPSS) version 26. The data obtained was summarized using frequency tables. Inferential statistics, such as Chi-square tests, Fisher's Exact Tests, and bivariate and multivariate analyses, were used to test for associations. In total, 50 admitted neonates were recruited to the study, and results were analyzed. Maternal characteristics encompassing age, education level, parity, marital status, ANC visits, residence, and knowledge of high-risk pregnancies did not have a statistically significant relationship with the occurrence of timely referral and safe transport of neonates. Availability of enough and qualified health care providers to aid in vital signs monitoring, pre-referral, and en-route stabilization of neonates.

Keywords: *Maternal factors, timely referral, safe transport, neonates*

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1. Introduction

Sick neonates need quality, timely hospital care in order to survive. The care includes providing feeding support, warmth, effective phototherapy, and safe oxygen therapy. Hospital care for neonates thus requires specialized ward space and professionally trained healthcare workers. The need for timely communication with referral facilities is therefore invaluable. An estimated 2.8 million neonates die each year, many of whom lack accessibility to such specialized care (Moxon et al., 2015).

In Sub–Saharan Africa, timely referral and safe transport of sick neonates ensure access to high-quality care, which is critical to improving outcomes. A study conducted in Ethiopia found that poor transportation and communication infrastructure delayed neonatal referrals across all study areas. The use of ambulances, training and sensitization of health care providers, use of referral guidelines, and receiving facility communications are all urgently

needed to improve outcomes for sick neonates presenting at higher-level healthcare facilities (Teklu et al., 2020).

In South Africa, a study found that the transfer of seriously ill neonates is an important aspect of neonatal care, as it influences safety during transportation to the receiving hospital. The study highlighted that specialised dedicated neonatal units, the availability of equipment such as incubators and monitors, adequate neonatal documentation, and thorough physical examination were crucial in the transfer process to ensure safe and efficient referral and to avoid compromising the already fragile condition of the neonate (Ashokcoomar et al., 2021).

Referral guidelines have been established in Kenya to ensure coordination and continuity of care at different levels of the healthcare system. The referral guidelines, especially for the transfer of neonatal patients, require an ambulance with a functional oxygen supply, drugs, and a firm couch. The neonate should be accompanied by a competent health care worker. Poor adherence to these rules may result in increased morbidity and mortality in neonate patients (Ministry of Health, 2014).

Studies carried out in Kenya indicate that newborns account for half of the admissions and two-thirds of the deaths in children aged zero to thirteen years in county referral hospitals (Irimu etal, 2020). Makueni County Referral Hospital averages 300 births per month (Hospital Records, 2023). Makueni County has a 24-hour emergency operating center and ensures the dispatch of ambulances within the county.

1.1 Justification of the Study

Neonates are referred to institutions with greater experience and resources by peripheral health care facilities in Kenya because they are typically not well-equipped to care for them. For a referred neonate, neonatal mortality due to reasons such as sepsis, birth asphyxia, and prematurity can be prevented through timely referral and safe transport. Delays in identifying sick neonates, lack of transport, lack of communication with the receiving facility, lack of the appropriate equipment, and the care provided before and during transport will all be aided by this study. It will make it easier to determine how they are carried, whether they are receiving the best possible care, and whether there are any gaps in the transit process.

Makueni County Referral Hospital, one of the hospitals considered for neonatal referrals to peripheral health care facilities, necessitates conducting the study to assess the effectiveness of services offered to neonates. Neonate patients are referred to Makueni County Referral Hospital for specialized care and management. Anecdotally, according to Makueni County Referral Hospital, figures from 2020 indicate that the newborn unit typically receives 17 referred neonates per month, accounting for a sizable share of newborn unit admissions. Therefore, it was crucial to conduct the study to determine whether referrals to MCRH (Makueni Health Records, 2020) are timely and transport safe for those neonates. The design of an intervention to enhance timely referral and safe transport procedures will be guided by the study's findings.

1.2 Problem Statement

From the literature review, it is evident that delays in identifying sick neonates, lack of transport, lack of communication with the receiving facility, and lack of the appropriate equipment increase risks of child mortality (Teklu et al., 2020). In many cases, an insufficient number of ambulances during a referral could adversely affect the neonate. In cases where

ambulance services are available, the lack of emergency care en route increases the risk of death (Bose, 2017). Lack of appropriate equipment, such as oxygen cylinders, radiant heaters, and incubators, affects a sick neonate's condition. Also, a lack of knowledge to identify danger signs in neonates has led to increased morbidity and mortality rates (Negi et al., 2019). MCRH averages 300 births per month (Hospital Records, 2022).

According to the Kenya National Bureau of Statistics (2022), the county has a neonatal mortality rate of 26 per 1,000 live births, while the countrywide rate is 21 per 1,000 live births. About 39% of neonates delivered in Makueni County develop complications during delivery or before the first month of life. About 26% of the 39% of the neonates are referred to MCRH for specialized care. Delays during the referral time and transport compromise the neonate's condition, and 19% of the neonates die before gaining access to specialized care (Hospital Records, 2022). Despite significant advancements in neonatal care, timely referral and safe transport remain critical to neonatal outcomes. Documented evidence on safe transport and timely referral of neonate patients at MCRH is inadequate, hence the need to carry out the study.

1.3 Research Objective

To determine maternal factors associated with timely referral and safe transport of neonates in Makueni County Referral Hospital.

2. Literature Review

According to a study conducted in Western Europe in London, it indicates that neonatal mortality rates have been demonstrated to increase during humanitarian emergencies, where women and neonates are susceptible to health complications as a result of difficulties coordinating referrals (Rutherford et al., 2023).

For a neonate who requires referral, the referral follows a pre-established plan that can be implemented at any time without delay and should be completed within thirty minutes. For neonates referred within or between health facilities, there should be appropriate information exchange and feedback to relevant health care staff in the lower health facilities/or other referring facilities. Every neonate who requires referral gets pre-referral care and is transferred in the kangaroo mother care position with their mother, when possible (UNICEF, 2020).

Regarding a study conducted in North India, sick neonates must be referred to higher centers due to the lack of specialized care, and this can be greatly enhanced by organized interhospital transport services delivered by knowledgeable, well-equipped staff. The study illustrated the high rate of mortality during referral and transport as well as the hemodynamic deterioration of neonates. They suggested that the outcomes for neonates referred can be improved by adequate pre-referral stabilization, increased awareness, improved basic resuscitation skills among peripheral health workers, and the availability of suitable equipment (Singh et al., 2021).

According to Bose (2017), in settings where trained health personnel are unavailable during the transport of a neonate, crucial lifesaving interventions such as blood glucose monitoring, maintaining warmth, and administering supplemental oxygen are missed, which may worsen the neonate's condition. The neonate's temperature should be maintained through the use of warm clothing, thermal mattresses, incubators or Kangaroo Mother Care. The ideal in transportation is the use of incubators, which are used extensively in developed countries.

In Sub–Saharan Africa, a study conducted in Nigeria revealed that 7% of neonates were accompanied by health care workers. The neonates, accompanied by health care professionals, were stabilized before and during transport (Muhyeed et al., 2016).

In Eastern Africa, a study conducted in Ethiopia revealed that when initiating a referral, communicating with the receiving institution about the reason for the referral reduces treatment delays, averts overcrowding, and leverages the expertise of advanced care centers. One should ensure communication with the receiving facility; however, in places of limited resources, such as a scarce number of experts and an increased turnover rate, as well as a lack of communication technology, may result in ineffective referral communication between the referring and the receiving health care facilities (Teklu et al., 2020).

In the Eastern Africa region, a study conducted in Ethiopia revealed that health system and client-related obstacles have a detrimental effect on the neonatal referral system, which is essential to the continuum of neonates' health care. Studies on neonatal referral systems have been scarce due to the intricate and varied nature of neonatal referral procedures. The study suggests that there is an urgent need for government investment in neonatal referral systems and in the standardization of referral and return-referral communication in Ethiopia to reduce neonatal mortality rates (Teklu et al., 2020).

In Kenya, the referral system comprises four service levels: community, primary care, county referral services, and national referral services. Community Health Services encompass all community-based health activities, organized according to the Comprehensive Community Strategy. Primary Care Facilities include all types of dispensaries, clinics, health centers, and maternity homes. County Referral Health Facilities consist of all level 4 and level 5 facilities operated and managed by the county. All the facilities managed by the county create a county referral system, which collaborates to offer specific services, forming a virtual network. National Referral Health Facilities are those that provide specialized health care services, such as hospitals, laboratories, blood banks, and research institutions. These establishments function with a specific degree of autonomy (MOH, 2014).

3. Materials and Methods

3.1 Study Design

A cross-sectional study design was used, allowing the researcher to collect data from many respondents at once. This was an easier way to gather data and identify correlations for further investigation. A cross-sectional study design addressed the study questions.

3.2 Study Population and Sample

The study population comprised all newborns referred to and discharged from the Makueni County Referral Hospital Newborn Unit at the time of the study. Similarly, neonates who were transferred from MCRH to other facilities for specialised care were included in the study. The researcher targeted a population of 200 neonates.

3.3 Sampling Procedures

The researcher used modified Fischer's formula as highlighted below:

Were,

$N = Z^2 P(1 - P) \div C^2$

N=Sample size

Z= Z value equal to 1.96

P= Prevalence estimated to be 50%

C=1- confidence level to be 0.05

Hence;

N = (1.96*1.96) *0.5(0. 5) ÷ (0.0025) =384

Therefore: $nf = no$; N=200 (N= the population size while $nf =$ is the finite sample size) $1+no/N$ nf = 384 1+384/50 = 50.

Adjusting for the finite population for neonates referred to Makueni County Referral Hospital newborn unit based on the 2022 hospital medical records, where an average of 17 referred neonates were admitted monthly, and this translates to 51 neonates in three months. Consecutive sampling continued until the minimum sample size was reached.

3.4 Sampling Method

The researcher used consecutive sampling to recruit all neonates referred from peripheral health facilities to Makueni County Referral Hospital. The researcher first recruited admitted neonates and continued to recruit study subjects as they were admitted to the hospital's Newborn Unit. This took place during the three months of the study.

3.5 Data Collection Method

Data were collected using open- and closed-ended questions. The researcher collected data through the Mother-and-Infant Dyad. A structured data checklist and document reviews of the patient's file were also used to identify institutional factors affecting the timely referral and safe transport of neonates at Makueni County Referral Hospital. The patient's condition on admission was obtained from their files. Data collected was filed safely, and privacy and confidentiality were ensured.

3.6 Data Collection Process

Research approval letter was obtained from the Kenyatta University Ethical Review Committee approval PKU/2574/11700 and the Kenyatta University Graduate School. Permission to collect data was sought from NACOSTI. The researcher visited the County Commissioner, County Director of Education, County Secretary, the Chief Officer of Health Services, and MCRH for clearance before collecting data. The researcher also had a work plan, which was followed. Data were collected through a researcher-guided questionnaire to assess mothers' knowledge of the identification of danger signs in neonates and a checklist to identify institutional factors associated with timely referral and safe transport of neonates.

3.7 Data Management

Once questionnaires and checklists were completed, the data obtained from study participants were stored in computers, hard disks, and flash disks for future reference. All the information was kept under lock and key to ensure its safety.

3.8 Data Analysis

The study's objectives served as a guide for the analysis. Inferential statistics were used to analyze the data that was gathered. The researcher verified the consistency and completeness of the questionnaires and checklists after the data collection was finished and before processing the replies. The data were organized and categorized in accordance with the study's goals. Data from the questionnaires, document reviews, and structured checklists were analyzed using the Statistical Package for Social Sciences (SPSS V26). Expert assistance from a statistician was sought. To test for independent association, logistic regression was employed. The study results were graphically presented in the form of frequency tables, bar graphs, and pie charts.

4. Results

4.1 Maternal Characteristics

The majority of mothers were aged 15-24 years, with 68% (n=32). The majority of respondents' highest level of education was secondary, comprising 64% (n=32). The majority of respondents had one child, with 52% (n=26). Amongst all the respondents, 60% (n=30) were married. Those who visited ANC 1-4 visits were 58% (n=29); more than 4 visits were 42% (n=19); 4% (n=2) had not attended the ANC clinic. 96% (n=48) had an ANC profile and 4% (n=2) had no ANC profile. Antenatal complications were reported in 20% (n=10) of the mothers and included pre-eclampsia 4% (n=2), Malaria and Dengue fever 2% (n=1), tonsillitis 2% (n=1), abdominal upset 2% (n=1), urinary tract infections 4% (n=2), anaemia in pregnancy 4% (n=2), and peptic ulcers 2% (n=1). The majority of respondents lived in rural areas, comprising 88% (n=44) and 12% (n=6) who were self-referrals. 12% (n=6) had in-utero transport (Table 1).

Table 1: Maternal Characteristics Associated with Timely Referral and Safe Transport at Makueni County Referral Hospital

Maternal characteristics	Frequency (N=50)	Percentage (%)
Maternal age (years)		
15-24 years	34	68
25-49 years	16	32
Education		
Primary	7	14
Secondary	32	64
College / university	11	22
Parity		
One child	26	52
Above one child	24	48
Marital status		
Married	30	60
Single	19	38
Windowed	1	2
ANC visits		
1-4 visits	29	58
More than 4 visits	19	38
Not attended	2	4
ANC profile		
Present	48	96
Absent	2	4
ANC complications		

No complication	40	80
Pre-eclampsia	2	4
Malaria/ Dengue fever	1	2
Tonsillitis	1	2
Abdominal upsets	1	2
UTI in pregnancy	2	4
Peptic ulcers	1	2
Anaemia in pregnancy	2	4
Residence		
Urban	6	12
Rural	44	88
Referral		
Self-referral	6	12
In utero transport	6	12
From health facility	38	76

4.2 Associations between Maternal Characteristics and Timely and Safe Referral Status

The association between various maternal characteristics and referral status, categorized as either "timely and safe" or "lack of timeliness or safety or both," during the referral process. The statistical analysis used Fisher's Exact test to assess the significance of the associations, and unadjusted odds ratios (ORs) were computed with "No" as the reference category.

The analysis revealed that mothers aged below 24 years were less likely to experience a lack of timely and safe referral than those aged above 24 years (OR = 0.346, 95% CI = 0.038-3.181, p = 0.657). However, it's worth noting that this difference did not attain statistical significance. Among mothers aged 25 years and older (the reference category), only 7.1% received timely and safe referrals, whereas the majority, 92.9%, did not.

In terms of educational background, no significant difference emerged in the likelihood of encountering a lack of timeliness and safety referrals between mothers with primary education or below and those with education above the primary level (OR = 1.059, 95% CI = 0.107-10.435, p = 1.000). Additionally, parity, or the number of children, appeared not to significantly influence the lack of timeliness and safety in referrals. The comparison between mothers with one or fewer children (parity <= 1) and those with more than one child (parity > 1) yielded an OR of 1.474 (95% CI = 0.291-7.450, p = 0.701). Similarly, marital status showed no marked correlation with the probability of experiencing a lack of timeliness and safety referral. The analysis comparing married mothers with other marital statuses showed an OR of 0.986 (95% CI = 0.194-4.994, p = 1.000).

Moreover, the number of antenatal care (ANC) visits, regardless of being four (or fewer) or more, did not notably sway the likelihood of facing a lack of timeliness and safety referral (OR = 0.489, 95% CI = 0.085-2.825, p = 0.682). Also, residence in rural or urban areas and knowledge of high-risk pregnancies did not exhibit statistically significant associations with the occurrence of timeliness and safety issues in the referral process (p>0.05). In summary, the analysis suggests that various maternal characteristics, including age, educational level, parity, marital status, ANC visits, residence, and knowledge of high-risk pregnancies, were not statistically significantly associated with timeliness and safety issues in the referral process.

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Table 2: Association Between Maternal Characteristics and Timely and Safe Referral Status of Neonates at Makueni County Referral Hospital

Maternal Characteristic		Referral status: Timely Referral and Safe Transport						P≤0.05 (Fisher's Exact)	Unadjusted OR (95%). Ref cat is NO for DV)
		No		Yes		Total			
		N	%	N	%	N	%		
Age	<=24	37	81.8	6	18.2	33	100.0	0.657	.346(.038-3.181)
	years	13	92.9	1	7.1	14	100.0		Ref
	>24 years.	50	85.1	7	14.9	47	100.0		
	Total								
Educational Level	<=Primary	16	85.7	1	14.3	7	100.0	1.000	1.059(.107-10.435)
	>Primary	34	85.0	6	15.0	40	100.0		
	Total	50	85.1	7	14.9	47	100.0		
Parity	<=1 child	31	87.5	3	12.5	24	100.0	0.701	1.474(.291-7.450)
	>1 child	19	82.6	4	17.4	23	100.0		
	Total	50	85.1	7	14.9	47	100.0		
Marital Status	Others	17	85.0	3	15.0	20	100.0	1.000	.986(.194-4.994)
	Married	33	85.2	4	14.8	27	100.0		Ref
	Total	50	85.1	7	14.9	47	100.0		
ANC visits	<=4	32	81.5	5	18.5	27	100.0	0.682	.489(.085-2.825)
	>4	18	90.0	2	10.0	20	100.0		Ref
	Total	50	85.1	7	14.9	47	100.0		
ANC profile	Yes	50	85.1	7	14.9	47	100.0		
	No	0	0.0	0	0.0	0	0.0		
	Total	50	85.1	7	14.9	47	100.0		
ANC complications	No	32	82.1	7	17.9	39	100.0	1.000	
	Yes	18	100.0	0	0.0	8	100.0		
	Total	50	85.1	7	14.9	47	100.0		
Residence	Rural	35	85.4	6	14.6	41	100.0	1.000	1.167(.115-
	Urban	15	83.3	1	16.7	6	100.0		11.814)
	Total	50	85.1	7	14.9	47	100.0		Ref
Knows high-risk pregnancies	No	18	88.9	1	11.1	9	100.0	1.000	1.500(.157-14.293)
	Yes	32	84.2	6	15.8	38	100.0		Ref
	Total	50	85.1	7	14.9	47	100.0		

5. Conclusion

Maternal characteristics encompassing age, education level, parity, marital status, ANC visits, residence, and knowledge of high-risk pregnancies did not have a statistically significant relationship with the occurrence of timely referral and safe transport of neonates.

6. Recommendations

To promote timely referral and safe transport of neonates at Makueni County Referral Hospital, it is recommended that sufficient qualified healthcare providers be available to support continuous vital signs monitoring, effective pre-referral care, and en route stabilization. Strengthening staffing capacity will enable timely maternal counseling, prompt referral decisions, and appropriate neonatal preparation before transfer, thereby reducing referral delays and improving neonatal safety and survival outcomes.

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