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ORIGINAL ARTICLE

TITLE: EFFICIENT SECONDARY NEONATAL HEALTHCARE SYSTEM; THE MISSING LINK TO THE REDUCTION OF NEONATAL MORBIDITY AND MORTALITY, AN URGENT CALL TO ACTION

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ABSTRACT

Background:

Kaduna state recorded a neonatal mortality rate of 64 deaths per 1000 live births (LB) in 2018. The major causes being prematurity, asphyxia, neonatal infections and neonatal jaundice. Successful management of these cases can only be achieved when standard quality care is offered in well- equipped and functional appropriate level of neonatal care. Sick neonates unable to access neonatal care units are at increased risk of morbidities and death.

Objective: To assess availability and functionality of public secondary-level neonatal in-patient care services in Kaduna state.

Methods: The study is a cross-sectional observational survey using mixed methods to evaluate the neonatal health care services as part of the reforming and strengthening the neonatal health care services in Kaduna state.

Results: Three (10%) of the 30 public secondary health care facilities in the state provided some degree of in- patient neonatal health care services. None of the 3 Neonatal units had distinctly separate in- and out- born wards, a kangaroo mother care (KMC) room, breastfeeding room or mothers' room. None of the facilities had a functional intensive phototherapy device, a bubble CPAP machine, multiparameter monitor or transport incubator. None of the facilities operated a distinct neonatal level of care nor were the staff aware of levels of neonatal care Overall, staff were inadequate and of insufficient mix.

Conclusion: There is lack of efficient secondary neonatal health care system in Kaduna state, Nigeria. This is a critical missing link to significant and successful reduction of neonatal morbidity and mortality. We urge that steps and actions be taken to expedite the reformation and strengthening of the health system to enable establishment of standard, quality secondary neonatal healthcare systems in all public secondary health care facilities.

Keywords: Levels. neonatal care, inequity, disparity, health, system, facility.

Introduction A comprehensive newborn healthcare system recognizes the essentials of a continuum care concept that caters for the prospective mother, mother, her foetus(es) and neonate(s), through delivery, immediate postnatal, and the neonatal period and transit of the neonate into post-neonatal infant and under-five care. An efficient newborn healthcare system guarantees optimum newborn health which remains a core and sensitive index of development. Unfortunately, globally neonatal morbidity and mortality continue to attract attention. In 2022, 2.3 million neonates died worldwide in the first 20 days of life with approximately 6500 neonatal deaths recorded per day.[1] A wide disparity in neonatal mortality exists between low and middle-income countries (LMICs) and high-income countries (HICs). The decline in annual neonatal deaths from 5-2.3 million from 1990 – 2022 is slow and the global target to reduce neonatal mortality to 12/ 1000 LB by 2030, remains unlikely attainable for most LMICs at their current pace.[1-4] In Nigeria,[5] about 700 babies die daily or about 30 babies dying every hour, the highest number of newborn deaths in Africa, and the second only to India. Within Nigeria, the northwestern states have the highest neonatal mortality and Kaduna state ranked highest nationwide with a rate of 64 neonatal deaths per 1000 live births in 2018.[6] The causes of these neonatal deaths include prematurity, asphyxia, neonatal infections and neonatal jaundice among others.[5-7] The

successful management of these cases with the expected optimal outcome can only be achieved with a combination of preventive care and care in a standard, well equipped and functional appropriate level in- patient neonatal healthcare system for those that require admission. The neonatal healthcare system (NNHCS) provides health care services to newborns aged 0- 28 days of life. The components of care are spread across systems and facilities structured to provide key interconnected services that are interwoven and usually hierarchical with a goal of providing optimal neonatal outcome and survival.[8-10] The components of NNHCS include the primary, secondary and tertiary systems. The care in these systems is structured into levels of neonatal care with each level purposely designed, equipped and positioned to offer optimum appropriate complexity of care.[8-11] Neonatal in- patient care is provided in secondary and tertiary NNHCS. The secondary (Levels I and II) system provides a broad base for provision of in- patient care for most of the mild and moderately, not too sick neonates who require in- patient care while the sickest and more complex cases are managed at the tertiary (Levels III and IV) system.[8] In Nigeria, NNHCS is organized along the three tiers of government. The secondary healthcare system falls within the mandate of state governments with such services provided by state general (public) and non-government/ private hospitals.[8] Secondary healthcare facilities provide a continuum of care that links the primary to tertiary NNHCS. The challenges of providing neonatal care services are numerous and are both intrinsic and extrinsic. One key gap is the paucity of functional and efficient in- patient neonatal health care services within a deficient newborn healthcare system. Little or nothing is known about secondary neonatal healthcare system in Kaduna state. An earlier study[10] reported inequitable, inadequate and below expected neonatal healthcare services in Kaduna state. This, coupled with the current status of the state, the state with the unacceptably highest neonatal mortality in Nigeria, spurred the need for this work.

Objective: To assess the availability and functionality of public secondary level neonatal in- patient care services in Kaduna state

Materials and method Kaduna state is located in northwestern Nigeria with an estimated population of 11 million, maternal fertility rate of 9.3 and an annual delivery of about 300, 000/year.[12] The state has 23 local government areas with a total of 30 Public/government secondary health care facilities designated as general hospital/ comprehensive health centers and a state-owned tertiary health facility. Kaduna state also hosts other tertiary mono- and multispecialty federal healthcare institutions, private for profit and non- profit and or faith-based health institutions. This is a cross-sectional observational survey using mixed methods to evaluate the neonatal health care services as part of the reforming and strengthening the neonatal health care services in Kaduna state. A desk review of list of all public secondary healthcare- providing facilities in the state was collated. All facilities were then contacted and interviews conducted to confirm availability or otherwise of a neonatal in- patient healthcare- providing services unit. Facilities which had a unit were then further assessed using a proforma to document structure of the facility, capacity, available equipment and staffing**.**

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Result All the 23 local government areas had at least a general hospital with a total of 30 public secondary healthcare facilities spread across these LGAs. Only 3 (10%) facilities had a unit for admitting and providing neonatal health care services with one in each zone. Yusuf Dantsoho Memorial Hospital (YDMH) and General Hospital Kafanchan (GHK) in Kaduna central and south senatorial districts in Northern and southern Kaduna respectively. A third facility, Hajiya Gambo Sawaba General Hospital (HGSGH), in Kaduna North senatorial district in northern Kaduna had a neonatal research ward which was also assessed. (fig. 1) YDMH had capacity to admit 10 neonates while GHK and HGSGH could each admit 5 neonates at a time. None of the 3 Neonatal units had distinctly separate in- and out- born wards. All the 3 units did not have a kangaroo mother care (KMC) room, a breastfeeding room or mother's room. None of the facilities had rest or washrooms and all were devoid of hand-washing areas.

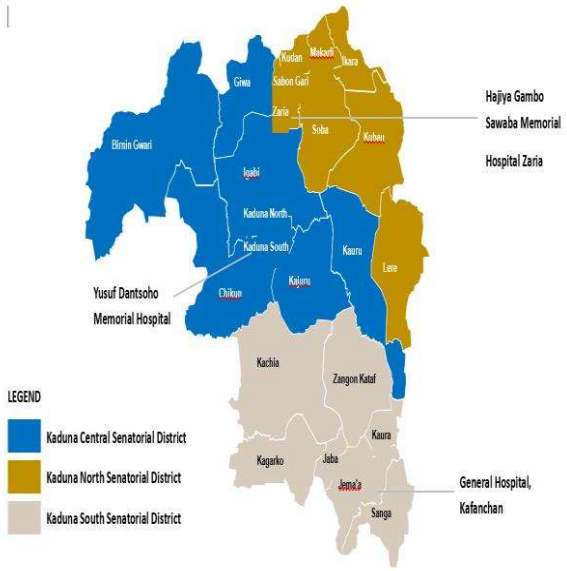

Figure 1: Map of Kaduna state showing hospital locations in the senatorial districts

All the facilities lacked doctors' call rooms, admission areas and procedure rooms within the unit area and none had staff lounge or store. Side laboratories were non-existent within the units but all 3 facilities could offer some variable investigation services at the facility main laboratory. All facilities reported having portable water supplies, however none of the facilities had water flowing from taps during the visits. YDMH had electricity supply for most of the day while in GHK and HGSGH it was unsteady and unpredictable and none of the 3 facilities had stable alternative electricity supply.

All the facilities had provisions for securing their units and have clearly available two-point entry/ exit and emergency exit point with security officers manning the points. The GHK and HGSGH hospitals did not have oxygen supply on the unit but this was available in YDMH. Source of oxygen in YDMH was both by cylinder and oxygen concentrators.

YDMH facility had at least a neonatal bag and mask breathing unit while GHK and HGSGH did not have a bag and mask breathing unit within their neonatal units to provide positive pressure ventilation. None of the units had appropriate varying sizes of neonatal face masks or a functional resuscitaire. Only GHK had some room warmers. Though YDMH and GHK had at least a phototherapy device, none of the facilities had intensive phototherapy devices nor did any of the units have an irradiance meter. The irradiance of the phototherapy devices was unknown to the unit staff. (Table 1). All 3 facilities each had at least an ambulance. HGSGH had 2 functional ambulances. YDMH had one functional ambulance while GHK also had an ambulance which was non- functional. None of the facilities had a transport incubator or a bubble

continuous positive airway pressure CPAP machine (Table1)

Table 1: Availability of Neonatal Equipment Assessed in Facilities

S/N	Equipment Assessed	Yusuf Dantsoho Memorial Hospital	General Hospital Kafanchan	Hajiya Gambo Sawaba General Hospital
1.	Oxygen Available a.Piped b.Cylinder c.Concentrator	NO YES YES	NO NO NO	NO NO NO
2.	A.Bag & Mask Unit b.Appropriate neonatal size mask	YES NO	NO NO	NO NO
3.	Pulse Oximeter paediatric/ neonatal	NO	NO	NO
4.	Functional Resuscitairre	NO	NO	NO
5.	Neonatal Cots	YES	YES	YES
6.	Room warmers	NO	YES	NO
7.	Thermometers	NO	NO	NO
8.	Infant Incubators	YES	YES	NO
9.	Transport Incubators	NO	NO	NO
10.	Phototherapy machines	YES	YES	NO
11.	Irradiance meters	NO	NO	NO
12.	Bilirubinometers	NO	NO	NO
13.	CPAP machines	NO	NO	NO
14.	Mechanical Ventilator	NO	NO	NO
15.	Neonatal Diagnostic set	NO	NO	NO
16.	Paediatric stethoscope	NO	NO	NO
17.	Neonatal weighing scale	YES	YES	YES
18.	Infusion Pumps	NO	NO	NO
19.	Multiparameter monitors	NO	NO	NO
20.	Infantometer	NO	NO	NO
21.	Suction machine a.Electric b.Manual	NO NO	NO NO	NO NO
22.	Protocols on management of common neonatal conditions	NO	NO	NO
23.	Sterilizer	NO	NO	NO
24.	Measuring Tape	NO	NO	NO
25.	Ambulance	YES	YES	YES

Only HGSGH had a doctor dedicated to the neonatal unit (due to ongoing research and was not primarily a staff of the facility) GHK and YDMH did not have doctors working solely in the neonatal unit. All 3 facilities had nurses working solely in the neonatal ward but were all reported to be grossly short staffed. There were no ward sub- staff/ attendants, porters/ cleaners and security working solely in the neonatal unit. None of the facility operated a distinct neonatal level of care. The staff were unaware of levels of neonatal care.

Discussion One in ten public secondary healthcare facilities in Kaduna state provide neonatal healthcare services to a population of more than 11 million and about 300,00 annual deliveries. Newborns delivered in 9 out of 10 LGAs in Kaduna state do not have access to a public in- patient neonatal healthcare services. While there isn't a single universal, standard newborn population- facility ratio, populations with high fertility rates and deliveries should have sufficient in- patient neonatal healthcare facilities within reach and affordable to provide appropriate care. The available facilities in the state are sparse and grossly insufficient to meet the newborn population's in- patient care needs.

Additionally, the facilities are located, though in the 3 senatorial districts, but far away from some LGAs and making access inequitable. Even for the population within the LGAs in which the facilities are situated, the capacities of the facilities underserve the population and makes majority of the sick newborns vulnerable to substandard or no care at all. Existing Neonatal healthcare facilities lacked requisite structure to offer optimal neonatal services. Units lacked call rooms, had no staff lounge or convenience for staff within. This creates a gap where neonatal unit staff on service are remote from the unit creating the risk of disruption in continuity of service

provision. The location of facilities remotely from the labour ward and the absence of transport incubators leads to delay in transferring sick neonates from the labour ward and other units of the facility to the neonatal unit and thus adversely affects care. Similarly, the inability to provide continuous electricity power supply affects the potential to provide in- patient care for sick neonates as virtually most if not all neonatal equipment require electricity to power them. Seamless coordination between different levels allows for timely referrals and transfers of newborns requiring specialized care. Fragmented systems create delays and disrupt continuity of care and adversely influence neonatal outcomes. The availability of adequate neonatal level- appropriate staff trained to care for neonates is a requisite for optimal neonatal care. All units had a dearth of all mix of neonatal health care work force available to care for their neonates. While providing important care within healthcare system, general practitioners alone are generally inadequate to provide comprehensive and specialised neonatal care. Access to specialists like neonatologists and neonatal/ paediatric nurses improve outcomes for complex cases. The numerical strength of healthcare providers also influences outcome. Nurse: patient ratio ranging from 1:3- 1: 4 are needed to provide optimal care in in- patient, secondary neonatal levels I and II care services.

The sharing of staff with other units undermines this goal. Additionally, sharing staff with other hospital units in the facility may predispose the staff to poor skills and competencies, overburdening and increased risk of burnout. This may result in poor monitoring, increased risk of medical errors and poor judgement.[12-14] These factors negatively impact the services rendered and lead to poor neonatal outcomes.

Facilities did not operate a distinct level of neonatal care and lacked most of the equipment to offer quality in- patient neonatal care. Levels of neonatal care aim to standardize and optimize quality care commensurate with the staffing, equipment and complexity of care provided at different levels and as well defines and enhances referrals. Operating levels of care tend to promote competence and improve expertise. Additionally, the gap in availability of functioning neonatal equipment hinders the units' ability to provide optimal neonatal care and will likely lead to poorer neonatal outcomes.

Overall, the existing units are highly limited in their spread and capacity. They have numerous gaps that prevent functional optimization of existing units from operating optimally and makes it impossible for the units to meet the needs of the neonatal population. The gaps prevent these units from providing services which address the common causes of neonatal morbidity and mortality. These identified gaps limit access to high quality in- patient care for neonates being seen and treated in primary or basic public healthcare facilities when secondary health care is needed. Thus, many neonates are forced to receive poor or no care. On the other hand, the lack of functional, appropriately equipped and staffed secondary- level neonatal health care leads to overburdening of tertiary- level neonatal care (levels III, IV and neonatal intensive care units (NICUs). These units are compelled to care for too many cases that present late and are extremely complicated.

Conclusion Lack of access to standard quality in- patient neonatal care characterised by the

existing huge gap in provision of levels I and II in- patient neonatal care services, expose neonates in Kaduna state to limited quality treatment options, more disabilities from complications in surviving newborns and higher risk of death. This lack of efficient secondary NNHCS remains a missing link to reduction of neonatal morbidity and mortality.

Recommendation There is the urgent need to define and operationalize standard levels of neonatal healthcare services which are properly structured, adequately and appropriately staffed and equipped and as well widely distributed to provide access and equity to neonatal care for the entire population.

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