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## Scope of neonatal care services in major Nigerian hospitals

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**Abstract:** *Background:* Neonatal survival bespeaks the quality of neonatal care services available and accessible to the population. Intensive care improves outcome of high-risk infants with serious illness. The tiered level of care is yet to be applied to newborn care in Nigeria. Classification of care is key to improving neonatal survival with enhanced referral of high-risk patients to higher-level centres.

*Objective:* To ascertain the scope and classify available newborn services offered at major Nigerian hospitals.

*Methodology:* A semi-structured validated questionnaire was administered to attendees during 2015 Pediatric Association of Nigeria conference. The information derived was used to categorize neonatal care services.

*Results:* The respondents consisted of doctors 201 (84.8%) and nurses 36 (15.2%) in 54 health facilities from all geopolitical regions of Nigeria. Of the 54 fa-

cilities, 34 (63%) were located in state capitals and 47 (87%) in public hospitals. Half of the evaluated units belonged to Class I, 22 (40.7%) Class II, and 5 (9.3%) Class III levels of neonatal care. Majority (81.6%) of the doctors have been trained on neonatal resuscitation; with senior residents being the highest 49 (89%) and Medical officers (MO) the least 4 (40%) trained. Doctors with training in mechanical ventilation (MV) were 39.2%; Consultants (51.2%), MO's the least 1(11.2%) trained ( $p=0.025$ ). Monitoring is usually by pulse oximeters 54 (100%), multi parameter monitors 23 (42.6%) and rarely ABGs 6 (11%).

*Conclusion:* Neonatal care in Nigeria is still developing. Most centres provide basic neonatal care services. Regionalization of care may be the solution to higher level neonatal care.

**Key Words:** Neonatal Care; Scope

### Introduction

Neonatal survival is relative to the level of accessible neonatal care in a community<sup>1-2</sup> and the availability of neonatal intensive care has improved the outcomes of high-risk infants.<sup>3-7</sup>

Neonatal care in Nigeria has improved significantly from the early 1970s when only six teaching hospitals offered such services. Currently, a large number of facilities provide similar services in different locations in the country. The quality of care provided by these centres are, however, not uniform. Hitherto, there has been no attempt to classify these centres according to the level of services offered.

Neonatal care facilities should be classified on the basis of functional capabilities, and should be organized within a regionalized system of perinatal care<sup>8-11</sup>. In the current context, Neonatal intensive care unit (NICU) is specialized in the care of ill new-borns and manned by

such key specialists. Whatever the situation, team members must be able to provide Neonatal resuscitation. Of the three essential functions key to the survival of the Newborn, respiration is of prime importance. Thus capacity for and availability of ventilator support is key in the provision of any form of life support system or intensive care for sick new-borns. The other two functions of feeding and thermal support can be provided through adaptations that include gavage enteral feedings of expressed breast milk and Kangaroo mother care.

**Level 1:** Basic care unit—provides evaluation and postnatal care of healthy new-born infants; and Phototherapy; Care for infants 34-35W>1800gm with mild illness and these units can initiate IV lines, administer and monitor Oxygen saturation

**Level 2:** Special care new-born nursery Cares for infants of greater than 32 weeks gestation or a weight of 1500 g or greater who are moderately ill; they can provide CPAP, Intravenous infusion, and possibly the use of umbilical central lines.

**Level 3: Intensive neonatal care unit**

Provides: care for very ill infants of all gestational ages and weights; Mechanical ventilation (MV) support, for as long as required and immediate access to the full range of subspecialty consultants. Ability to monitor fully the critically ill new-born using multi-parameter monitors and to measure Arterial Blood gasses (ABG). This definition is adapted from the AAP guidelines to meet with available resources in a developing community. This standard of tiered level of neonatal services as contained in the policy statement of the American Academy of Pediatrics<sup>8</sup> and utilized in developed communities is yet to be applied in Nigeria.

Classification of newborn care services is key to improving neonatal survival as this offers the opportunity of enhanced referral of high-risk patients to higher-level centres with the appropriate resources for complexity of care.<sup>8</sup> A documentation of the services provided by different neonatal units in the country is helpful in establishing the scope and quality of available newborn care. Quality of newborn care by level of services offered is a critical determinant of neonatal outcomes.<sup>1-2</sup>

**Aim**

To ascertain the scope and classify the quality of newborn services available at major Nigerian hospitals.

**Specific Objectives:**

1. To ascertain the standard of neonatal services available at major hospitals
2. To categorize these services by level of available resources for Neonatal care

**Methods***Study Design*

A questionnaire based descriptive study was conducted

*Validation of the questionnaire*

After the development of the questionnaire, it was field tested with medical students, nurses and midwives, house officers, resident doctors and consultants in the Department of child health. This was to ensure validity of the responses and questions for which the answers were not reproducible were eliminated.

*Ethical Considerations*

The study proposal was approved by the ethical committee of the University of Benin Teaching hospital. At the 2015 edition of the Pediatric Association of Nigeria (PAN) Conference that held in Abakaliki, Ebonyi state, after the general information of the essence of the study was explained to the participants, informed consent was obtained and the willing participants accepted to fill out the anonymous questionnaire. The validated semi-structured questionnaire that assessed basic social demographic information of the re-

spondent, information about their practice location, neonatal unit capacity, personnel, trainings in newborn cardio-pulmonary resuscitation and maintenance of cardiovascular stability, equipment's available for key support of critically ill neonates, especially for newborn thermal control, respiratory support cardiovascular stabilization and monitoring devices for care and support of babies on these interventions was administered to attendees. Information on parenteral alimentation was not sought for neither were issues on modalities of case management sought after.

The availability of surfactant replacement service was also solicited. The responses were weighted according to the status of the respondents and completeness of solicited information. Consultant with neonatal training were considered key informants.

The care facilities were classified according to the level of sophistication of services available using the AAP criteria for categorization of levels of care.<sup>8</sup>The data gathered were entered into an IBM/ SPSS spreadsheet and analyzed.

**Results**

A total of 250 questionnaires were distributed during the conference and 237 were returned. The return rate of the questionnaires was 94.8%.The respondents comprised doctors and nurses working in Paediatric and Neonatal facilities in Nigeria. There were 90 (38.0%) males and 147 (62.0%) females.

The geopolitical regions of the 237respondents are as follows: South-South 59(24.9%), South-East 85(35.9%), South-West 30(12.7%), North-Central 43 (18.1%), North-East 3(1.3%), North-West 10(4.2%), No response 7(3.0%); whilst 218(92.0%) were Christians and 16(6.8%) Muslims. Other characteristics of the respondents are shown in Table 1.

**Table 1:** General Characteristics of the Respondents

Characteristics	Number (%)	Total (%)	
Doctor	Consultant	96 (40.5)	201 (84.8 )
	Senior Registrar	59 (24.9)	
	Registrar	35 (14.8)	
	Medical Officer	11 (4.6)	
Nurse	ADNS	5 (13.9)	36 (15.2)
	CNO	5 (13.9)	
	ACNO	5 (13.9)	
	SNO	8 (22.2)	
	NO-I	1 (2.8)	
	NO-II	12 (33.3)	
Type of practice	Public	208 (87.8)	
	Private	26 (11.0)	
	No response	1 (1.2)	
Level of practice	Primary	5 (2.1)	
	Secondary	26 (11.0)	
	Tertiary	199 (83.9)	
	No response	7 (3.0)	

ADNS: Assistant Director of Nursing services, CNO: Chief Nursing Officer, ACNO: Assistant Chief Nursing Officer, SNO: Senior Nursing Officer, NO: Nursing Officer.

Of the thirty six states of the federation and Abuja, Paediatric and Neonatal personnel from twenty nine states

returned the questionnaires. The states without respondents were Adamawa, Bauchi, Benue, Jigawa, Niger and Yobe; hence their neonatal care services were not assessed. These states are in the North-East, North-Central and North-West geopolitical regions of the country.

Table 2 Shows the location of respondents (states & cities), the functional and other details of their neonatal units. The respiratory support capability of the units consisted of (Full Mechanical Ventilation (MV) Capacity; Availability of MV and Continuous positive Airway pressure [CPAP]. Partial Capacity; as defined by Stand-alone CPAP only available). These information facilitated the categorization of the proposed level of neonatal care.

**Table 2:** Respondents location by Unit capacity, Level, Type and Respiratory support capacity of Neonatal units.

State	City	Respondent(s)	Level of care	Type of Practice	Bed Capacity	Respiratory support available	Level
Abia	Umuahia	11	3 <sup>0</sup>	Public	30, 18	Partial	II
	Aba	-	2 <sup>0</sup>	Public	24	-	I
Akwa Ibom	Uyo	1	3 <sup>0</sup>	Public	45	-	I
Anambra	Awka	11	3 <sup>0</sup>	Public	16	-	I
	Nnewi	-	3 <sup>0</sup>	Public	30,45	Full*	II
Bayelsa	Yenogoa	2	3 <sup>0</sup>	Public	14,	-	I
Borno	Maiduguri	1	3 <sup>0</sup>	Public	22	Full	II
Cross River	Calabar	4	3 <sup>0</sup>	Public	35	-	I
Delta	Asaba	19	3 <sup>0</sup>	Public	20	Partial	I
	Warri	4	2 <sup>0</sup>	Public	20	-	I
		-	2 <sup>0</sup>	Private	5	Partial	II
	Oghara	-	3 <sup>0</sup>	Public	20	Full	III
Ebonyi	Abakaliki	33	3 <sup>0</sup>	Public	30	-	I
Edo	Benin City	14	3 <sup>0</sup>	Public	50	Full	III
	Irrua	-	2 <sup>0</sup>	Public	23	Full*	I
			3 <sup>0</sup>	Public	15	-	I
Ekiti	Ado- Ekiti	4	3 <sup>0</sup>	Public	15	-	I
	Ido- Ekiti		3 <sup>0</sup>	Public	37	-	I
Enugu	Enugu (1)	21	3 <sup>0</sup>	Public	50, 40	Full	III
	Enugu (2)				35, 20	-	I
Gombe	Gombe	2	3 <sup>0</sup>	Public	18	Full	II
Imo	Owerri	9	3 <sup>0</sup>	Public	40, 20	Full*	II
	Orlu				21		I

The neonatal unit capacities ranged from 2-80 cots. The private health facilities have smaller neonatal units (<5 cots) and the largest private unit have 20 cots spaces. The public tertiary facilities have units ranging from 14-80 cot capacity. All units above 30 cots capacity are in public tertiary health facilities.

The 54 health institutions of these respondents were headed by a neonatal Paediatrician.

The distribution of the respondents units by the geopolitical regions, type and level of practice, and their respiratory support capacity are shown in Table 4.

**Table 4:** Geopolitical distribution of the respondent units by Respiratory support capacity and Level of neonatal care.

Geopolitical n Region	Capital City (%)	Public (%)	Partial (%)	Full (%)	Level (%)		
					I	II	III
S-S	13(24.1)	8(61.5)	10(76.9)	4(30.8)	5(38.5)	8(61.5)	3(23.1)
S-East	9(16.7)	6(66.7)	9(100.0)	2(22.2)	3(33.3)	5(55.6)	3(33.3)
S-West	16(29.6)	7(43.8)	13(81.3)	4(25)	6(37.5)	10(62.5)	5(31.2)
N-Central	8(14.8)	6(75.0)	7(87.5)	3(37.5)	3(37.5)	4(50.0)	1(12.5)
N-East	2(3.8)	2(100)	2(100)	2(100)	2(100)	-	2(100)
N-West	6(11.1)	5(83.3)	6(100)	2(33.3)	4(66.7)	1(16.7)	5(83.3)
54	4(63)	47(87)	17(31)	23(42.6)	7(50)	22(40.7)	5(9.3)

Units offering multiple level of care. Nonfunctional MV equipment.

**Table 3:** Respondents location by Unit capacity, Level, Type and Respiratory support capacity of Neonatal units

State	City	Respondent(s)	Level of care	Type of Practice	Bed Capacity	Respiratory support available	Level
Kaduna	Zaria	3	3 <sup>0</sup>	Public	30	Full	II
Kano	Kano	1	3 <sup>0</sup>	Public	38	Full	II
Katsina	Katsina	1	3 <sup>0</sup>	Public	24	Partial	II
Kogi	Lokoja	4	3 <sup>0</sup>	Public	18	-	I
Kwara	Ilorin	2	3 <sup>0</sup>	Public	35	Full	II
Lagos	Ikeja	5	3 <sup>0</sup>	Public	50, 30	Full	II
	Idi-Araba		1 <sup>0</sup>		80	Full	II
	Mainland		2 <sup>0</sup>		8	-	I
	Isolo		1 <sup>0</sup>	Private	13	Full	III
	Others	7	3 <sup>0</sup>	Private	3-13	Full	II
Nasarawa	Keffi	6	3 <sup>0</sup>	Public	25	-	I
Ogun	Abeokuta	3	3 <sup>0</sup>	Public	40	-	I
	Shagamu		3 <sup>0</sup>	Public	28	-	I
Ondo	Akure	3	2 <sup>0</sup>	Public	25	-	I
	Owo		3 <sup>0</sup>	Public	16	-	I
Osun	Oshogbo		3 <sup>0</sup>	Public	28	-	I
	Ile-Ife		3 <sup>0</sup>	Public	25	Full	II
	Ilesha		3 <sup>0</sup>	Public	20	-	I
Oyo	Ibadan	4	3 <sup>0</sup>	Public	40	Full*	II
	Ogbomosho	-	3 <sup>0</sup>	Public	25	-	I
Plateau	Jos	1	3 <sup>0</sup>	Public	15	Full	II
Rivers	P/H	11	3 <sup>0</sup>	Public	30, 45	Full*	II
	P/H	3	3 <sup>0</sup>	Private	4	-	I
	Bonny island	1	2 <sup>0</sup>	Private	2	Full	II
Sokoto	Sokoto	3	3 <sup>0</sup>	Public	25	Full	II
Zamfara	Gusau	3	2 <sup>0</sup>	Public	10, 30	Partial	I
FCT	Abuja	23	3 <sup>0</sup>	Public	20-60	Partial	II
	G/wlada	-	3 <sup>0</sup>	Public	40	Full	I
	Abuja	7	2 <sup>0</sup>	Public	10,12.2	Partial	II
			2 <sup>0</sup>	Private	7-20	Full	III
No Response (%)		9 (3.8)				10 (4.2)	4 (1.7)

\*available none functional MV, P/H = Port Harcourt  
G/Wlada = Gwagwalada

Only 20 (37%) of facilities were located outside the state capitals; while 7 (13%) were private outfits. The capacity to offer one form or the other of respiratory support partially or full was available in more than 60% of the facilities surveyed.

Although in the public sector, tertiary were in the majority, half 27 (50%) of the units belonged to level I, 22 (40.7%) level II, and 5 (9.3%) level III class of neonatal care. The highest proportion of level I units 10 (37%) were in the SW region, level II 5 (22.7%) also in the SW, while level III units 2 (40%) were in the SS region. Three (60%) of the level III units are public facilities while 2 (40%) are private healthcare facilities.

The details of the Neonatal resuscitation training of respondents who are doctors are shown in Table 5.

Neonatal Resuscitation training information were omitted by 9 (4.5%) of the doctor respondents, 164 (81.6%) were trained on Neonatal resuscitation. Senior residents were the highest 49 (89%) and Medical officers the least 4 (40%) trained. For the Nurse respondents, 3 (8.3%) did not provide the Neonatal Resuscitation training information. Less than two thirds 22 (61.1%) were trained on Neonatal resuscitation.

The distribution of the training among the different cadre of Nurses is shown in Table 5.

Health personnel	n	Trained (%)	NRT	HBB	NRT/HBB	Others
<i>Doctors</i>						
Consultants	92	82 (89.1)	43	4	32	3
Residents	90	78 (86.7)	61	2	14	1
Medical Officers	10	4 (40)	4	-	-	-
No response	9					
Sub-Total	201	164 (81.6)	108 (65.9)	6 (3.7)	46 (28.0)	4 (2.4)
<i>Nurses</i>						
Senior Cadre	15	11 (73.3)	9	1	1	-
NO. Cadre	18	11 (61.1)	9	1	1	-
No response	3		9			
Sub-Total	36	22(61.1)	18 (81.2)	2 (9.1)	2 (9.1)	

Of the 201 doctor respondents, 181 (90%) indicated their Neonatal Ventilation training information out of which 71 (39.2%) were trained. Consultants 42 (51.2%) are the highest trained cadre and the medical officers the least 1(11.2%) trained on neonatal mechanical ventilation.

There is a significant relationship between increasing level of paediatric specialization and mechanical ventilation training as shown in table 6.

Out of 36 Nurse Respondents, 32 (88.9%) completed their Neonatal ventilation training information. Only 6 (18.8%) of them are trained with Nursing Officers II (NO-II) being the highest 4 (40%) trained cadre and the Assistant Director of Nursing services (ADNS) and Chief Nursing Officers (CNO) being the cadre without Neonatal ventilation training. This is shown in Table 6.

Health Staff	n	Mechanical	Ventilation Training	
Yes(%)	No(%)			
<i>Doctors</i>				
Consultants	86	42 (48.8)	44 (51.2)	
Resident Doctors	86	28 (32.6)	58 (67.4)	2 9.15, p 0.025
Medical officer	9	1 (11.1)	8 (88.9)	
	181	71 (39.2)	110 (60.8)	
<i>Nurses</i>				
Senior Cadre	14	1 (7.1)	13 (92.9)	
NO. Cadre	18	5 (27.8)	13 (72.2)	
	32	6 (18.8)	26 (81.2)	

The total number of neonatal ventilators available in the newborn units evaluated were 38, located in 23 of the 54 units. The private units have 7 (18.4%) while the public units have 31(81.6%) of the neonatal ventilators. State capitals were the location of 14/22 (63.6%) and 24/38 (63.2%) of the ventilators. They were most commonly available in the SW and SS 11(28.9%) and least available in the NE 2 (5.2%). This is shown in Tables 8 & 9. Pulse oximeters were available in all (100%) the neonatal units, multi-parameter monitors in 23 (42.6%) while 6 (11%) have ABG machines. Four (66.67%) of the ABG machines were located in the SS region. Surfactant replacement services are available in 9 (16.7%) of the units evaluated. For 4 (44.4%) of these units, surfactant replacement services were provided on request. Five

(55.6%) units are level III, while 4 (44.4%) are level II neonatal care facilities.

Location	City n	Pulse n(%) oximeters	Multi-parameter monitors n(%)	ABG n (%)	Surfactant services n(%)
SS	13	13 (100)	6(46.2)	4 (30.7)	3 (23.1)
SE	9	9 (100)	4(44.4)	- (0.0)	2 (22.2)
SW	16	16 (100)	4(25.0)	1(6.3)	3 (18.8)
NC	8	8 (100)	6(75.0)	1(12.5)	1 (12.5)
NE	2	2 (100)	1(50.0)	- (0.0)	- (0.0)
NW	6	6 (100)	2(33.3)	- (0.0)	- (0.0)
	54	54 (100)	23(42.6)	6(11.1)	9 (16.7)

## Discussion

Neonatal care in Nigeria has made progress. This assessment highlights availability and scope of services provided in neonatal units in Nigeria, each functioning at different levels of sophistication. The response rate of 95% was much higher than a similar survey in the US<sup>12</sup>. The respondents comprising mostly of doctors (85%) and female health workers, reflecting the composition of participants at this conference. The nurses' respondents (15.2%) maybe reflective of interest in knowledge update of pediatric care and development.

As expected, more of the respondents (35.9%) were from the South-East (SE) states due to proximity to the conference location while the least (1.3%) were from the North East (NE) states which is farther away. The relatively high representation of the Neonatal facilities located in the South West may be a true reflection of the availability of neonatal services in that region. The paucity of respondents and facilities from the NE region may be due to the restriction of movement in that region as a result of insurgency activities. It may also be due to redistribution of Pediatric specialists from that region to other regions due to security concerns.

That most (87.8%) neonatal units were from public and tertiary healthcare facilities (83.9%) may be a true reflection of the current prevailing national circumstances where highly specialized and cost intensive services are provided by public sector.

The fact that many of these hospitals are located in state capitals calls for an urgent need to establish networks in the periphery so as to reduce mortality and morbidity in communities<sup>13,14</sup>.

Neonatal Mechanical ventilators were available in only half of the centers evaluated with the highest proportion being in the south West; this highlights the need for establishment of such services in its simplest form throughout the country, whilst more sophistication could be made available at the regional levels. The regionalization of services has been linked to neonatal mortality reduction in Europe and North America<sup>1,5,15,16</sup>.

The existence of level I neonatal units or basic care nurseries in teaching hospitals is a misnomer for facilities that ought to give specialized care to referred cases. Basic or level I neonatal care centers ought to be located in primary health centers or secondary care facilities. So that they can provide newborn resuscitation, optimal postnatal care for every delivery and stabilization of ill babies before transport to level II or III facilities. When tertiary centers cater for level I or II care, chances are that the newborn services are non-existent in primary or secondary care centers. This may be responsible for the poor quality of neonatal services with the attendant high neonatal morbidity and mortality in the country.

It's interesting to note the disproportionate distribution of higher levels of neonatal care in the south with only one level III neonatal unit in the North central region. This finding may reinforce the quest for regional care centres<sup>1,5</sup> in targeted hospitals and scaling up of neonatal

services in the primary and secondary centres which are either non-existent or not functional.

Most of the doctors at this conference were trained on Neonatal resuscitation through one form of training or the other; NRT being the most common is a reflection of the availability of this training annually during the PAN conference.

A reasonable proportion of the nurses were trained on neonatal resuscitation however, the finding that more than one third of nurses were untrained in neonatal resuscitation is worrisome albeit the lowest cadre being the most trained. This portends a negative influence on neonatal survival as more deliveries are supervised by nurses.<sup>14</sup> The nursing staff are key to the implementation of community based neonatal care at the hinterlands where the delivery of babies needing bag-mask-valve resuscitation mostly occurs. Neonatal resuscitation training should be stepped down to nurses in the primary centres as a matter of urgency.

Half of doctors that have been trained on neonatal MV are consultants; the medical officers have the fewest proportion of trained personnel. This finding ought to translate to a highly skilled and responsive neonatal survival systems and teams in the different centres. However this was not verified in this study.

Only few of the nurses were trained in neonatal MV, with the lowest cadre being the most trained group a reversal of the trend observed among doctors. This finding is thought provoking as skilled medical and nursing personnel is key to successful mechanical ventilation service. This maybe one of the reasons for the unavailability and non-commencement of this service in some tertiary hospitals evaluated.

The finding of slightly above one third of tertiary neonatal centres having MV facilities is a reflection of the poor neonatal infrastructural capacities. There are no similar publications known to the authors from resource poor and high neonatal mortality settings on the avail-

ability of neonatal MV. MV services are available in level II neonatal units in developed countries<sup>8</sup> hence the drift from MV availability to ventilation strategies or techniques.<sup>17</sup>

It's noteworthy that some of the neonatal units with MV capacity (40.7%) may be suitable for NICU or level III care. The number of units 5 (9.3%) with level III neonatal care are appalling hence the dire need to establish Regional neonatal centres as centres to provide full range of care.

All the centers have pulse oximetry capacity, while a quarter (25%) have multi-parameter monitors and only 11% had ABG machines. This shows poor neonatal monitoring infrastructure in the facilities evaluated. Critical care decision are dependent on the ability to anticipate biochemical abnormalities and confirm promptly using these monitoring tools for informed interventions. Paucity of monitoring tools may be a contributory factor to the reduced survival of very ill newborns in the units. The paucity of surfactant replacement services reduces chances of survival of ELBW and VLBW babies,<sup>5,18</sup> which contributes to the high National neonatal mortality.

This study is has attempted to describe the scope and quality of neonatal care available in major Nigerian hospitals. It is limited in the sense that it did not assess for sophisticated care such as the availability of parenteral alimentation or further sophisticated means of management of encephalopathies such as cooling devices and techniques. However in the assessment, focus was placed rather on what was considered simpler means of management by the authors such as respiratory support which had played a major role in the drastic reduction in neonatal mortality in the developed countries. This is because prior to the introduction of ventilator support in Europe and North America, the neonatal mortality could not reduce further than below 35 per thousand live births<sup>18</sup>. The introduction of ventilator support drove the reduction in neonatal mortality. All the respondents uniformly had available means of thermal regulation through the use of incubator care even though the quantity of incubators to the ratio of babies catered for was not estimated. The ratio of support health personnel to patient was equally not assessed.

The findings from this study is far below what is found in developed countries of Europe, North America and south Africa where Standard level of Intensive care Units are available and these countries can provide for the various levels of care ranging from level 1 to level 3 to 4. In most countries of Africa there is scarcity of published data on the tiered system of care. In other countries of West Africa like Ghana, there is the capacity for the provision of level 1,2 and one or two level 3 hospitals. In Countries of East Africa where there may be paucity of level 3 neonatal care services, there is scarcity of published data on the tired care. It is therefore apparent that the level of available care is driven by the available resources allocable to the health care services.

Despite the limitations of this survey, it has given an indication of the impact of allocation of limited resource to health care services in general and more importantly the effect of none prioritization of neonatal care in the scope of maternal and child care. Health sector funding should therefore be refocused with emphasis placed on the improved funding of hospitals as the panacea for better scope and quality of neonatal care services.

Funding does not have to come strictly from government directly. It could come from private investors, from various sectors of the economic community but there should be a well-coordinated mechanism for this source of funding to ensure a sustainable source. Such funding source could come from some foundations or companies. Various innovative means could be focussed upon and stake holders can focus on exploring creative means of identification of sustainable funding mechanisms for health sector and neonatal health.

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## Conclusion

Neonatal care in Nigeria is still in evolution. The peak of the medical personnel are skilled but the lower medical, senior and intermediate nursing care staff are unskilled for critical neonatal care service. Basic neonatal care is widespread in major public and private centers in major

cities. Such basic neonatal care is scarce in the communities

## Recommendations

More in-depth Assessment should provide for evaluation of availability of feeding modalities  
More resources should be allocated to health to ensure provision of improved neonatal health care resources  
Regionalization of higher level care, networking and community linkage may be the panacea for the preventable deaths and diseases of newborn babies.

## Limitations

The study did not evaluate for sophisticated care such as the availability of parenteral alimentation or further sophisticated means of management of encephalopathy such as cooling devices and techniques or the administration of Nitric Oxide.

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## References

- Bode MM, O'shea TM, Metzguer KR, Stiles AD. Perinatal regionalization and neonatal mortality in North Carolina, 1968–1994. *Am J Obstet Gynecol.* 2001;184(6):1302–1307
- MacDorman MF, Kirmeyer S. Fetal and perinatal mortality, United States, 2005. *Natl Vital Stat Rep.* 2009;57(8):1–19.
- Stahlman MT. Newborn intensive care: success or failure? *J Pediatr.* 1984;105:162–167.
- Hack M, Wright LL, Shankaran S et al. Very low birth weight outcomes of the National Institute of Child Health and Human Development Neonatal Network, November 1989 to October 1990. *Am J Obstet Gynecol.* 1995;172:457–464.
- Horwood SP, Boyle MP, Torrance GW, Sinclair JC. Mortality and morbidity of 500 to 1,499 gram birth weight infants live-born to residents of a defined geographic region before and after neonatal intensive care. *Pediatrics.* 1982;69:613–620.
- Lee KS, Paneth N, Gartner LM, Pearlman MA, Gruss L. Neonatal mortality: an analysis of the recent improvement in the United States. *Am J Public Health.* 1980;70:15–21.
- Williams RL, Chen PM. Identifying the sources of the recent decline in perinatal mortality rates in California. *N Engl J Med.* 1982;306:207–214.
- Levels of Neonatal Care. Committee on fetus and newborn. *Pediatrics* 2012;130:587; originally published online August 27, 2012 doi: 10.1542/peds.2012-1999.
- March of Dimes, Committee on Perinatal Health. Toward Improving the Outcome of Pregnancy: Recommendations for the Regional Development of Maternal and Perinatal Health Services. White Plains, NY: March of Dimes National Foundation; 1976.
- Richardson DK, Reed K, Cutler JC, et al. Perinatal regionalization versus hospital competition: the Hartford example. *Pediatrics.* 1995;96(3 pt 1):417–423.
- Yeast JD, Poskin M, Stockbauer JW, Shaffer S. Changing patterns in regionalization of perinatal care and the impact on neonatal mortality. *Am J Obstet Gynecol.* 1998;178(1 pt 1):131–135.
- Louis D. Pollack, Ian M. Ratner, Greg C. Lund DO. United States Neonatology Practice Survey: Personnel, Practice, Hospital, and Neonatal Intensive Care Unit Characteristics. *PEDIATRICS* Vol. 101 No. 3 March 1998.
- Saving newborn lives in Nigeria: Newborn health in the context of the Integrated Maternal, Newborn and Child Health Strategy. Abuja: Federal Ministry of Health, Save the Children, ACCESS; 2009. Full report with references and detailed data sources available on [www.savethechildren.org/savenewborns](http://www.savethechildren.org/savenewborns).
- National Population Commission (NPC) [Nigeria] and ICF International. Nigeria Demographic and Health Survey 2013. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International; 2014.
- American Academy of Pediatrics and the American College of Obstetrics and Gynecology. Guidelines for Perinatal Care. 5th ed. Elk Grove Village, IL: American Academy of Pediatrics; Washington, DC: American College of Obstetrics and Gynecology; 2002. 2.

- 
16. Horbar JD, Badger GJ, Carpenter JH, et al. Trends in mortality and morbidity for very low birth weight infants, 1991–1999. *Pediatrics* 2002;110 (Part 1):143–51.
  17. Steven MD, Sunil KS. Invasive and Noninvasive Neonatal Mechanical Ventilation. *Respir Care* 2003;48 (4):426–439.
  18. Kamath BD, MacGuire ER, McClure EM, Goldenberg RL, Jobe AH. Neonatal Mortality From Respiratory Distress Syndrome: Lessons for Low Resource Countries. *Pediatrics* 2011; 127: 1139–1146.