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Neonatal 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 neonatal factors associated with timely referral and safe transport of neonates in Makueni County Referral Hospital. Cross sectional study design was used for this study. The researcher targeted a population of 200 neonates. The researcher used consecutive sampling to recruit all neonates referred from peripheral health facilities to Makueni County Referral Hospital. Data from questionnaires, document reviews, and structured checklists were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26. Expert assistance from a statistician was sought. To test for independent association, logistic regression was used. There was no significant association between timely referral and safe transport and neonatal variables such as age, gender, birth weight, gestational age, place of delivery, duration of labour, and complications requiring oxygen. Availability of enough and qualified health care providers to aid in vital signs monitoring, pre-referral, and en-route stabilization of neonates.

Keywords: *Neonatal factors, timely referral, safe transport*

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1. Introduction

Worldwide, 2.5 million babies lost their lives between 0 and 28 days of life in 2018 (World Bank Group et al., 2019). In many low-income and middle-income countries (LMICs), neonatal survival has decreased in neonates, although mortality is slow. Problems such as prematurity, birth asphyxia, and sepsis are the main reasons for neonatal deaths (Walker et.al., 2020). According to the World Health Organization, many neonate deaths are preventable and can be avoided by simple interventions. One of such interventions is proper preparedness and early identification of intrapartum complications and timely referral of the neonates which ensures reductions of neonatal deaths.

In South Africa, a study unveiled that transfer of seriously ill neonates is an important aspect of neonates from referring hospitals because it has an influence on 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 et al., 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 Problem Statement

Globally, 2.5 million neonates lose their lives every year, with 98% of the newborn deaths. Many neonatal deaths are attributable to preventable causes such as sepsis, birth asphyxia, and prematurity. When a decision to transfer a sick neonate is made, the receiving facility is informed to get prepared to receive the baby. Referral notes are written and transport services are organized by the initiating healthcare provider. Neonates can have better chances of survival, especially in developing countries, with early identification and treatment of infections, proper preparedness, and timely referral of neonates to highly specialized and equipped healthcare facilities, early launch of breastfeeding, and warmth maintenance through skin-to-skin contact.

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 of neonates 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.

1.2 Objective of the Study

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

2. Literature Review

A crucial component of the third Sustainable Development Goal is lowering neonatal mortality, which is high in developing nations. Despite a global fall, the neonate mortality rate remains unacceptable at 37 per 1000 live births, and the decline is slower than that of the under-5 child mortality rate. Approximately 7000 babies worldwide pass away every day; many of these deaths take place in the first week of life, and almost 2.6 million babies pass away in the first

month. South Asia and Sub-Saharan Africa, which account for 39% of all neonate fatalities worldwide and rank in the top 10 nations with the highest neonatal mortality rate, account for almost 78% of these neonatal deaths. Building on the Millennium Development Goals (MDGs), the Sustainable Development Goals (SDGs) were introduced in 2015 to address health issues pertaining to mothers, neonates, children, and adolescents (WHO, 2018).

In western countries, the neonatal transport team includes a trained neonatal nurse in combination with other disciplines such as an anaesthetist, paramedic, or a pediatrician. The choice of the neonatal transport team is dependent on the needs of the patient and the competency of the staff. Transport by skilled, organized personnel has been shown to decrease neonatal morbidity and mortality, and therefore, neonates transported by skilled health personnel had a higher survival than those who came by themselves (Jenniffer et.al., 2021).

Since 2000, the number of neonatal deaths has dropped by 44%. However, the neonate period (the first 28 days of life) accounted for nearly half (47%) of all deaths in children under five in 2022. This is one of the most vulnerable times of life and calls for higher-quality intrapartum and neonatal care. African continent, in West Africa, it was responsible for only 30% of live births worldwide in 2022, but 57% (2.8 (2.5–3.3) million) of all under-5 deaths. With 27 neonatal deaths per 1000 live births, Sub-Saharan Africa had the highest neonatal mortality rate globally. Central and southern Asia came in second with 21 neonatal deaths per 1000 live births.
Neonatal morbidities such as congenital defects, neonatal infections, premature birth, and birth complications such as asphyxia or trauma continue to be the main causes of neonatal mortality (WHO, 2022).

In Eastern Africa, studies conducted in Kenya and Uganda indicate that stillbirth and neonatal mortality have been slowly declining, despite improvements in neonate survival in many low- and middle-income nations. The main cause of neonatal mortality is complications from prematurity (Walker et al., 2020).

According to the Kenya National Bureau of Statistics (2022), Makueni County has a neonatal mortality rate of 26 per 1,000 live births, while the countrywide rate is 21 per 1,000 live births.

3. Materials and Methods

A cross-sectional study design was used, allowing the researcher to collect data from many respondents at once. The researcher targeted a population of 200 neonates. The researcher used modified Fischer's formula as highlighted below:

Were,

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

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: $n\,f\,{=}no$; N=200 (N= the population size while $n\,f\,=$ is the finite sample size) 1+no/N $n\,f$ = 384 1+384/50 = 50.

Adjusting for finite population for neonates referred to Makueni County Referral Hospital new born 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 was done until the minimum sample size was achieved.

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

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 was organized and categorized in accordance with the study's goals. Data from the questionnaires, document reviews and structured checklist was analyzed using the Statistical Package for Social Sciences version 26 (SPSS V26). Expert assistance from a statistician was sought. In order to test for independent association, logistic regression was employed. The study results were graphically presented in forms of frequency tables, bar graphs, and pie-charts.

4.1 Results

4.1.1 Neonatal Characteristics

The response rate of the admitted neonates was 100%. Of the 50 admitted neonates 62% (n=31) were males. Majority of the neonates had a birth weight above 2500grams consisting 54% (n=27). Most of the neonates 64% (n=32) were less than 7 days during the time of study. 40% (n=20) of the neonates were born preterm. Majority of maternal gestation in weeks was term with 52% (n=27). Majority of all the deliveries occurred in hospital at 92 % (n=46) with 0nly 4% (n=2) of the deliveries occurring on the way to the health facility. Out of all the deliveries conducted, 70% (n=35) labored for less than 18 hours and 12% (n=6) labored for more than 18 hours. Majority of the neonates needed oxygen immediately after delivery with 54% (n=27) and 8% (n=4) failed to cry immediately after delivery (Table 1).

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Table 1: Neonatal Characteristics for Neonates Referred to Makueni County Referral Hospital

Neonatal characteristic	Frequency (N=50)	Percentage (%)
Sex of neonate		
Male	31	62
Female	19	38
Age in days		
Less than 7 days	32	64
More than 7 days	18	36
Birth weight in grams		
Less than 1000 grams	4	8
1001-1500 grams	6	12
1501- 2500 grams	13	26
Above 2500grams	27	54
Gestational age in weeks		
Prematurity	20	40
Term	26	52
Post-datism	4	8
Place of delivery		
Home	2	4
Hospital	46	92
On the way to health facility	2	4
Duration of labor in hours		
Less than 18 hours	35	70
More than 18 hours	6	12
Caesarean section	9	18
Complication during delivery		
Birth Asphyxia	27	54
Failure to cry	4	8
Others	19	38

4.1.2 Admission diagnosis

The most common admission diagnosis was prematurity with 32% (n=16) and birth asphyxia at 26% (n=13). Other common conditions that were referred where neonatal sepsis 8%, (n=4) neonatal jaundice 10% (n=5), respiratory distress syndrome 8% (n=4), among other conditions (Figure 1).

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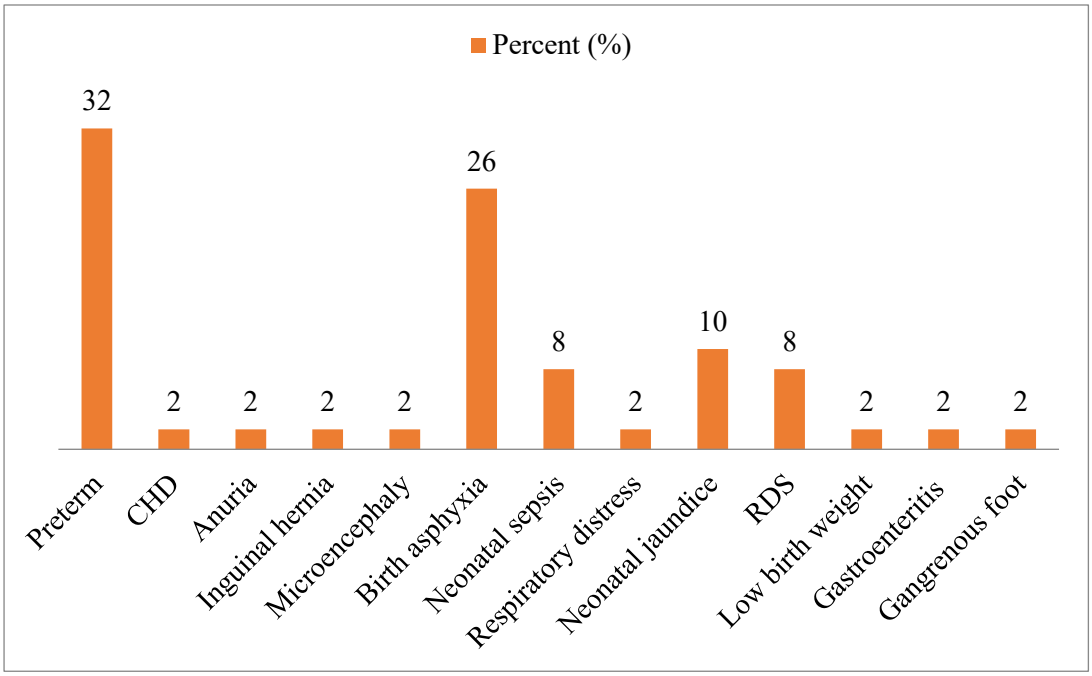

Figure 1: Diagnosis for Neonates Admitted at Makueni County Referral Hospital

4.1.3 Neonatal characteristics and Referral Status (Timely, safe or both)

The association between various neonatal characteristics and the 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 determine the significance of the associations, and unadjusted odds ratios (O.R.s) were computed using "No" as the reference category. Female neonates were less likely to lack timely and safe referrals than male neonates (OR = 0.800, 95% CI [0.157, 4.075], p = 1.000), although this difference was not statistically significant. Similarly, neonates under 7 days demonstrated no statistically significant difference in their likelihood of lacking timely and safe referrals compared to those over 7 days (OR = 1.558, 95% CI [0.303, 8.003], p = 0.676). However, neither age nor gender showed significant relationships with the timeliness and safety of referrals. Concerning birth weight, low-birth-weight neonates displayed a higher likelihood of lacking timely and safe referrals (OR = 2.500, 95% CI [0.433, 14.430], p = 0.423) compared to their normal-birth-weight counterparts. Nevertheless, this difference was not statistically significant. Moreover, preterm gestational age also exhibited no significant difference in the likelihood of lacking timely and safe referrals (OR = 1.848, 95% CI [0.319, 10.693], p = 0.685) compared to term gestational age.

Furthermore, the place of delivery did not significantly influence the likelihood of lacking timely and safe referrals. Similarly, the duration of labor (in hours) did not significantly affect this outcome. Regarding complications during delivery, neonates requiring oxygen did not exhibit a significant difference in their likelihood of lacking timely and safe referrals (OR = 0.151, 95% CI [0.017, 1.369], p = 0.102) compared to those not needing oxygen. In conclusion, this study found no significant associations between timely and safe referrals and the neonatal

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variables of age, gender, birth weight, gestational age, place of delivery, duration of labor, and complications requiring oxygen.

Table 2: Neonatal Characteristics vs Timely-Referral and Safe Transport of Neonates Admitted at Makueni County Referral Hospital

		Timely Referral and Safe Transport						P≤0.05 (Fisher's Exact	Unadjusted OR(95%). Ref cat is NO for DV)
		No		Yes		Total			
Neonatal Characteristic		N	%	N	%	n	%		
Sex of neonate	Female	15	83.30	3	16.70	18	100.00	1.000	.800(.157-4.075)
	Male	35	86.20	4	13.80	29	100.00		.Ref
	Total	50	85.10	7	14.90	47	100.00		
Age in days	<7 days	27	87.10	4	12.90	31	100.00	0.676	1.558(.303-8.003)
	> 7 days	23	81.30	3	18.80	16	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		
Birth Weight	Low	20	90.90	2	9.10	22	100.00	0.423	2.500(.433-14.430)
	Normal	30	80.00	5	20.00	25	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		
Gestation	Preterm	17	89.50	2	10.50	19	100.00		1.848(.319-10.693)
	Term	33	82.10	5	17.90	28	100.00	0.685	Ref
	Total	50	85.10	7	14.90	47	100.00		
Place of delivery	Home	13	75.00	1	25.00	4	100.00	0.488	.486(.043-5.482)
	Hospital	37	86.00	6	14.00	43	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		
Duration of labour (Hrs.)	>18hrs	14	80.00	1	20.00	5	100.00	1.000	.727(.069-7.684)
	<18hrs	36	84.60	6	15.40	39	100.00		Ref
	Total	50	84.10	7	15.90	44	100.00		
Complication during delivery	O2 Needed	19	76.00	6	24.00	25	100.00	0.102	.151(.017-1.369)
	02 Not needed	31	95.50	1	4.50	22	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		
Admission diagnosis	Others	16	84.20	3	15.80	19	100.00	1.000	.889(.175-4.515)
	Preterm/Asphyxia	34	85.70	4	14.30	28	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		
Current diagnosis	Others	16	80.00	4	20.00	20	100.00	0.423	.500(.098-2.540)
	Preterm/Asphyxia	34	88.90	3	11.10	27	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		

5. Conclusion

Based on the findings, the study concluded that there was no significant association between timely referral and safe transport and neonatal variables such as age, gender, birth weight, gestational age, place of delivery, duration of labour, and complications requiring oxygen.

6.0 Recommendations

It is recommended that Makueni County Referral Hospital ensure the availability of adequately trained healthcare providers to support early identification of neonatal complications,

continuous vital signs monitoring, timely referral decisions, and safe pre-referral and en-route stabilization. Strengthening neonatal-focused staffing capacity will reduce referral delays and transport-related risks, thereby improving neonatal outcomes.

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