Institutional Factors Affecting Timely Referral and Safe Transport of Neonates in Makueni County Referral Hospital, Kenya

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Abstract

Purpose: Internationally, 2.5 million babies lose their lives before first 28 days of life, many of the deaths occur in underdeveloped countries and a third occur on day one of life. According to the World Health Organization, many infant deaths are preventable by simple interventions. Some of the early interventions are proper preparedness and early identification of danger signs, timely referral, and safe transport of sick newborns to ensure reductions in newborn deaths. The purpose of this study was to identify institutional factors that affect timely referral and safe transport of neonates in Makueni County Referral Hospital.

Methodology: The study employed an analytic cross-sectional study design. The researcher collected data from 50 primary caregivers or the mothers. The researcher used a self-administered questionnaire, document reviews of the patients' files, and a structured data checklist. Patients condition on admission was obtained from the patient's file. The researcher analyzed the data quantitatively using the Statistical Package for Social Sciences version 26 (SPSS V26).

Results: According to the study findings, institutional characteristics highlight several significant factors associated with the likelihood of timely referral and safe transport during a referral. Patients who did not receive stabilization treatment were found to be more prone to experiencing a lack of timeliness and safe transport during referral (P=0.004), patients who did not undergo vital signs monitoring were 9.25 times more prone to experiencing delays and unsafe transportation (P = 0.035). The results suggest that patients with a response time exceeding 2 hours were more likely to face a lack of timeliness and safe transport during referral (P=0.032). The availability of an ambulance emerged as a significant factor, with 59.5% (25) reporting waiting for an ambulance as the reason for the delay.

Conclusion: The study concludes that institutional factors influenced safe transport and timely referral including stabilization treatment, vital signs monitoring, response time for referral, and the availability of an ambulance. The study recommends that ambulances should be availed timely, in adequate numbers, and be equipped with the necessary drugs and equipment so that

in the event of a problem, the healthcare provider can intervene appropriately. Also, hospitals should be supplied with all the necessary equipment and drugs to aid in stabilization of patients.

1.0 Introduction

Worldwide, 2.5 million babies lost their lives between 0 and 28 days of life in 2018 (World Bank Group, UNICEF, UNDESA & WHO, 2019). In many low-income and middle-income countries (LMICs), neonate survival has decreased in newborns although mortality is slow. Problems such as prematurity, birth asphyxia, and sepsis are main reasons for newborn deaths (Walker, Otieno, Butrick, Namazzi, Achola, Merai, Otare, Mubiri, Ghosh, Santos, Miller, Sloan, & Waiswa, 2020). According to the World Health Organization, many infant 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.

According to a study conducted in Bangladesh, early identification and timely transfer of pregnancy-related emergencies and problems such as prolonged labour, pre-eclampsia, premature rapture of membranes and early separation of the placenta improved neonate's survival. This identification of the high-risk pregnancy can be made by the mothers, community-based healthcare workers and trained healthcare providers and in-utero transport used to save the newborn baby and the mother (Biswas, Anderson, Doraiswamy, Sayeed, Purno, Rahman & Halim, 2018).

A study carried out in India indicated that safe transport of sick neonate relies mostly on the means of transport, well-trained emergency response team, appropriate drugs, proper equipment, and timely communication with receiving facility. In most cases, sick newborns are transported in public and private vehicles without any pre-referral treatment hence making the transport for the neonates unsafe. Primary caregivers and household members play an important role in early recognition of warning signs in neonates and making self-referral to healthcare facilities. This also reveals a gap in transportation of a sick neonate (Shalini, Nakhila & Alimelu, 2017).

Sick neonates need quality-time hospital care to survive. The care includes providing feeding support, warmth, effective phototherapy, and safe oxygen therapy. Hospital care for newborn babies thus requires a specialized ward space, equipped with 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 access to such specialized care (Moxon et.al., 2015).

According to a study conducted in India, referral and transport framework has progressed with utilization of written referral notes and wide use of ambulance. However, despite the continued emphasis on maternal and neonatal health plans, bottlenecks still exist, such as lack of prior communication with referral agencies, the number of times that elapse between referrals and hospitalizations, utilization of uncommon ambulance travel and intensified transportation time. Delays while referring a neonate can worsen the newborn's condition hence increasing the

mortality rates and this represents a gap in transport and timely referral. If well addressed, this can decrease the number of deaths amongst neonates (Negi et.al, 2019).

In Sub–Saharan Africa, timely and safe referral of sick neonates ensures access to timely high-quality care which is critical to improve outcomes. A study conducted in Ethiopia found that poor transportation and communications caused neonatal referrals to be delayed in all areas of study. 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 the outcomes of sick neonates presenting at higher level healthcare facilities (Teklu, Litch, Tesfahun, Wolker, Tuamay, Gidey, Cheru, Senturia, Gezahegn, 2020).

In South Africa, a study unveiled that transfer of seriously ill newborns is an important aspect of newborns from referring hospitals because it has an influence on safety during transportation to the receiving hospital. The study highlighted that specialised dedicated neonatal units, availability of equipment such as incubators and monitors, adequate neonatal documentation, and thorough physical examination was crucial in the transfer process to ensure safe and efficient referral and to avoid compromising the already fragile condition of the neonate (Ashokcoomar & Bhagwan, 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 in the transfer of neonate patients require an ambulance that has a functional supply of oxygen, drugs, and a firm couch. The neonate should be in company of a competent health care worker. Poor adherence to these rules may result in increased morbidity and mortality in neonate patients.

Studies carried out in Kenya indicate that newborns comprise half of the admissions and two-thirds of the deaths in children zero to thirteen years in county referral hospitals (Irimu, Aluvaala & Malla, 2020).

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 births. 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.

From a 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, a lack of emergency care on the way increases risk of death (Bose A, 2017). Lack of appropriate equipment such as oxygen cylinders, radiant heaters, and incubators affects a sick neonate's condition. Also, lack of knowledge to identify danger signs in neonates has led to increased morbidity and mortality rates (Negi et. al, 2019).

About 39% of neonates delivered in Makueni County develop complications during delivery or before first one month of life. About 26% of these babies are referred to different levels 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, 2020). Documented evidence on safe transport and timely referral of neonate patients at Makueni County Referral Hospital is inadequate hence the need to carry out the study.

1.2 Research Objective

To identify institutional factors that affect timely referral and safe transport of neonates in Makueni County Referral Hospital.

2.0 Literature Review

2.1 Institutional Factors affecting Timely Referral and Safe Transport of a Neonate

2.1.1 Place of Referral and Pre referral Stabilization

A study conducted in India, indicated that most referrals were from homes, public and private hospitals, and many neonates were referred and transported in private and public vehicles without any pre-referral care during transportation rendering a referral unsafe for the baby (Shalini et. al, 2017). An observational study carried out in Indonesia indicated that neonates reported to health facilities in unstable conditions due to a lack of stabilization before and during transportation (Ekaputri, Sukmawati, Putra, Kardana & Artana, 2020).

According to Bose (2017), in places where trained health personnel are unavailable during transportation of a neonate, crucial lifesaving interventions such as blood glucose monitoring, maintenance of warmth, and supplementation of oxygen are missed out and this may worsen the neonate's condition.

In Sub–Saharan Africa, a study conducted in Nigeria revealed that seven percent of the neonates were accompanied by healthcare workers. The neonates accompanied by health care professionals were stabilized before and during transport (Muhyeed, Olukemi, Adebola & Olukayode, 2016).

In Kenya, a study conducted at Kisumu County revealed that many patients were self-referred due to location of the healthcare facility and accessibility of the required services (Otieno et al, 2019). Stabilization procedures such as intravenous line insertion, nasogastric tube insertion, temperature monitoring, airway protection, and blood glucose monitoring during transportation were very crucial.

2.1.2 Duration of Stay at Other Health Facilities

According to Negi et al. (2019), many neonates spent more than two days in both private and public health facilities indicating a gap in timely referral. Majority of the referrals come from public government hospitals, private hospitals, and homes as self-referrals. Private health facilities referred neonates to neonatal intensive care units due to inability to provide quality care.

A study carried out in Ethiopia by Teklu et al. (2020), stated that parents chose to remain in facilities where they could gain support from their relatives and extended family to avoid incurring transportation and accommodation costs. When parents could not find a close relative near the receiving facility, they decided to take the newborn home hence increasing the

mortality rates. In Kenya, a study conducted at Kisumu County revealed that many patients were self-referred from their homes due to location of the healthcare facility and availability of the required services (Otieno et al, 2019).

2.1.3 Communication and Documentation

Worldwide proper documentation guides decisions being made. A study carried out in Indonesia found out that when a referral is required, the referring healthcare facility should provide a written form, ensure good communication with the facility receiving the patient and the health care provider should inform the family about the neonate's condition (Nabila, Putu &Achmad, 2019).

A study conducted in Ethiopia revealed that when initiating a referral, communicating with the receiving institution about the reason for the referral reduces delays in treatment, avert overcrowding, and draw on the expertise of advanced care centers. One should ensure communication with the receiving facility, however, in places of limited resources, such as scarce number of experts and 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).

A study carried out in South Africa by Ashokcoomar and Bhagwan, (2021), indicated that correct newborn documentation, information about clinical procedures performed before departure, and thorough inspection methods are essential before referral and should be ensured.

In Kenya, a study revealed that for facility-to-facility referral, the healthcare worker attending to the patient should visit the receiving hospital earlier to confirm availability of the required advanced medical service, write the referral letter clearly, and specify any preceding medical care and support offered to include attachment of all the pertinent diagnostic test results (Murphy et. al., 2018).

2.1.4 Mode of Transport and Time Spent on Transportation

Worldwide, referral system has faced challenges. A study conducted in India found that transport was a challenge and has developed the use of free ambulance services to transfer sick neonates (Singh et.al, 2021). According to Negi et.al, (2019), the use of uncommon ambulance travel and increased transportation time led to delays while referring a sick neonate which can worsen the newborn's condition hence increasing the mortality rates. The modes of transport according to Negi et al, (2019), are walking, use of ambulances, cars, and buses hence indicating a gap in safe transport of neonates. In cases where an ambulance was available, there were no skilled personnel to accompany the patient hence making the transport unsafe for the neonate.

A study conducted in Bangladesh stated that adequate newborn transfer is very important for the care of sick newborns who need to be referred to higher specialized levels of care. When referring to a neonate, transport interferes with various aspects of its balance, such as temperature regulation, fluid and electrolyte balance, metabolic activities, and cardiopulmonary status. This meddling can lead to deterioration and complications during transportation which may increase the morbidity and mortality of this fragile neonate (Madhabi et.al, 2017).

In Sub-Saharan Africa, transport and infrastructure remain to be a bottleneck. A study carried out in Ethiopia indicated that a lack of transport and poor communication resulted in delays in neonate patient referral (Teklu et.al, 2020). There is evidence that difficulties with referral systems, including insufficient transportation, poor communication, inadequate paperwork, and a lack of monitoring, are holding back efforts to lower newborn mortality in developing countries. To transfer newborns to a tertiary care center, a reliable referral mechanism is essential. A study conducted in Tanzania indicated that all government-owned facilities in Tanzania offer free ambulances, which helps to explain why many newborns are transported by ambulance. However, it is worth noting that regardless of the presence of ambulances, subpar functionality and equipment are seen hence causing unstable conditions of the referred neonates (Kiputa et.al, 2022).

In Kenya, the greatest challenge faced by the country is neonatal transport. Lower-level healthcare facilities in rural areas need key interventions to operate to achieve operational conditions, but it require multiple infrastructure support to operate. Numerous people lack water, electricity, and reliable sanitation personnel, while road conditions are generally poor hence barriers to referral for maternal and newborn care (Essendi, Johnson & Madise, 2015). A study conducted in Kiambu County disclosed that a lack of transport and poor infrastructure affected referral system (Kamau, Osuga & Njuguna, 2017).

3.0 Methodology

The study employed an analytic cross-sectional study design. The researcher collected data from 50 primary caregivers or the mothers. The researcher used a self-administered questionnaire, document reviews of the patients' files, and a structured data checklist. Patients condition on admission was obtained from the patient's file. The researcher analyzed the data quantitatively using the Statistical Package for Social Sciences version 26 (SPSS V26). The data obtained was summarized using frequency tables. Inferential statistics such as Chi-square tests Fishers were used to test for associations. Graphs, text, tables, and pie charts were used to present the ultimate results.

4.0 Results and Discussion

4.1 Descriptive Statistics of Institutional Factors

Majority of the neonates, 74% (n=37) were transported via ambulance which respondents argued was safer and 18% (n=9) used private cars. Transport choice was influenced by several factors where transport availability was the main with 38% (n=19) and cost at 26% (n=13). The patient stay was also a factor for the safety of the neonate where 76% (n=36) stayed less than 24 hours and 14% (n=7) more than 2 days. Healthcare professionals (nurses) escorted most of the neonates at 68% (n=34), and those escorted by relatives were 22% (n=11). Those neonates who had stabilization treatment during transport were 46% (n=23), those without stabilization treatment were 48% (n=24) and 6% (n=3) did not require pre-referral stabilization. Majority of the neonates had no vital signs monitoring consisting of 88% (n=44). The response time the median was 1-2 hours yielding 62% (n=31). The neonates whose warmth was kept via warm linen were 84% (n=42). Majority of the referral communication was made via phone call at 82% (n=41) to the receiving facility. During transport, 86% (n=43) of the neonates were not fed (Table 1).

Among those who provided reasons for the delay in referral, 59.5% (25 individuals) specifically mentioned issues related to ambulance services, such as waiting for the arrival of an ambulance. In contrast, the remaining 40.5% (17 individuals) cited various other reasons for the delay, such as waiting for the patient's condition to stabilize.
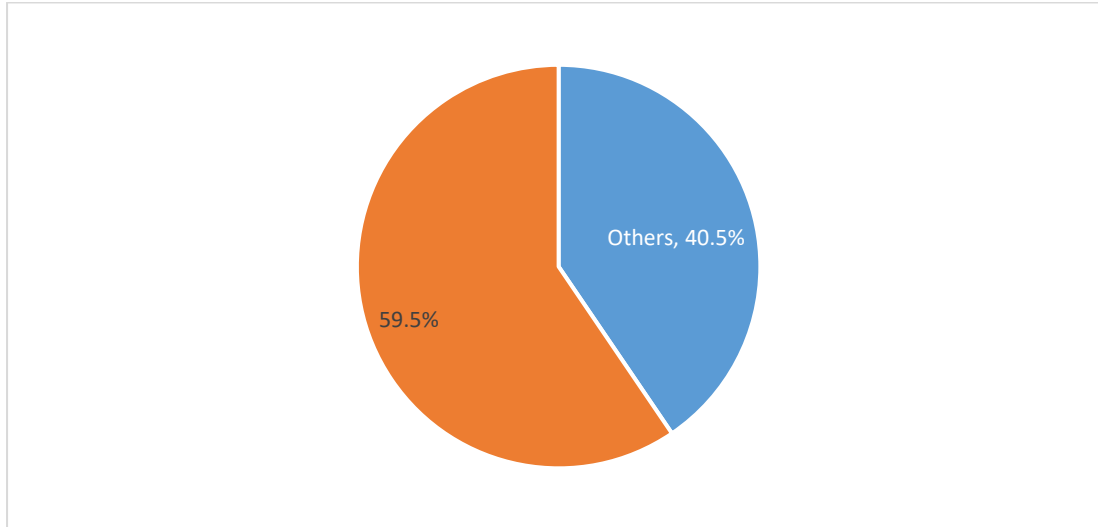
Figure 1: Common reasons for delay in referral

Table 1: Referral and Transport Characteristics

Referral and transport characteristics	Frequency (N=50)	Percentage (%)
Mode of transport		
Ambulance	37	74
Private cars	9	18
Public vehicles	2	4
Walking	2	4
Influence of transport		
Cost	13	26
Distance to be travelled	8	16
Transport availability	19	38
Others	10	20
Patient stay		
Less than 24 hours	38	76
Between 1-2 days	5	10
More than 2 days	7	14
Escort of neonate/mother		
Health care professionals	34	68
Not healthcare professionals	16	32
Stabilization treatment		
Yes	23	46
No	27	54
Vital signs monitoring		
Yes	6	12
No	44	88

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Response time (Hours)		
1-2 hours	31	62
3-4 hours	16	32
5-6 hours	2	4
7-8 hours	1	2
Reasons for the delay in referral Lack of ambulance	25	59.5%
Other reasons e.g., on treatment, etc	17	40.5%
Warmth of baby		
Warm linen	42	84
Incubators/ skin to skin	8	16
Communication from referring facility		
Phone call	41	82
No communication	9	18
Feeding of the neonate during transportation		
Breastfeeding	1	2
Intravenous fluids	4	8
Cup and spoon feeding of expressed breast milk	2	4
Not fed	43	86

4.1.1 Ambulance status: Checklist

Data on ambulance characteristics revealed that 60% (n=30) of the respondents had an ambulance. Among all the ambulances present 60% (n=30) had oxygen cylinders, 10% (n=5) had radiant heaters, 2% (n=1) had incubators, 100% (n=50) had a firm coach, 14% (n=7) had monitoring equipment, and 10% (n=5) had resuscitation medicines while 8% (n=4) had resuscitation equipment (Figure 2).
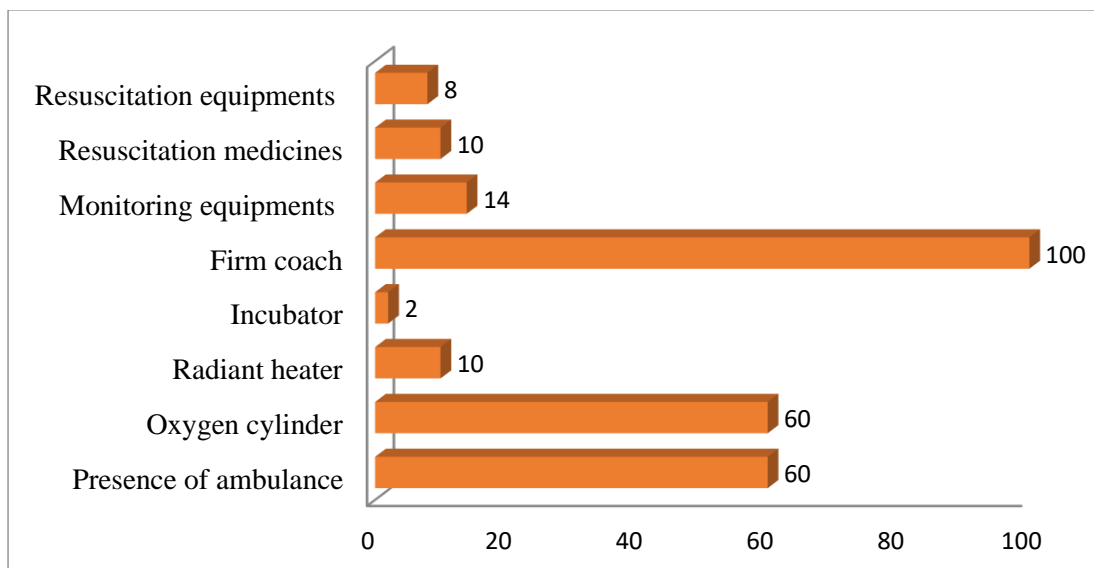

Figure 2: Ambulance Checklists

4.1.2 Referral Requirements or prerequisites

In most of the referred neonates, 92% (n=46) had referral guidelines and 84% (n=42) of all the neonates referred had written referral notes. Amongst the referred neonates 62% (n=31) required oxygen with 52% (n=27) needed nasogastric tube and was not fixed. Majority of the neonates 66% (n=33) required intravenous line with intravenous fluids administered to 52% (n=26) of the neonates. 36% (n=18) were administered with intravenous fluids appropriately. Majority of the neonates had warmth maintained by use of warm linen in 90% (n=45) of all the referred neonates. Vital signs monitoring such as temperature, respirations, oxygen saturation and random blood sugars was done to 12% (n=6) of all the referred neonates (Table 2).

Table 2: Structured Data Checklists of Referral Requirements

Data checklists of referral requirements	Frequency	Percentages (%)
Referral guidelines	46	92
Written notes	42	84
Oxygen requirements	31	62
Need for NGT	26	52
IV line	33	66
IV fluids	29	58
IV Administered	26	52
IV fluids administered appropriately	18	36
Warmth of neonate	45	90
Vital signs monitoring	6	12

4.2 Associations between Institutional Characteristics and Timely and Safe Referral Status

Table 3 presents a cross-tabulation of the relationship between different institutional or hospital characteristics and the referral status of maternal patients. The referral status was dichotomized into "timely and safe" or "lack of timeliness or safety or both" during the referral process. The statistical significance of these relationships was assessed using Fisher's Exact test. Additionally, unadjusted odds ratios (O.R.s) were computed using "No" as the reference category for the outcome variable.

Examining the mode of transport, encompassing "Others (Public/Private Car)" and "Ambulance," the findings suggest that the mode of transport does not significantly influence whether a patient experiences a lack of timeliness and safe transport during the referral process (P>0.05). Transport considerations, specifically "Cost" and "Transport availability," were also explored. The results demonstrate no substantial impact on the likelihood of experiencing a lack of timeliness and safe transport during referral (P>0.05). Considering the duration of patient stay before referral, categorized as ">24hrs" or "<=24hrs," the analysis suggests that the duration of patient stay in the hospital before referral does not significantly affect the likelihood of encountering a lack of timeliness and safe transport (P>0.05).

The escort of neonate/mother, categorized as "Others" or "HCP," was also investigated. However, the data indicates no significant association with the likelihood of a lack of timeliness and safe transport during referral (P>0.05).

Interestingly, the presence or absence of "Stabilization treatment" emerges as a significant factor. Patients who did not receive stabilization treatment were found to be more prone to

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experiencing a lack of timeliness and safe transport during referral (P=0.004). In the context of vital signs monitoring, the analysis suggests that patients who did not undergo vital signs monitoring were 9.25 times more prone to experiencing delays and unsafe transportation (P = 0.035) compared to their monitored counterparts (OR = 9.250, 95% CI = 1.3-62.091). Furthermore, the response time for referral, categorized as ">2hrs" or "<=2 hours," was explored. The results suggest that patients with a response time exceeding 2 hours were more likely to face a lack of timeliness and safe transport during referral (P=0.032). The "Availability of an ambulance" emerged as a significant factor, with 59.5% (25) reporting waiting for an ambulance as the reason for the delay, in comparison to 40.5% (17) who cited other reasons for the referral delay. The absence of an ambulance was found to have a substantial influence on the likelihood of experiencing a lack of timeliness and safe transport during referral (P=0.039).

Other factors, including "Warmth of baby," "Communication to referring facility," "Feeding of neonate on transit," "Oxygen cylinder," "Radiant heater," "Incubator," and "Monitoring equipment," were also considered. Nevertheless, the results for these factors did not reveal significant associations with the likelihood of a lack of timeliness and safe transport during referral (P>0.05).

In summary, the analysis of institutional or hospital characteristics highlights several significant factors associated with the likelihood of timely and safe transport during referral. These factors include stabilization treatment, vital signs monitoring, response time for referral, and the availability of an ambulance.

Table 3: Association Between Institutional and Timely and Safe Referral Status

Institutional Factors		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	%		
Mode of Transport	Others (Public/Private Car)	10	100.0%	0	0.0%	10	100.0%	0.318	
	Ambulance	30	81.1%	7	18.9%	37	100.0%		
	Total	40	85.1%	7	14.9%	47	100.0%		
Transport Considerations	Cost	11	84.6%	2	15.4%	13	100.0%	1.000	1.100(.156-7.740)
	Transport	15	83.3%	3	16.7%	18	100.0%		Ref category
	Total	26	83.9%	5	16.1%	31	100.0%		
The patient stays before the referral	>24hrs	8	80.0%	2	20.0%	10	100.0%	0.630	.625(.102 - 3.833)
	<=24hrs	32	86.5%	5	13.5%	37	100.0%		

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Institutional Factors		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	%		
	Total	40	85.1%	7	14.9%	47	100.0%		
Escort of neonate/mother	Others	12	92.3%	1	7.7%	13	100.0%	0.655	2.571(.279-3.733)
	HCP	28	82.4%	6	17.6%	34	100.0%		Ref category
	Total	40	85.1%	7	14.9%	47	100.0%		
Stabilization treatment	No	24	100.0%	0	0.0%	24	100.0%	**0.004**	
	Yes	16	69.6%	7	30.4%	23	100.0%		
	Total	40	85.1%	7	14.9%	47	100.0%		
Vital signs monitoring	No	37	90.2%	4	9.8%	41	100.0%	**0.035**	9.250(1.3-62.091)
	Yes	3	50.0%	3	50.0%	6	100.0%		Ref category
	Total	40	85.1%	7	14.9%	47	100.0%		
Response time(hrs)	>2hrs	19	100.0%	0	0.0%	19	100.0%	**0.032**	
	<=2 hours	21	75.0%	7	25.0%	28	100.0%		
	Total	40	85.1%	7	14.9%	47	100.0%		
Warmth of baby	Others	6	100.0%	0	0.0%	6	100.0%	0.571	
	Warm linen	34	82.9%	7	17.1%	41	100.0%		
	Total	40	85.1%	7	14.9%	47	100.0%		
Communication with referring facility	No communication	6	100.0%	0	0.0%	6	100.0%	0.571	
	Phone call	34	82.9%	7	17.1%	41	100.0%		
	Total	40	85.1%	7	14.9%	47	100.0%		
feeding of neonates in transit	Not Fed	4	66.7%	2	33.3%	6	100.0%	0.214	.278(.040-1.929)
	Fed	36	87.8%	5	12.2%	41	100.0%		Ref category
	Total	40	85.1%	7	14.9%	47	100.0%		
is there ambulance	No	17	100.0%	0	0.0%	17	100.0%	**0.039**	

Institutional Factors		No		Yes		Total		P≤0.05 (Fisher's Exact)	Unadjusted OR (95%). Ref cat is NO for DV)
		N	%	n	%	N	%		
	Yes	23	76.7%	7	23.3%	30	100.0%		
	Total	40	85.1%	7	14.9%	47	100.0%		
oxygen cylinder	No	16	94.1%	1	5.9%	17	100.0%	0.396	4.000(.439-36.44)
	Yes	24	80.0%	6	20.0%	30	100.0%		
	Total	40	85.1%	7	14.9%	47	100.0%		
radiant heater	No	37	88.1%	5	11.9%	42	100.0%	0.154	4.933(.65-37.124)
	Yes	3	60.0%	2	40.0%	5	100.0%		Ref category
	Total	40	85.1%	7	14.9%	47	100.0%		
Incubator	No	40	87.0%	6	13.0%	46	100.0%	0.149	
	Yes	0	0.0%	1	100.0%	1	100.0%		
	Total	40	85.1%	7	14.9%	47	100.0%		
monitoring equipment	No	37	92.5%	3	7.5%	40	100.0%	0.006	16.444(2.450-110.385)
	Yes	3	42.9%	4	57.1%	7	100.0%		Ref category
	Total	40	85.1%	7	14.9%	47	100.0%		

4.3 Neonatal outcome

In the current study, 78% (n=39) of the neonates received adequate care including oxygen administration, vital signs monitoring, intravenous fluid therapies, nasogastric tube feeding, and antibiotic therapy, 6% (n=3) were referred to level 6 facility to specialized care due to anuria and was referred for peritoneal dialysis, gangrenous foot and congenital malformation. Those referred to a level 6 facility also came as referrals from other healthcare facilities within Makueni County. 16% (n=8) lost their lives (Figure 3).
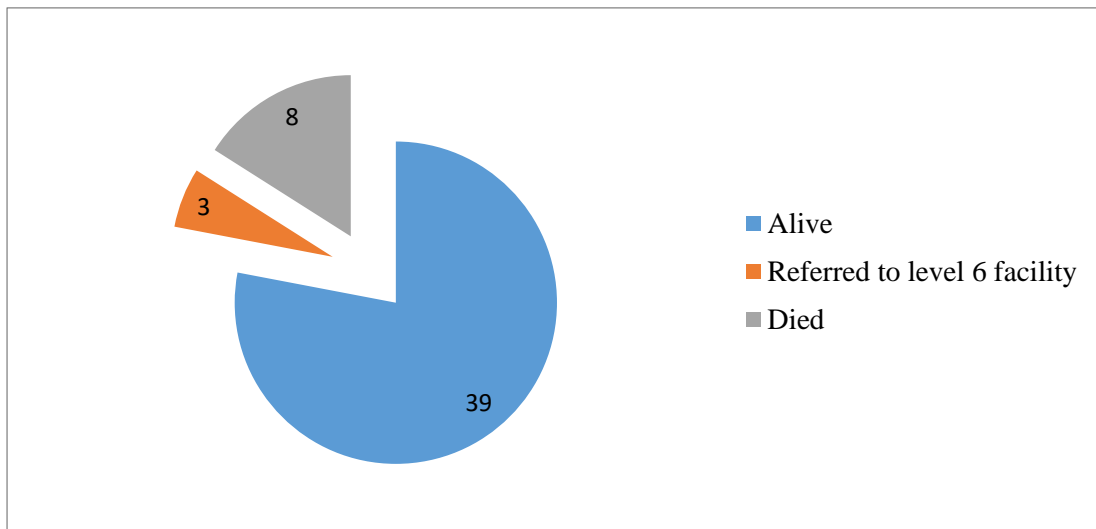
Figure 3: Neonatal Outcome

4.4 Discussion

In the current study, most neonates were transported via ambulance. This finding is similar to a study carried out by Shalini et.al, (2017) and Punitha et.al, (2016) which found that many neonates who were referred to higher centres of care used ambulances as modes of transport at 70% and 75% respectively. This also concurs with a study conducted in Tanzania which indicated that hospital-organized ambulances transported 88.5% of the neonates that were referred to all government-owned facilities. This is because, in Tanzania, all government-owned facilities offer free ambulance services (Kiputa et.al, 2022). In addition, the results are in line with research conducted in KwaZulu-Natal, South Africa, where all referrals were conveyed by ambulance (Ashokcoomar et.al, 2016). In Makueni County, this indicated that there is increased use of ambulances hence ensuring timely referral of neonates. Majority of those who used ambulances as a mode of transport in the present study was due to availability and cost. This could be as a result of health services devolution and counties can acquire ambulances.

In the present study in Makueni County Referral Hospital, most ambulances had a functional oxygen supply and oxygen delivery devices. However, lack of monitoring of the neonates led to increased unstable clinical conditions of the referred neonates. This finding concurred with a study conducted in Tanzania which found out that, despite the presence of ambulances, subpar functionality and lack of equipment (Kiputa et.al, 2022).

In the present study, the presence or absence of stabilization treatment emerges as a significant factor with patients who did not receive stabilization treatment were found to be more prone to experiencing a lack of timeliness and safe transport during referral. This could be as a result of most ambulances having not been equipped with the necessary drugs and equipment. This finding is comparable to an observational study conducted in Indonesia which revealed that neonates reported to health facilities in unstable conditions due to a lack of stabilization before and during transportation (Ekaputri et.al, 2020). In addition, a study conducted in Tanzania indicates that inadequate pre-transfer treatment and surveillance during transit led to a poor clinical condition upon admission (Kiputa et.al, 2022).

In this study, analysis suggests that patients who did not undergo vital signs monitoring were 9.25 times more prone to experiencing delays and unsafe transportation compared to their monitored counterparts though, a study carried out by Negi et.al, (2019) indicated that 11.1% of the referred neonates were escorted by health care professionals hence signifying relatively unsafe transportation. In addition, a study by Jajoo et.al (2017), found that 40% of medical personnel accompanied neonates during referral. The differences in these studies may be due to toughness of the referral systems in these different study areas.

The response time for referral found out that time exceeding 2 hours were more likely to face a lack of timeliness and safe transport during referral. Longer duration of time during transportation of a neonate creates a gap in a timely referral of a neonate and should be reduced to a minimum possible. In the current study, the mean time spent in transportation was 1-2 hours. This finding is similar to a study conducted in India where the mean time spent on transportation was 1.08 hours (Negi et.al, 2019).

In the current study, the availability of an ambulance emerged as a significant factor, with 59.5% (25) reporting waiting for an ambulance as the reason for the delay, in comparison to 40.5% (17) who cited other reasons for the referral delay. This agreed with a study carried out by Shalini et.al, (2017) and Punitha et.al, (2016) which found that many neonates who were referred to higher centres of care used ambulances as modes of transport at 70% and 75% respectively. This is also in line with a study conducted in Tanzania which indicated that hospital-organized ambulances transported 88.5% of the neonates that were referred to all government-owned facilities. This is because, in Tanzania, all government-owned facilities offer free ambulance services (Kiputa et.al, 2022). In contrast to studies conducted in Ghana and Nigeria, the majority of neonates were transported by taxis and private automobiles at rates of 36% and 43.9%, respectively (Abdulraheem, 2016). The results are in line with research conducted in KwaZulu-Natal, South Africa, where all referrals were conveyed by ambulance (Ashokcoomar et.al, 2016). In contrast, a study done in Ibadan Nigeria found that 4% of neonates used ambulances as a mode of transport (Muhyeed, 2016). Also, similar findings were found in a study conducted in Indonesia which revealed that there is poor transportation, emergency transport is not available and private transport is very expensive (Rakhmadi et.al, 2020). In Makueni County referral hospital, this indicated that there is increased use of ambulances hence ensuring timely referral of neonates. Those who did not use an ambulance as a mode of transport posted a gap in neonatal safe transport. Majority of those who used ambulances as a mode of transport in the present study was due to availability and cost respectively.

The patients who did not receive stabilization treatment were found to be more prone to experiencing a lack of timeliness and safe transport during referral (P<0.004). These findings are similar to a study conducted in Indonesia which revealed that neonates reported to health facilities in unstable conditions due to a lack of stabilization before and during transportation (p<0.05) (Ekaputri et.al, 2020).

In the current analysis, it suggests that patients who did not undergo vital signs monitoring were 9.25 times more prone to experiencing delays and unsafe transportation (P <0.035) which is similar to a study carried out by Negi et.al, (2019) indicated that referred neonates who had their vital signs monitored were 11.1% (p<0.005). The results suggest that patients with a response time exceeding 2 hours were more likely to face a lack of timeliness and safe transport

during referral (P<0.032). This finding is similar to a study conducted in India where the mean time spent on transportation was 1.08 hours with a (p < 0.05) (Negi et.al, 2019). Availability of an ambulance emerged as a significant factor, with (p<0.05) even though a study done in Ibadan Nigeria found that neonates who used ambulances as a mode of transport had a P-value (p>0.05) (Muhyeed, 2016).

5.0 Conclusion

According to research findings, it can further be concluded that institutional factors influenced safe transport and timely referral including stabilization treatment, vital signs monitoring, response time for referral, and the availability of an ambulance.

6.0 Recommendations

From the findings of the research, the study recommended the following;

  i.   Ambulances should be availed and equipped with the necessary drugs and equipment so that in the event of a problem, the healthcare provider can intervene appropriately.

  ii.   Hospitals should be supplied with all the necessary equipment and drugs to aid in stabilization of patients.

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