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Original Research

Transport Network Services: Preparedness of healthcare systems in Southern Nigeria

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Abstract

Background: Nigeria remains a major contributor to neonatal deaths worldwide, yet little consideration has been given to intra/inter health facility transfer of sick neonates. The dearth of Neonatal Transport Network Services (NNTS) is probably an underappreciated driver of the abysmally high national neonatal mortality indices. This study aimed to evaluate neonatal transport services and the healthcare workers' preparedness among health facilities in Port Harcourt Metropolis, Rivers State, Nigeria.

Methods: Twenty-eight selected health facilities (tertiary, private hospitals Primary Health Centers] were assessed on the availability, modality and practice of NNTS. Data was analyzed using SPSS Version 23.

Results: Routine transfer of high-risk pregnant mothers to higher levels of care occurred always in 14 (50%) and sometimes in 6 (21.4%) facilities; Private cars and taxis were the most common mode of transport in 24 (85.7%) facilities. Two facilities (7.2%) had ambulances equipped with transport incubators. Nurses and nurse attendants with no formal training in NNTS accompanied referred neonates in 2 (7.2%) facilities. Most referring facilities (78.6%) neither rarely or never contacted receiving centres before the arrival of neonates and most nor gave back referrals after offering neonatal care. None (100%) of the facilities had a trained emergency transport team.

Conclusion: Health facilities in Southern Nigeria lack a standardized Neonatal Transport Network and are characterized by poor communication between health facilities and inadequately trained personnel for inter-facility transfer of sick neonates. Urgent action is required to address these gaps, including training of healthcare workers on neonatal transport and sharing findings with relevant stakeholders/policymakers to establish a functional neonatal transport network among health facilities.

Keywords: Neonatal Transport; Health Facilities; Healthcare Workers Preparedness; Rivers State; Nigeria.

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Introduction:

The primary goals of neonatal transport are to provide early stabilisation and initiation of advanced care at the referring institution, followed by establishing and continuing critical care therapies. According to the 2007 American Academy of Pediatric Guidelines for Air and Ground Transport of Neonatal and Pediatric Patients, in-transit care should simulate intensive care standards with seamless transition that prevents compromise in patients clinical status.[1]In-utero transfer of high-risk pregnant mothers to facilities with requisite skilled manpower and equipment for appropriate care of mother and newborn is the safest mode of transport for at-risk newborns and is the standard in regionalised perinatal care in developed countries.[1]

In resource-rich settings, efficient neonatal transport - an integral component of regionalised perinatal care - is the norm. Here, simultaneous attention is paid to the transport of sick newborns using specially trained transport teams and mechanisms that ensure that sick neonates do not deteriorate during transfers.[2]The ensuing improvement has been from paying attention to training, clinical governance, disseminating best practices, setting standards, ring-fenced funding and supporting parents.[3,4]

On the contrary, in resource-limited settings like Nigeria, the prevalence of deliveries occurring outside of traditional hospital settings exceeds 60%.[5,6] This situation poses significant challenges for the timely and effective management of at-risk and sick neonates requiring referral to facilities offering higher levels of care. Unfortunately, these neonates encounter a compounded dilemma: they are often transported utilizing substandard transport modalities, compounded by the limited availability of referral centres primarily concentrated in urban areas.[7]

Similarly, Nigeria's lack of standardised neonatal transport services has been aptly described as the hidden or underappreciated driver of the abysmal neonatal indices in the country.[8]Poor healthcare funding, lack of trained manpower, lack of modern transport equipment and lack of neonatal transport network are some of the factors working against efficient neonatal transport services in resource-limited settings.[8]

There is a dearth of literature on this critical aspect of neonatal care, as no previous study has been carried out on the availability of neonatal transport services in South-South Nigeria. This dire situation underscores the urgent need for comprehensive reforms within Nigeria's healthcare system to address the critical gaps in neonatal transport infrastructure and services. Without prompt and decisive action, the plight of at-risk and sick neonates will continue to be perilously compromised, with devastating consequences for neonatal mortality rates and public health outcomes at large. Hence the study aimed to evaluate the availability of neonatal transport services and the healthcare workers' preparedness for neonatal transport services in health facilities in Port Harcourt Metropolis, Southern Nigeria.

Justification for the study:

Neonatal transport is a critical aspect of neonatal care. There are no previous studies on neonatal transport services for at-risk and sick neonates in Southern Nigeria. Poor neonatal transport services are an under-appreciated driver of Nigeria's poor neonatal indices. The findings of this study will hopefully provide evidence to aid policymakers in seeing the need for setting up a neonatal transport network in Rivers State and the country at large.

Materials and Methods:

This was a 2-staged cross-sectional analytical study design involving key healthcare workers in 28 health facilities comprising 2 tertiary, 6 Private hospitals and 20 primary health Centers between October and December 2023. The first stage assessed the availability of the neonatal transport team, transport equipment and mode of transport as well as in-transit care and level of communication between referring and referral facilities while the second stage was a training workshop.

A pre-tested questionnaire was used to obtain respondents' sociodemographic data, mode of transportation of at-risk or sick newborns to the facility, availability and members of the neonatal transport team, the practice of kangaroo mother care (KMC) position for neonatal transport (NNT), the practice of in-utero transfer of high-risk pregnant mothers and at-risk foetuses. This manuscript focuses on the first stage.

Data was analysed using SPSS version 23. Data were expressed as frequency tables and charts for categorical data and mean (standard deviation) for numerical data. A 5-point Likert scale was used to assess the mode of transport frequently used for newborns brought to the participating facilities. Ethical approval was also obtained from the relevant institution/authorities. Verbal informed consent was also obtained from the facility heads of the surveyed hospitals.

Results

Sociodemographic characteristics of participants in the study

There were 28 healthcare workers representing the facilities where they practiced who participated in the study and the majority were females (82.1%). Concerning age, eleven participants (39.3%) were in the fifth decade (40 – 49 years) of life. More than half 16 (57.1%) had tertiary education as the highest level of education attained. About a third of participants had worked between 11 – 15 years in a paediatric/ neonatal department (Table 1). Tertiary and secondary-level neonatal care were available in 4 (14.3%) facilities.

Table I: Sociodemographic characteristics of participants, Type and Level of care of selected health facilities

Characteristics	Frequency N = 28	Percent (%)
Sex		
Female	23	82.1
Male	5	17.9
Age group		
30 - 39 years	7	25.0
40 - 49 years	11	39.3
50 - 59 years	10	35.7
Educational level		
Tertiary education	16	57.1
Postgraduate education	12	42.9
Professional qualification		
Medical Officer	12	42.9
Nurse/Midwife	10	35.7
Paediatrician	6	21.4
Number of years of experience		

1 – 4 years	2	7.1
5 – 10 years	5	17.9
11 - 15 years	9	32.1
16 - 20 years	3	10.7
21 - 25 years	5	17.9
26 - 30 years	4	14.3
Type of health facility		
Private	6	21.4
Public	22	78.6
Level of care of the health facility		
Primary	22	78.5
Secondary	4	14.3
Tertiary	4	14.3

The pattern of neonatal transport services in Port Harcourt

Mode of transportation of at-risk and sick neonates in surveyed facilities

Table II shows that the most frequently used mode of transporting a neonate in Port Harcourt is a Taxi/Bolt/Uber. 25 (87%) of respondents reported that sick neonates were sometimes 14 (50.0%), always 9 (32.1), and often 2 (7.1%) transported to their facilities in a commercial vehicle (Taxi/Ube/Bolt). Private cars are the next commonly used mode in transporting neonates to health facilities. Any available vehicle as a means of transportation was indicated as 'always', 'often' and 'sometimes' used by 2 (7.1%), 4 (14.3%) and 11 respondents (39.3%) respectively. Walking-to-health facility as a means of transporting neonates to facilities was seen sometimes by 3 respondents (10.7%). Ambulances with transport incubators, purposive neonatal ambulances and Air ambulances were reported as being 'never' used by 17 respondents (60.7%), 18 respondents (64.3%) and 20 respondents (71.4%) respectively. However, the use of a purposive neonatal ambulance was reported as occurring 'sometimes' by 1 (3.6%) respondent, while 2 (7.1%) facilities had transport incubators for intra-facility transfer of newborns.

Table II: Mode of transportation of at-risk and sick neonates in surveyed facilities

Mode of transport	**Response to Use of Modes of Transportation for Neonates – N = 28 (%)**					
	Never	**Rarely**	**Sometimes**	**Often**	**Always**	**Non-response**
Walk to Health Facility	10 (35.7)	6 (21.4)	3 (10.7)	1 (3.6)	0 (0.0)	8 (28.6)
Bicycle	17 (60.7)	3 (10.7)	0 (0.0)	0 (0.0)	0 (0.0)	8 (28.6)

Motorbike	12 (42.9)	4 (14.3)	4 (14.3)	0 (0.0)	0 (0.0)	8 (28.6)
Tricycle	7 (25.0)	4 (14.3)	7 (25.0)	3 (10.7)	0 (0.0)	7 (25.0)
Taxi/Bolt/Uber	1 (3.6)	1 (3.6)	14 (50.0)	9 (32.1)	2 (7.1)	1 (3.6)
Private car	1 (3.6)	2 (7.1)	17 (60.7)	6 (21.4)	0 (0.0)	2 (7.1)
Regular ambulance	7 (25.0)	6 (21.4)	8 (28.6)	1 (3.6)	0 (0.0)	6 (21.4)
Any available vehicle	1 (3.6)	4 (14.3)	11 (39.3)	4 (14.3)	2 (7.1)	6 (21.4)
Purposive neonatal ambulance	18 (64.3)	2 (7.1)	1 (3.6)	0 (0.0)	0 (0.0)	7 (25.0)
Ambulance with transport incubator	17 (60.7)	2 (7.1)	2 (7.1)	0 (0.0)	0 (0.0)	7 (25.0)
Air ambulance	20 (71.4)	1 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)	7 (25.0)

Figure 1: shows that 14(50%) and 6(21.4%) of participating facilities ‘always’ and ‘sometimes’ refer pregnant mothers to higher levels of care while 8 facilities never do.

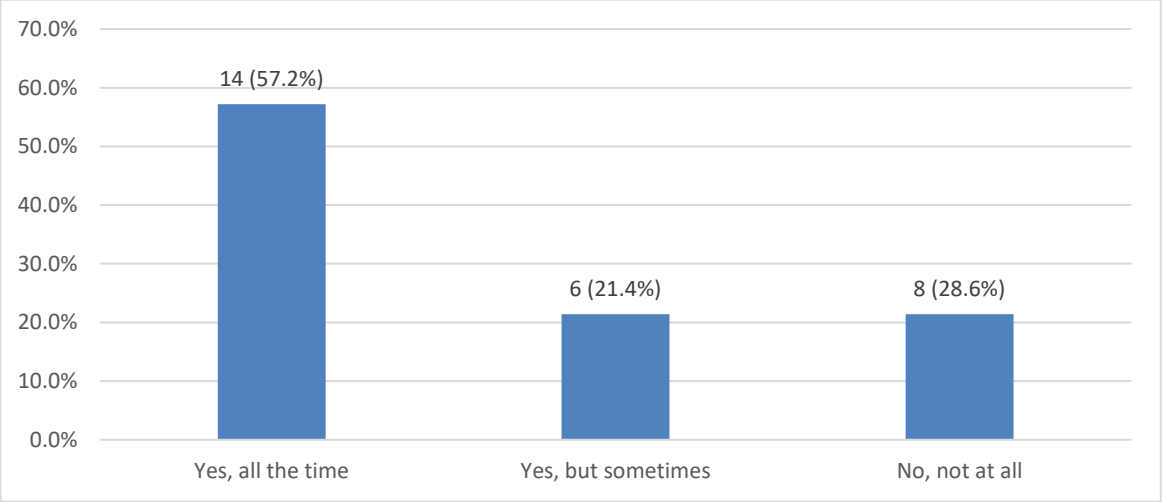

Figure 1. The proportion of facilities that refer pregnant mothers to higher levels of care.

Only 2 (7.1%) of the facilities ‘sometimes’ transferred sick neonates using transport incubators. Foremost of the facilities, the provision of warmth during transport was by covering the babies with a wrapper/piece of clothing (Figure 2).

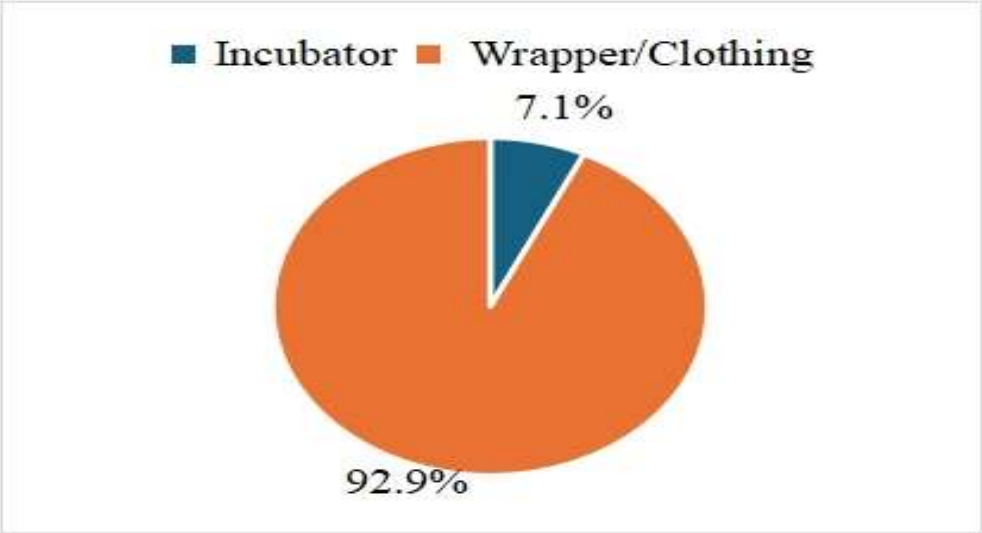

Figure 2: Methods of providing warmth for neonates during transportation

Participants' knowledge of the composition of the Transport Team, Support Equipment, and In-transit care during neonatal transportation in Port Harcourt

As shown in Table III, participants from most 18 (64.3%) health facilities correctly identified Nurses as members of NNTT. However, less than half (46.4%) identify paediatricians, medical officers (42.9%), and anaesthetists (32.1) as members of NNTT. Although two-thirds (60.7%) included oxygen sources, less than 20% of participants identified CPAP, transport incubator and neonatal ventilator as supportive equipment for neonatal transport. However,21 (75%) of participants listed vital signs monitoring, about half (57.1%) included blood sugar monitoring and correction of hypoglycaemia (53.6%), while only 25% included administration of epinephrine and caffeine citrate as part of in-transit care of at-risk and sick neonates.

Table III: Participants knowledge of the composition of the Transport Team, Support Equipment and In-transit care during neonatal transportation in Port Harcourt

Characteristics	Frequency N = 28	Percent (%)
Members of a neonatal transport team*		
Nurse	18	64.3
Paediatrician	13	46.4
Medical officer	12	42.9
Transport technician	10	35.7
Anaesthetists	9	32.1
Nurse assistant	8	28.6
Neonate's relatives	1	3.6
Support Equipment available for transporting a neonate*		
Oxygen	17	60.7
CPAP Machine	5	17.9
Resuscitator	5	17.9
Neonatal Ventilator	4	14.3
Transport Incubator	4	14.3

Transit care possible for neonates on referral		
Vital signs monitoring	21	75.0
Correction of hypoglycaemia	16	57.1
Blood sugar monitoring	15	53.6
Intravenous fluid administration	14	50.0
PPV	11	39.3
Administration of Epinephrine	7	25.0
Administration of Caffeine citrate	7	25.0

*Participants could choose more one, CPAP- Continuous positive pressure ventilation, PPV- positive pressure ventilation

Transport of At-Risk and Sick Neonates in KMC position was not practised by any of the participating facilities.

Figure 3 shows that none of the facilities transferred or received a sick neonate transferred in the KMC position.

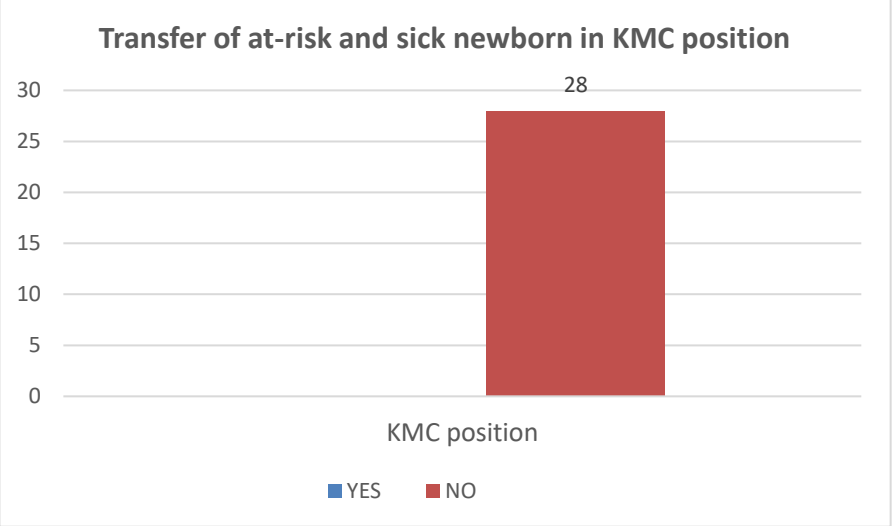

Figure 3. Transfer of at-risk and sick neonates in KMC position

Practice of Communication between referring and referral facilities

Nine (32.1%) health facilities either sometimes 5 (17.9%), often 2 (7.1%) or always 2 (7.1%) contacted receiving facilities before referring neonates out. More than 50% either never 5 (17.9%) or rarely 10 (35.8%) contacted receiving facilities before the arrival of neonates. Only 6 (21.4%) receiving health facilities gave back referrals to the referring centres as seen in Table IV.

Table IV: Practice of Communication between referring and referral facilities

Characteristics	Frequency N = 28	Percent (%)
Frequency of contacting receiving centers Before the arrival of neonates		
Never	5	17.9
Rarely	10	35.7
Sometimes	5	17.9
Often	2	7.1
Always	2	7.1

Non-response	4	14.3
Frequency of giving Back referrals to referring facilities		
Yes	6	21.4
No	18	64.3
Non-response	4	14.3

Discussion

This study set out to comprehensively evaluate the availability of neonatal transport services and healthcare workers' preparedness for neonatal transport among health facilities in Port Harcourt Metropolis, Southern Nigeria. Neonatal transport is a critical but neglected aspect of neonatal care in resource-limited settings. Current literature reveals major gaps in the availability of NNT services; including inadequate availability of neonatal intensive care units (NICU), lack of trained transport personnel, poor communication between referring and referral facilities and lack of neonatal transport network.[9,10]

This study revealed that tertiary and secondary-level neonatal care services were available in less than one-fifth of the health facilities sampled. This implies inadequate availability of NICU services within the study area and corroborates the findings by Okonkwo et al, who found that there are 53 NICU service providers across Nigeria.[11] Consequently, there is limited access to specialized neonatal care for at-risk and sick neonates who are transported over long distances to access NICU services. This shortage of NICU centres also creates a situation where these centres operate at full capacity and so unable to accept some referred neonates leaving them at the mercy of ill-equipped hospitals and consequent poor outcomes.[12]

In this study, only half of the surveyed facilities reported routine transfer to higher levels of care. This is contrary to findings in resource-rich settings where in-utero transport is a component of efficient NNTS and a key part of regionalized perinatal care. The reason for this low rate of in-utero transfer is not clear, particularly at the primary health centres where there exists a protocol for referral of high-risk pregnancies to higher levels of care. On the other hand, Tertiary centres and some private facilities as well as model primary health centers that offer a secondary level of care may also not engage in in-utero transfer because requisite manpower and other resources are available to provide needed care for mothers and newborns at these centres. The disparity in in-utero transfer for high-risk pregnant mothers in this study compared to the study by Riley in the United States of America can be attributed to the level of development in the deferring level of development and availability of technology. While Nigeria is a resource-constrained setting, The USA is a high-income technologically advanced country.

The guiding principle of neonatal transport is to take the baby to the nearest referral facility by the shortest route using the fastest, safest mode of transport [13]. In most parts of Nigeria, including Port Harcourt, where over 60% of deliveries take place in settings without specialized newborn care, having inadequate number of NICUs which are limited to urban areas[8] implies that these vulnerable neonates are transported over long distances before accessing needed care. Neonatal transport in Nigeria is poorly organized with few or no trained transport personnel, a lack of neonatal transport network and inadequate equipment. Hence, a significant number of sick newborns get to referral centres hypothermic, have hypoglycaemia, and are neurologically damaged or dead on arrival.[7]

Over 80% of referred neonates in this study were transported by commercial taxis. None of the facilities reported transporting neonates in dedicated neonatal ambulances, because these were not available, since the state had no dedicated neonatal transport service. The findings are similar to that of Abdulrahim and colleagues at Ibadan South-West[7] but contrast with the findings by Kiputa in Tanzania[14] where of the 384 neonatal transfers, 308 (88.5%) were transferred by ambulance, 30 (8.6%) by private car/taxi, public service vehicle 9 (2.6%) and tri-cyclic motor vehicle 1 (0.3%). The findings from the present study revealed that only one facility had an ambulance equipped with a transport incubator for inter-facility neonatal transfer which is consistent with the reports of Abdulraheem[7] in Ibadan. It is however in contrast to the situation in resource-rich settings, where emergency neonatal transport has even expanded and has evolved into mobile ICUs, capable of delivering state-of-the-art neonatal practices for critical care outside the NICU.[15]Also, no facility in our setting reported the transfer of neonates by air ambulance is in complete contrast to the study by Riley T *et al*[16]in which 96% were transported by air ambulance. The difference can be attributed to the fact that while this study was done in a resource-limited setting, the study by Riley et al was done in a resource-rich setting where besides the technological advancement, there is both political will, and trained manpower to effectively execute such services to curb neonatal mortality. Although ground transport has the advantages of being readily available, ease of training of transport team and lower cost compared to air ambulances, its utilization is further restrained in resource-limited settings, like ours, which is plagued with poor road networks, and difficult-to-reach areas. Currently, there are no organized neonatal air services in Nigeria.

In this study, none of the surveyed facilities reported transporting or receiving transported neonates in the KMC position. The low utilization of KMC as a transport modality may be due to a lack of awareness of the benefits of KMC among healthcare workers and the public. This is despite the use of KMC being recommended in the Nigerian National guideline on comprehensive newborn care.[17]The low utilization of KMC seen in this study is similar to the findings of a study in Tanzania[14] where only 2% of the neonates were transferred using the KMC position[14].Similarly, in a systematic review involving a total of 20 studies and 11,895 neonates from 10 countries, none of the studies reported on the use of Kangaroo mother care (KMC) in the transfer process.[10]The low-cost, high-impact benefit of the KMC position which has been validated as a means of neonatal transport with all the benefits is largely underutilized in our setting and raises concern as to poor knowledge of its use in low-resource settings like ours.

In-transit monitoring for at-risk and sick neonates is necessary to identify neonates who develop complications intra-transport and facilitate the commencement of appropriate intervention. Ideally, in-transit care should provide NICU-level care that is indistinguishable from that at the referral centre, ensuring that transferred neonates arrive in optimal condition.[13] In-transit monitoring focuses on the 'STABLE' which pays attention to monitoring of blood sugar, temperature, breathing, lab work and emotional support of the parents. The availability of a dedicated transport team is more effective compared to institutional teams. In this study, none of the facilities had a dedicated neonatal transport team. One possible explanation could be that these dedicated units also known as Special neonatal retrieval teams are specially trained to provide NICU-level care in transit, hence the improved outcome. However, in our setting, sick neonates are usually accompanied by untrained nurse assistants.[18] Although most participants in this study correctly identified the scope of in-transit care, most transferred neonates do not receive this needed care and vital interventions. This is thought to account for the high number of neonates who arrive at referral centres hypothermic, hypoglycaemic with severe neurological damage or are brought in dead as demonstrated in the study by Abdulraheem and his colleagues. Studies[19] have shown that the outcome of neonatal transport is a function of the skill and expertise of the transport team and that despite adequate resuscitation and pre-transport stabilizations, transported neonates can suddenly deteriorate while on transit and successful transfer then depends mainly on appropriate intervention by the ENT Team. This therefore underscores the urgent need for a curriculum for the training and re-

training of emergency neonatal transport personnel addressing the gap in neonatal transport service in our environment.

Frequency of prior communication from referring to referral facilities was found to be poor among facilities in this study as less than a tenth, reported either 'often' or always communicating with referral centres before transporting sick neonates. Similarly, feedback from referral centres on treatment outcomes at referral centres to initiating facilities was reported in only one-fifth of the facilities. This is like the 26.7% of prior notifications reported in the study by Kiputa.[12] Effective prior communication from referring facilities provides referral centres with the right information that enhances their preparedness to receive the referred neonate. Another benefit of communication before a referral is that it enables referring centres to seek alternative facilities in the event of a lack of NICU space in each centre. This is particularly important in resource-limited settings such as Port Harcourt Metropolis with only 2 tertiary hospitals and a few private facilities capable of providing NICU level 2 to level 3 care. Due to a lack of effective communication from referring facilities, sick neonates are moved from one referral facility to another. This prolongs transit time and lengthens inter-facility distance which has been shown to negatively impact outcome.[14] To address this gap, there will be a need to increase the number of NICUs, as well as develop a reliable communication network with dedicated hotlines accessible to all health facilities and the public.

Limitations of the study: Although the study addresses a vital aspect of neonatal care, it is limited in that we could not estimate the impact of the lack of neonatal transport services on neonatal mortality and morbidity in our state and Country. Also, we may have missed some private hospitals that offer NICU services and perhaps provide neonatal transport services. A larger state-wide or national survey would likely shed more light on hard outcomes like the impact on neonatal mortality. Albeit being a pioneering study in our locale is a major strength as it gives a foundation upon which future studies can be done. It also was conducted in the largest local government area of Rivers State, which has the tertiary, secondary, and primary health centres represented in this study. It aptly demonstrated that healthcare workers are largely unskilled and health facilities are unprepared for neonatal transport and buttress the need for urgent capacity building in human and material resources.

Conclusion: This study addresses the burden of inefficient neonatal transport practices in Southern Nigeria and reveals gaps that are potential hidden drivers of the high neonatal mortality rate in the country. These gaps include inadequate availability of neonatal intensive care units (NICU), lack of trained transport personnel, lack of use of safe, evidenced-based, low-cost modes of neonatal transport such as using the kangaroo care position and poor communication between referring and referral facilities. All of which need urgent attention.

Recommendations:
There is an urgent need to increase the number of NICUs across the state. The Federal Ministry of Health in collaboration with telecommunication industries should develop a communication network with hotlines accessible that links referring facilities to NICU centers. There is an urgent need to provide well-equipped neonatal ambulances stationed at strategic locations across the state and connected to uninterrupted 24/7 communication services linked to referring and receiving facilities and a public enlightenment campaign on the benefits of the KMC position as a safe mode of neonatal transport.

Conflict of interest
The authors have no conflict of interest to declare.

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References

1. Watson H, McLaren J, Carlisle N, Ratnavel N, Watts T, Zaima A, et al. All the right moves: why in utero transfer is both important for the baby and difficult to achieve and new strategies for change. F1000Res 2020;9:F1000 Faculty Rev-979. doi: 10.12688/f1000research.25923.1

2. Tette EMA, Nuertey BD, Akaateba D, Gandau NB. The Transport and Outcome of Sick Outborn Neonates Admitted to a Regional and District Hospital in the Upper West Region of Ghana: A Cross-Sectional Study. Children (Basel) 2020;7(3):22. doi: 10.3390/children7030022.

3. World Health Organization. Survive and thrive: transforming care for every small and sick newborn. Geneva: World Health Organization; 2019 [cited 2024 Apr 27]. Available from: https://iris.who.int/handle/10665/326495

4. Ratnavel N. Evaluating and improving neonatal transport services. Early Human Development. 2013;89(11):851–3.

5. Bolarinwa OA, Fortune E, Aboagye RG, Seidu AA, Olagunju OS, Nwagbara UI, et al. Health facility delivery among women of reproductive age in Nigeria: Does age at first birth matter? Bartels SA, editor. PLoS ONE. 2021 Nov 4;16(11):e0259250.

6. Ali D. Sociodemographic and Pregnancy Risk Factors Associated with Place of Delivery Among Northern Nigerian Women. [Internet]. 2021. Report No.: 10084. Available from: https://scholarworks.waldenu.edu/dissertations/10084

7. Abdulraheem MA, Tongo OO, Orimadegun AE, Akinbami OF. Neonatal transport practices in Ibadan, Nigeria. Pan Afr Med J. 2016;24:216.

8. Okonkwo RI, Abhulimhen-Iyoha IB, Okolo AA. Newborn Transport Practices: Influence on Newborn Survival in Benin City, Nigeria. AJP 2020;6(3):346.

9. Nakayuki M, Basaza A, Namatovu H. Challenges Affecting Health Referral Systems in Low-And Middle-Income Countries: A Systematic Literature Review. European Journal of Health Sciences. 2021;6(3):33–44.

10. Okai E, Fair F, Soltani H. Neonatal transport practices and effectiveness of the use of low-cost interventions on outcomes of transported neonates in Sub-Saharan Africa: A systematic review and narrative synthesis. Health Sci Rep. 2024;7(3):e1938.

11. Okonkwo I, Abhulimhen-Iyoha B, Okolo A. Scope of neonatal care services in major Nigerian hospitals. Nigerian Journal of Paediatrics. 2016 Jan 12;43(1):8.

12. Kibret GD, Demant D, Hayen A. The effect of distance to health facility on neonatal mortality in Ethiopia. BMC Health Services Research. 2023;23(1):114.

13. Narli N, Kırımi E, Uslu S. Turkish Neonatal Society guideline on the safe transport of newborn. Turk Pediatri Ars. 2018;53(Suppl 1):S18–31.

14. Kiputa M, Salim N, Kunambi PP, Massawe A. Referral challenges and outcomes of neonates received at Muhimbili National Hospital, Dar es Salaam, Tanzania. PLoS One.2022;17(6):e0269479.

15. Ashokcoomar P, Bhagwan R. The neonatal transfer process through the lens of neonatologists at public hospitals in South Africa. Health SA. 2022;27:1617.

16. Riley T, Umoren R, Kotler A, Feltner J, Billimoria Z, James J, et al. Disparities in access to healthcare services in a regional neonatal transport network. International Journal of Industrial Ergonomics. 2024;99:103526. Available from: https://www.sciencedirect.com/science/article/pii/S016981412300118X

17. Federal Ministry of Health. National Guidelines for Comprehensive Newborn Care: Referral Levels. 1st ed. Federal Ministry of Health; 2021. 1–318 p.

18. Mcnamara P, Mak W, Whyte H. Dedicated Neonatal Retrieval Teams Improve Delivery Room Resuscitation of Outborn Premature Infants. Journal of perinatology: official journal of the California Perinatal Association. 2005; 25:309–14.

19. Ashokcoomar P, Bhagwan R. The neonatal transfer process through the lens of neonatologists at public hospitals in South Africa. Health SA Gesondheid. 2022;27(0):9. Available from: https://hsag.co.za/index.php/hsag/article/view/1617