

Neonatal Resuscitation in Some Nigerian Primary and Secondary Health Institutions: an Evaluation of Ongoing Practices

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Summary

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Background: Birth asphyxia is an important cause of neonatal morbidity and mortality all over the world and especially in developing nations. Therefore, it is necessary to ascertain if birth attendants have the requisite knowledge, equipment and skills for effective resuscitation of newborns.

Objectives: To evaluate the knowledge and ongoing practices of newborn resuscitation at the primary and secondary health care levels in Nigeria, so as to suggest ways of improvement.

Design: Cross-sectional questionnaire and facility inspection study.

Participants: Midwives and other birth attendants in 10 primary and two secondary health care facilities in Osun state.

Methods: Structured questionnaires eliciting details of available equipment and drugs, training, length of experience, knowledge and practices of birth attendants on infant resuscitation were administered to all the birth attendants on duty in 12 health care facilities.

Results: There were 170 respondents; 113 (66.5 percent) at primary and 57 (33.5 percent) at secondary health care levels. Basic resuscitating equipment was lacking in all, but the situation was worse at the primary level. Ambu-bagging and endotracheal intubation were rarely practised. There were significantly greater use of vigorous stimulation ($p < 0.012$), administration of nikethamide and methylated spirit ($p < 0.005$) and less frequent administration of oxygen ($p < 0.005$) in the primary than secondary level health facilities.

Conclusions: The knowledge and skill of birth attendants at primary and secondary health care levels were inadequate and should be upgraded.

Introduction

NEONATAL resuscitation is an important emergency procedure expected to be undertaken at all levels of health care services where babies are delivered.¹ Birth asphyxia accounts for about 19 percent of the approximately five million annual neonatal deaths worldwide,^{1,2} a great percentage of which occurs in developing nations.²⁻⁴ According to various studies, perinatal asphyxia is a leading cause of neonatal

mortality and morbidity in Nigeria especially among babies born outside the teaching hospitals.^{5,6}

Since the second quarter of the twentieth century, the basis for resuscitation of the newborn has changed. With increased knowledge, many of the earlier methods which depended on uncomfortable stimuli to initiate the onset of breathing, like intermittent traction on the tongue, spanking the feet or buttocks, dilation of the anal sphincter and alternate immersion of the infant in hot and cold water, have been found to be injurious and wasteful of precious time which could be used more effectively.^{2,7-9} Many other methods like Bloxsum's positive pressure oxygen air lock, body rocking, intragastric oxygen, hyperbaric oxygen, analeptic drugs, electrical stimulation of the phrenic nerve and hypothermia which were once thought to be effective, have also been discarded when controlled animal experiments were undertaken.^{2,10,11} Currently, neonatal resuscitation can be divided into four categories of action: rapid

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assessment and initial steps in stabilization, ventilation, including bag-mask or bag-tube ventilation, chest compressions and administration of medications or fluids.² Tracheal intubations may be required during any of these steps.²

Most teaching hospitals in Nigeria combine all levels of care within their facilities. However, increase in the cost of health care and worsening economic conditions dictate that increased proportions of high risk mothers deliver outside tertiary hospital settings and many of their babies may need resuscitation. The aim of the present study was to evaluate the knowledge and ongoing practices of newborn resuscitation at the primary and secondary health care delivery facilities in the country so as to suggest ways of improvement.

Methods

This was a cross-sectional study conducted at ten local government primary health and maternity centres and two state owned general hospitals in Osun State. These centres were chosen because of their close proximity to the tertiary hospitals in the State. It was assumed that their geographical closeness to the two teaching hospitals would bring the knowledge and practice in them close to the optimum.

Consent for the study was obtained from the midwives and birth attendants. A structured questionnaire was administered to all the staff on duty during the three shifts of duty. Excluded were off-duty staff and those on leave. The questionnaire contained questions on years of experience, resuscitation training courses attended, equipment, drugs and methods used in resuscitation as well as their judgment on the effectiveness of such methods and drugs. Equipment available for resuscitation was also inspected. The data generated were entered into an IBM personal computer and analysed with the statistical with the statistical package for the social sciences (SPSS version 11). Simple frequencies and chi square test of significance were calculated. The level of significance was taken as $p < 0.05$.

Results

Health facilities, experience and posts held by the respondents

Out of three hundred questionnaires, 194 were completed and returned. They covered 10 primary health facility/maternity centres and two state hospitals in the State. Twenty four of these were not analysed because of inappropriate entries and confusing information. Only the one hundred and seventy questionnaires returned and appropriately completed were analysed. One hundred and thirteen (66.5 percent) of the respondents were birth

attendants at the primary health /maternity centres and 57 (33.5 percent) were midwives in secondary health care facilities. Of the 113 respondents at the local government maternity centres, 13 were Nursing Officers, five Chief Community Health officers, six Chief Community Health Extension Workers (CHEWs), 10 Principal CHEWs, 22 CHEWs, 29 Junior CHEWs and 28 Health Assistants. The staff midwives respondents at the secondary health care comprised five Chief Nursing Officers, six Assistant Chief Nursing Officers, eight Principal Nursing Officers and 38 Nursing Officers. The years of experience in neonatal resuscitation practice ranged between four and 30 years, with a mean of 12 years among secondary health care providers, while the range was between one and 32 years (mean, 17 years) among the primary level health providers. The number of deliveries ranged from 10 to 36 (mean, 19) births per month in the secondary care level and from eight to 18 (mean, 11) in the primary care level. Only two (3.5 percent) of the midwives at the State hospitals had ever undergone any in-house training during their years of practice, and then, only once, while none of the birth attendants at primary health centres had received any other training since leaving their original training school.

Equipment available for resuscitation at the health facilities

Table I compares the equipment and drugs for resuscitation available at the primary and secondary health care levels. Generally, basic resuscitating equipment was lacking in the two levels of health care but worse in the primary health facilities. One of the secondary health facilities had access to oxygen but only at a distance. New breathing bags, oxygen cylinders and a suctioning machine had been bought for the centre but were not yet in use; no drug for resuscitation was available at the time of inspection. At the primary health facility, only a few mucus extractors and syringes were available. None of the health facilities had any means of providing warmth during resuscitation.

Methods and drugs for resuscitation

Table II compares the resuscitation methods used by the primary and secondary health care birth attendants. Common methods of resuscitation were slapping/ beating, suctioning of airways, inversion of head, sprinkling of cold water, vigorous shaking, and mouth to mouth breathing. Ambu bagging was sometimes practised while laryngoscopy and endotracheal intubation were never practised. While vigorous shaking and inversion of head were significantly more commonly practised at primary health unit ($p=0.012$), ambu bagging was commoner with the secondary health centres ($p<0.0001$). Table III compares the

Table I
Comparison of Availability of Space, Equipment and Drugs for Resuscitation at the Ten Primary and Two Secondary Health Care Levels

<i>Equipment and Availability of Space</i>	<i>Primary Health Care Units n = 10 (%)</i>	<i>Secondary Health Care Units n = 2 (%)</i>
Special site for resuscitation	4 (40)	2 (100)
Warmer	0	0
Electric bulb	0	0
Suction equipment		
Bulb syringe	0	0
Mucus extractors	7 (70)	2 (50)
Suction catheters	0	1 (50)
Feeding tube and 20ml syringe	2 (20)	2 (100)
Meconium aspirator	0	0
Laryngoscope	0	0
Endotracheal tubes	0	0
Bag-and-mask	1 (10)	1 (50)
Oxygen source with flowmeter	0	1 (50)
Oxygen concentrator	0	1 (50)
Face masks, newborn and premature sizes	1 (10)	1 (50)
Drugs		
Epinephrine 1:10,000	0	1 (50)
Isotonic crystalloid (normal saline or Ringer's lactate)	0	1 (50)
Sodium bicarbonate	0	0
Naloxone hydrochloride	0	0
Dextrose 10%,	0	1 (50)
Feeding tubes	0	2 (100)
Syringes	5 (50)	2 (100)
Needles	5 (50)	2 (100)

frequency of drugs administered during resuscitation by the primary and secondary health care birth attendants. Common drugs used during resuscitation at both levels included methylated spirit vapour inhalations, parenteral hydrocortisone, vitamin K, aminophylline and nikethamide. Oxygen and sodium bicarbonate were rarely used at both health care levels. More than 65 percent of attendants at both health care levels used methylated spirit and injections of hydrocortisone in resuscitating newborns at birth. However, the use of methylated spirit and nikethamide were significantly more common at the primary than secondary health care levels ($p < 0.0001$), while oxygen use was commoner at the secondary health care level ($p < 0.005$).

Assessment of efficacy of methods and drugs used during resuscitation

There was similarity in the attendants' judgment of the efficacy of the methods and drugs they used. Three methods were judged to be of good effect. These were different degrees of tactile pressure - for example, rubbing, slapping or beating of the back, buttocks or feet of the newborn, inhalation of methylated spirit and intramuscular injection of hydrocortisone.

Referral of babies

The referral centres used by the primary and secondary health care levels were the teaching hospitals as stated by 76 percent, and 100 percent respondents,

Table II

Comparison of Methods of Resuscitation by 113 Primary and 57 Secondary Health Care Birth Attendants

Method	Primary Health Care Birth Attendants (n = 113)			Secondary Health Care Midwives (n = 57)			p-value
	Always n (%)	Sometimes n (%)	Never n (%)	Always n (%)	Sometimes n (%)	Never n (%)	
Slapping/beating	47(41.6)	43(38.1)	23(20.3)	15(26.3)	37(64.9)	5(8.8)	0.17
Suctioning the airways	31(27.4)	70(61.9)	12(10.6)	36(63.2)	20(35.1)	1(1.8)	0.08
Inversion of head head	42(37.2)	47(41.6)	24(21.2)	10(17.5)	33(57.9)	14(24.6)	0.002
Sprinkling of cold water	3(2.7)	10(8.8)	100(88.5)	0	4(7.0)	53(93.0)	0.5
Endotracheal intubation	0	0	113(100)	0	0	57(100)	-
Vigorous shaking	8(7.1)	33(29.2)	72(63.7)	0	10(17.5)	47(82.5)	0.012
Laryngoscopy	0	0	113(100)	0	0	57(100)	-
Mouth to mouth breathing	5(4.4)	46(40.7)	62(54.9)	5(8.8)	15(26.3)	37(64.9)	0.2
Breathing bag (Ambu bag)	0	5 (4.4)	108(95.6)	0	20 (35.1)	37(64.9)	0.0001

Table III

Comparison of Frequency of Drugs administered during Resuscitation by 113 Primary and 57 Secondary Health Care Birth Attendants

Drug	Primary Health Care Birth Attendants (n = 113)			Secondary Health Care Midwives (n = 57)			p-value
	Always n (%)	Sometimes n (%)	Never n (%)	Always n (%)	Sometimes n (%)	Never n (%)	
Aminophylline	03 (2.7)	23 (20.3)	87 (77.0)	0	10(17.5)	47(82.5)	0.4
Hydrocortisone	13(11.5)	74(65.5)	26(23.0)	0	39(68.4)	18(31.6)	0.6
Stimulation with methylated spirit and swab	19(16.8)	89(78.8)	05(4.4)	03(5.3)	39(68.4)	15(26.3)	0.0001
Adrenaline	0	05(4.4)	108(95.6)	0	10(17.5)	47(82.5)	0.0001
Sodium bicarbonate	0	02(1.8)	111(98.2)	0	07(12.3)	50(87.7)	0.001
Calcium gluconate	0	01(0.9)	112(99.1)	0	14(24.6)	43(75.4)	0.0001
Nikethamide (Couramine)	0	36(31.9)	77(68.1)	0	4(7.0)	53(93.0)	0.047
Lobeline	0	2(1.8)	111(98.2)	0	0	57(100)	0.8
Oxygen	0	0	113(100)	0	15(26.3)	42(73.7)	0.0001
Intravenous dextrose	0	0	113(100)	0	07(12.3)	50(87.7)	0.0001
Vitamin K injection	07(6.2)	24(21.2)	82(72.6)	0	07(12.3)	50(87.7)	0.9
Glucose drink	21(18.6)	12(10.6)	80(70.8)	05(8.8)	09(15.8)	43(75.4)	0.5

respectively. However, none had ever received any feedback on the outcome of the babies referred.

Discussion

The present study has shown that little or no provision is made for resuscitation at birth in either the primary or secondary health facilities in our area of study. This may explain why perinatal asphyxia is a leading cause of neonatal referral, morbidity and mortality in our area of work as has also been reported from many other developing nations.^{4,6}

The present study also shows that there was general poverty of knowledge of the proper practice of newborn resuscitation at the primary and secondary health care levels. Only one out of a hundred midwives resuscitating babies at birth, had received any in-house training on neonatal resuscitation, the adequacy of which is doubtful. The health facilities were not adequately equipped, hence most of the methods in use were attempts at 'just doing something' for a dying baby. This may be the reason why various outdated, obsolete and sometimes dangerous methods of resuscitation were used. What makes this finding more worrisome is the fact that these facilities were situated near teaching hospitals. One can therefore only imagine what the practice must be in remote and rural areas where most of the Nigerian population dwell. It is therefore not surprising that neonatal mortality rates in health institutions in developing countries, including Nigeria, are very high; and Nigeria has one of the highest in Africa.^{5,13,14}

Another surprising finding in the present study was the use of chemicals and drugs like methylated spirit, intramuscular vitamin K and aminophylline in resuscitating newborns. Apart from constituting a waste of precious time, such practices could worsen the outcome of resuscitative measures both in the immediate and later periods. For example, methylated spirit which is often instilled into the nostrils, rubbed on the skin for tactile stimulation or instilled into a swab placed under the nostrils of the baby, is a denatured absolute ethyl alcohol commonly used in the hospital for preparation of the skin, wound dressing and as a cleaning agent.¹⁵ It consists of two percent methanol, less than 6.2 percent water and over 90 percent of ethanol and it is known to be irritant to the eyes, mucous membranes, upper respiratory tract and skin.¹⁵ It causes central nervous system depression, convulsions, ataxia and coma. It may also cause pulmonary damage, alteration in gastric secretion, nausea, vomiting and other gastrointestinal changes.¹⁵ However, no known study has documented the direct immediate and long term effects of its use on newborns. Parenteral aminophylline can precipitate convulsions and gastric bleeding. Furthermore, while

steroids have not been shown to be of any benefit in birth asphyxia, their use may predispose the baby to abnormal bleeding, increased intracranial pressure, pseudo tumour cerebri and increased mortality. Besides, animal studies have also shown that steroid use increased mortality and lack of any improvement in the extent of neurological injury just as has been similarly found in human adult patients with head trauma, stroke and hypoxic ischaemic encephalopathy (HIE).^{15,16}

Hypothermia to between 33°C and 34°C if initiated as soon as possible after delivery, has been observed to reduce mortality and disability in babies with hypoxic ischaemic encephalopathy.^{16,17} However, extreme cooling and hypothermia are known to induce neonatal cold injury and result in grave consequences.¹⁸

The results of the present study suggest that there is an urgent need to improve the knowledge and skills of birth attendants in the resuscitation of newborns at both the primary and secondary levels of health care in order to reduce neonatal morbidity and mortality. It is the presence of skilled birth attendants, not just anybody, that could improve birth outcome. Provision of necessary resuscitating equipment is also necessary. The present study raises an important question about the influence teaching and tertiary hospitals should have on primary and secondary level centres. One of the pillars on which primary health care stands is the participation and active cooperation of the formal health system especially in relation to training and referral. This would seem to be inadequately addressed at the present time.

We suggest that the various authorities regulating medical and nursing practices in Nigeria should extend their supervision and regulations to the health facilities at the primary and secondary health care levels. Minimum standards of care necessary to improve neonatal care should be enforced. Regular in-service training should be mandatory and a precondition for continued issuance of license to practise as well as for earning promotion at work. These issues should be addressed by the various interest groups such as the Paediatric Association of Nigeria (PAN) and the Society for Gynaecology and Obstetrics in Nigeria (SOGON) with a view to reducing the current rate of child wastage in Nigeria.

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