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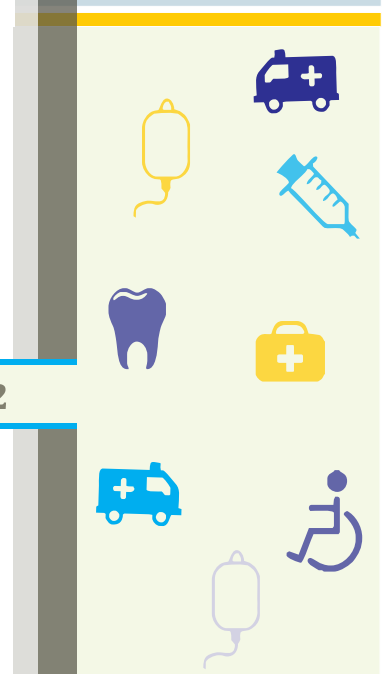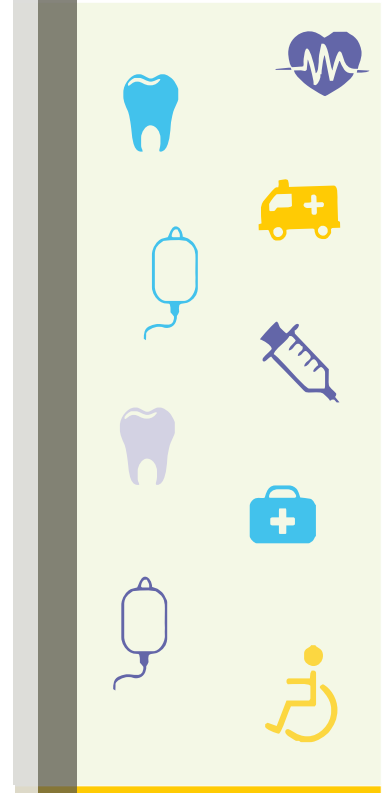# Content   Pages

INTERNATIONAL EDITORIAL ADVISORY BOARD continues

EDITORIAL: EXPLORING THE HORIZONS
Oghenekaro G. Egbi (MBBS, MPH, FMCP, FWACP)
Editor-in-Chief

Niger Delta Medical Journal 2022;**6**(2):5

Having hit the ground running as a new editorial crew with our maiden issue last quarter[1], it is perhaps time to explore new horizons. There are a lot we are set out to achieve in the nearest future. In this quarter, we hope to make the manuscript submission and review process more seamless by introducing a user-friendly on-line process.

Newborn health is in the front burner in this issue. The transition from a fetus to a neonate is said to be the most complex adaptation that occurs in human experience [2] and is therefore fraught with its challenges. Bolaji and colleagues are concerned about the high rate of neonatal mortality in a resource poor setting and identify sepsis as a leading cause[3] while Duru et al in the same vein, highlights adequate cord care as a possible preventive measure, alluding also to the important roles of hospitals and qualified health personnel.[4] What however are the possible reasons why patients may not want to remain under hospital care? Odigri and her co-researchers may have provided some clue to this in their retrospective study.[5]

In this issue, we also have an interesting case report [6] suggesting that a severed snake head may not be as harmless as may be believed and therefore seeks for the sensitization of the general public about the possible dangers. The case report on rhabdomyolysis [7] possibly brings to the fore a need to review the nature and intensity of physical training in boot camps.

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4. Cord Care Practices and their Determinants among Mothers of Under-Fives Residing in Bayelsa State, Nigeria. Duru CO, Oyeyemi A, Adesina A, Tobin-West C, Nte A. *Nig Del Med J* 2022;**6**(2):17-34

5. Reasons for Discharge Against Medical Advice in A Tertiary Hospital in a Developing Country. Odigie VA, Mba O, Ogagi DS. *Nig Del Med J* 2022;**6**(2):35-49

6. Decapitated Snake Bite Envenomation: A Report of Two Cases. Ayinbuomwan AS, Opadeyi AO, Osho OP, Isah AO. *Nig Del Med J* 2022;**6**(2):50-55

7. Acute Kidney Injury Secondary To Rhabdomyolysis in a 29 Year Old Naval Cadet Officer: Case Report. Ndu VO., Oko-Jaja R., Ujah T. *Nig Del Med J* 2022;**6**(2):56-62

ORIGINAL ARTICLE
A 5-YEAR AUDIT OF NEONATAL MORTALITY AT FEDERAL TEACHING HOSPITAL, IDO-EKITI, SOUTHWEST NIGERIA.

Olufunke B. Bolaji[1], **Ebenezer O. Adeyemi**[1], **Ayodeji Ajibola,**
Olufunmilayo V. Adebara[2], **Olaniyi Fayemi**[1], **Olusegun J. Adebami**[2]

[1]Department of Paediatrics. Federal Teaching Hospital,
Ido-Ekiti, Ekiti State, Nigeria
[2]Department of Paediatrics and Child Health,
Osun State University, Osogbo, Osun State, Nigeria

Address for correspondence
Dr. O. B. Bolaji
Department of Paediatrics, Federal Teaching Hospital,
PMB 201, Ido-Ekiti, Ekiti, Nigeria
Email: olufunke.bolaji@gmail.com

ABSTRACT
Background: *The newborn period is the most vulnerable period of child survival. Sub-Saharan Africa as a region has the highest neonatal mortality rate in the world, and Nigeria has the highest neonatal mortality rate in the region.*

Objectives: *We aimed to identify the common causes of neonatal mortality and determine the predictors of neonatal mortality in Federal Teaching hospital Ido-Ekiti (FETHI), Nigeria.*

Methods: *We did a retrospective review of admitted newborns records from January 2013 to December 2017. Information was extracted on the maternal, sociodemographic and the neonatal characteristics of the participants and the results were analyzed.*

Results: *A total of 1236 babies were admitted in the neonatal ward during the study period out of which 110 babies died giving a neonatal mortality rate of 8.9 % in the hospital. Of the 110 babies that died, 65 (59.1%) were males and 45 (40.1%) were females. Early neonatal mortality constituted 75.5% of the mortalities while late neonatal mortality was 24.5%. The primary diagnoses as causes of neonatal mortality were neonatal sepsis (32.7%), perinatal asphyxia (26.3%) and complications of prematurity (22.7%).Binary logistic regression analysis of selected neonatal characteristics showed that prematurity, low birth weight and the age on admission were the statistically significant predictors of neonatal mortality in the hospital (p<0.01).*

Conclusion: *Neonatal mortality rate is still high. Neonatal sepsis, perinatal asphyxia and complications of prematurity were the leading causes of neonatal deaths seen during the study period in our hospital. There is a need to improve on the strategies for better neonatal survival.*

KEYWORDS: *neonatal mortality, cause of death, predictors, South-West Nigeria*

INTRODUCTION

The neonatal period represents a very vulnerable phase of life when there are substantial risks of acquiring potentially life-threatening diseases. The complexity of the various adaptive processes which the newborn undergoes during the first few days of life may unduly put the newborn at risk of dying.[1,2] Globally, about four million neonatal deaths occur each year with more than 90% of these deaths occurring in sub-Saharan Africa with Nigeria having a high rate of 39 per 1000 live birth replace with. This is higher than that of the African region as a whole as at 2018 (27 per 1000).[3,4]

This high neonatal mortality rate has unfortunately not improved significantly over the years in Nigeria. It stagnated at 41/1000 live births between 1990 and 2013 [5] and thereafter, there was a marginal reduction of the neonatal mortality rate to the present rate of 39/1000 in 2018.[5] These rates are actually tips of the iceberg as many neonatal births and deaths in the communities are undocumented and unreported.[6] Even though several international and national programs for example the Integrated Maternal, Newborn and Child Health (IMNCH) in 2016, IMNCH 2 in 2018, Helping Babies Breathe (HBB), Kangaroo Mother Care (KMC), maternal steroid administration, and recently Essential Newborn Care (ENC) were introduced and implemented to improve perinatal and immediate neonatal care, neonatal mortality rates have not shown significant improvement; neonatal mortality rate has consistently lagged behind the substantial progress in infant mortality rate such that neonatal mortality still contributes about 47% of under-5 mortality in Nigeria.[5,6]

While data on the overall statistics of newborn mortality are generally available from Nigeria Demographic and Health Survey (NDHS) and 2019 Verbal and Social Autopsy (VASA) reports for example, there is need for continual research and data on causes of newborn mortality as determined by facility audit of practice as this may vary by geographical location. This is the first audit of our neonatal unit at the Federal Teaching Hospital, Ido Ekiti, Ekiti state and we aimed to identify the common causes of neonatal mortality and determine the predictors of neonatal mortality in our centre. This will improve neonatal care in the state and invariably in the nation as Nigeria strives to achieve the Sustainable Development Goal 3 for child survival.

MATERIALS AND METHODS
Study design, setting and methodology

This retrospective descriptive study was carried out at the Federal Teaching Hospital Ido-Ekiti (FETHI). The hospital is a tertiary health facility that serves the health needs of communities in Ekiti and neighbouring communities in Ondo, Osun and Kwara States. The hospital provides care in specialized areas of medicine and surgery, obstetrics and paediatric care. The neonatal ward receives babies delivered in the maternity unit of the hospital (Inborns) and sick babies referred from outside the hospital (Outborns). The neonatal ward generally provides level IIIa care and has facilities such as resuscitaires, incubators, LED phototherapy units, improvised/oxygen driven bubble CPAP, syringe pumps, infusion pumps, pulse oximeters, glucometers as well as facilities for KMC. Oxygen is delivered through a piped system. It is divided into the neonatal intensive care unit with seven incubators, special care baby unit inborn with eight cots, special care baby unit out born with seven cots and an isolation ward with five cots. Attached to the neonatal ward is the eight bedded mothers'

room. However, as at the time of this study, there were no facilities for mechanical ventilation, exogenous surfactant administration and total parenteral nutrition. Similarly, the neonatal unit staffing was limited to two paediatricians, one senior registrar, two junior registrars, two medical interns and twenty-three nurses.

Participants and data collection
All the admissions and discharges records in the neonatal ward register for the period January 2013 to December 2017 were reviewed. The hospital notes of all neonates who had died in the neonatal unit of our facility between January 2013 and December 2017 were retrieved and reviewed. Patients who had incomplete records were excluded. Information required from the notes were entered into a proforma pre-designed for the study. This proforma was explained to the neonatal ward residents and interns who then had the responsibility of data entry. Data obtained from the records included the maternal characteristics like age, marital status, employment status, level of education, obstetric data including the parity, ANC attendance and mode of delivery while the neonatal characteristics included postnatal age on admission, sex, birth weight, gestational age, place of birth, major reason for admission, duration of hospitalization and possible causes of death. Approval for the study was obtained from the Ethics and Research Committee of FETHI.

Definition of terms
Our neonatal ward has protocols (based on the widely accepted guidelines and within the limits of available hospital facilities) for diagnosing and managing common neonatal problems. These protocols are regularly reviewed in line with global best practices.
Neonatal sepsis is diagnosed in the presence of maternal or neonatal risk factors for sepsis, laboratory evidence of infection and bacteriological confirmation when available. The gold standard for diagnosing sepsis is blood culture but in the absence of blood cultures, full blood count parameters suggestive of sepsis (presence of leucocytosis [> 30,000/ul], absolute neutrophil count [< 3,5000/mm^3] or reversal of the neutrophil to lymphocyte ratio for age) with or without the presence of risk factors for sepsis was regarded as sepsis.[7]

Perinatal asphyxia is diagnosed using the Apgar scoring system as there are no facilities available for blood gas and pH analysis. For babies that are outborn, the history of failure to initiate spontaneous respiration at birth plus clinical features suggestive of asphyxia were used to make the diagnosis. A diagnosis of Hypoxic Ischaemic Encephalopathy (HIE) was based on the Sarnat-Sarnat grading system which uses neurologic findings to classify the severity of asphyxia[5,6] Preterm birth was defined as babies born before 37 completed weeks of gestation.

Acute bilirubin Encephalopathy was diagnosed in the presence of clinical jaundice plus serum bilirubin greater than the norm on the normogram for the babies' gestational age and weight with signs of encephalopathy.

Deaths which occurred within and after the first seven days of life were classified as early and late neonatal deaths, respectively.[6] Postmortem examinations for the deaths were not routinely carried out due to the strong socio-cultural bias against neonatal postmortems. Consequently, cause of death relied mainly on clinical diagnosis made by a paediatrician and confirmed by a 2nd paediatrician in most of the cases.

Neonatal mortality rate was defined as the number of deaths occurring among the admitted newborns over the period of study expressed as a percentage.

Data analysis and management
Data was analyzed using the statistical package SPSS version 23. The mean, standard deviation and associated percentages were determined where applicable. The Chi square test was used for testing the significance of associations between categorical variables. The level of statistical significance was set at $p < 0.05$. The inborn and outborn babies were compared for age, weight and mortality rate using the Chi square and Student's t-tests. Binary logistic regression was done to determine the predictors of neonatal mortality using selected neonatal characteristics. The corresponding odds ratio and 95% CI are reported.

RESULTS
Neonatal admissions and characteristics of the babies who died.
A total of 1236 babies were admitted into the neonatal unit over the 5-year period out of which 110 (8.9%) babies died. Out of the 110 babies that died, 66 (60%) were preterms while 44 (40%) were term babies. The mortality

distribution by place of admission was 69 (62.3%) as Outborns while 41 (37.2%) were inborns admissions. Significantly higher proportion of outborn babies died (p = 0.01). Out of the 110 patients who died, 65 (59.1%) were males and 45 (40.1%) females, giving a male to female ratio of 1.4:1 The difference between the proportion of deaths between gender was not statistically significant (p = 0.54).

Eighty-three (75.5%) babies experienced early neonatal deaths, the mean age at demise was 2.6 ± 1.1 days. Of the 83 babies, 20 (25.0%) died within the first 24 hours of life.

Causes of death and specific neonatal mortality.
In this review, the leading causes of neonatal mortality in our study were sepsis (32.7%), perinatal asphyxia (26.3%), and complications of prematurity (22.7%) and together they accounted for more than 80% of the neonatal deaths. The other causes included acute bilirubin encephalopathy, congenital malformations, tetanus and "Others" which included chromosomal anomalies and few cases of haemorrhagic disease of the newborn that presented very late. This is shown in Figure 1.

Figure 1: Causes of death and specific neonatal mortality.
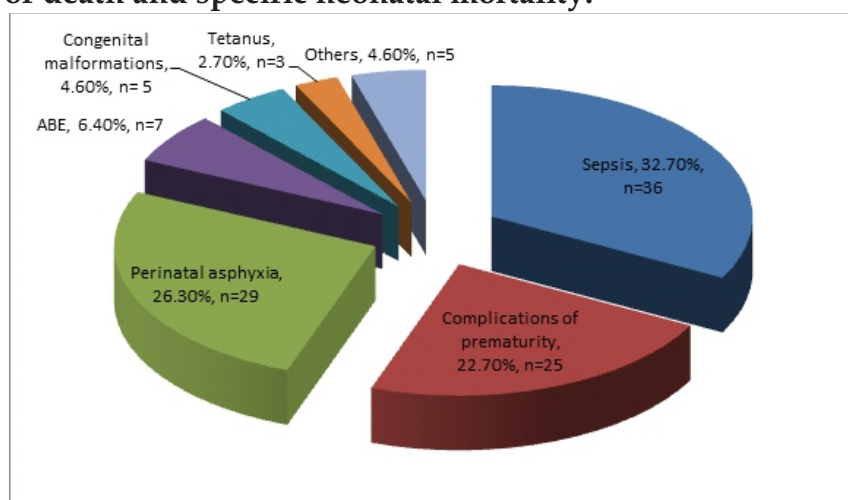
Association of causes of death with place of birth

The leading causes of deaths for Inborn babies were sepsis (44.4%), complications of prematurity (56.0%) and asphyxia (34.5%) in that order while leading causes of death for the outborn babies were sepsis (55.6%), asphyxia (65.5%) and complications of prematurity (44.0%) in that order. All the deaths from neonatal tetanus and acute bilirubin encephalopathy occurred in outborn babies accounting for 2.7% and 6.4% of overall deaths respectively. This was statistically significant ($p < 0.05$ and 0.01 respectively). However, more Inborns died from complications of prematurity than Outborns but the difference was not statistically significant. This is shown in table 1.

Table 1: Association of Cause of Death with Place of Birth

Diagnosis	Inborns n = 41 (%) +	Outborns n = 69 (%)+	Total (n) (%)	x^2	p Value
Sepsis	16 (44.4)	20 (55.6)	36	0.25	0.62
Asphyxia (HIE)	10 (34.5%)	19 (65.5%	29	1.83	0.18
Complications of Prematurity	14 (56.0)	11 (44.0)	25	1.7	0.19
ABE	0 (0.0)	7 (100.0)	7	15.94	**0.01**
Congenital Malformation	0 (0.0)	5 (100.0)	5	0.44	0.51
Tetanus	0 (0.0)	3 (100.0)	3	3.77	0.05
Others*	1 (20.0)	4 (80.0)	5	0.13	0.72
Total	41 (37.3)	69 (62.7)	110		

ABE- Acute Bilirubin Encephalopathy, HIE - Hypoxic ischemic encephalopathy.   + Percentages of total in column. Others*: Chromosomal anomalies, Haemorrhagic disease of newborn, Meconium aspiration syndrome

Timing of mortality and cause specific neonatal mortality.

Table 2 shows the relationship between the time of death and specific diagnosis. Babies who had sepsis, asphyxia and prematurity had early neonatal deaths. For example, 85.7%, 93.1%, and 100.0% of babies who died from acute bilirubin encephalopathy, perinatal asphyxia and complications of prematurity respectively died in the early neonatal period. However, babies with diagnoses of tetanus and sepsis died in late neonatal period.

Table 2: Timing of neonatal mortality and cause specific neonatal mortality.

Primary Diagnosis	No who died during Early Neonatal Period(n)	% of n+	No who died during Late Neonatal Period (n)	% of n+	Total n	% of total deaths
Sepsis	16	44.4	20	55.6	36	32.7
Perinatal asphyxia	27	93.1	2	6.9	29	26.4
Complications of Prematurity	25	100	0	0.0	25	22.7
Acute Bilirubin Encephalopathy	6	85.7	1	14.3	7	6.4
Congenital Malformation	4	80.0	1	20.0	5	4.5
Others	4	80.0	1	20.0	5	4.5
Tetanus	1	33.3	2	66.7	3	2.7
Total	**83**		**27**		**110**	**100**

+ Pecentages of total in the Column

Relationship between baby's sex, selected maternal socio-demographic characteristics and causes of neonatal mortality.

The specific cause of neonatal mortality was compared with the sex of the baby, the place of birth and some socio-demographic characteristics of the mother like educational status of the mother, the level of income for the family and the marital status of the mother. This is depicted in Table 3. Although, all the causes of death were commoner among males than females, the difference was not statistically significant (p= 0.54). The level of income did not appear to be differentiating factor for babies who died from complications of prematurity. The cases of sepsis were higher in mothers with primary (30.8%) and secondary education (42.9%) compared to tertiary education (25.0%). The place of birth i.e., whether the baby was Outborn or Inborn was a statistically significant variable irrespective of the specific cause of death.

Table 3: Relationship between selected maternal sociodemographic characteristics and causes of neonatal mortality.

Variables	Categories	ABE	Prematurity	Sepsis	Congenital Malformation	Tetanus	Asphyxia	Others	P	Total
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)		
Babies Gender	Male	3(4.6)	17(26.2)	20(30.8)	3(4.6)	2(3.1)	16(24.6)	4(6.2)	0.54	65
	Female	4(8.9)	8(17.8)	16(35.6)	2(4.4)	1(2.2)	13(28.9)	1(2.2)		45
Maternal Educationa l Status	Nil	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(50.0)	1(50.0)	0(0.0)		2
	Primary	2(7.7)	5(19.2)	8(30.8)	2(7.7)	1(3.8)	8(30.8)	0(0.0)		26
	Secondary	3(7.1)	7(16.7)	18(42.9)	1(2.4)	1(2.4)	8(19.0)	4(9.5)	0.22	42
	Tertiary	2(5.0)	13(32.5)	10(25.0)	2(5.0)	0(0.0)	12(30.0)	1(2.5)		40
Income	Low	5(9.3)	9(16.7)	18(33.3)	3(5.6)	3(5.6)	13(24.1)	3(5.6)		54
	Medium	2(7.1)	7(25.0)	8(28.6)	2(7.1)	0(0.0)	8(28.6)	1(3.6)		28
	High	0(0.0)	9(32.1)	10(35.7)	0(0.0)	0(0.0)	8(28.6)	1(3.6)	0.35	28
Marital Status	Married	5(6.0)	19(22.9)	26(31.3)	5(6.0)	2(2.4)	22(26.5)	4(4.8)		83
	Others	2(7.4)	6(22.2)	10(37.0)	0(0.0)	1(3.7)	7(25.9)	1(3.7)	0.17	27
Inborn/ Outborn	Inborn	0(0.0)	14(34.1)	16(39.0)	0(0.0)	0(0.0)	10(24.4)	1(2.4)		41
	Outborn	7(10.4)	11(16.4)	20(29.0)	5(7.5)	3(4.5)	19(27.5)	4(6.0)	0.01	67

Multivariate analysis of selected neonatal predictors of neonatal mortality

Table 4 shows selected neonatal characteristics were subjected to binary regression analysis at 95% CI as predictors of neonatal mortality.

Prematurity (p= 0.0001), low birth weight (p = 0.0001) and age at admission (p = 0.01) were factors associated with neonatal mortality. The gender and the place of birth did not show statistically significant association. This is shown in Table 4.

Table 4: Binary logistic regression analysis of selected neonatal characteristics as predictors of neonatal mortality

Neonatal characteristics	Babies who died (n = 110)	Babies who survived (n= 1065)	Odds ratio	95% CI	p-value
Gestational age					
< 37 weeks	66	331			
≥ 37 weeks	44	734	3.33	2.22 – 4.98	**< 0.0001**
Birthweight					
< 2500g	72	382	3.39	2.24 – 5.12	**<0.0001**
≥2500g	38	683			

Gender*					
Male	65	603	1.1	0.74 – 1.64	0.6412
Female	45	459			
Age on admission (days)	101	884	2.3	1.14 – 4.63	0.010
0 – 7	9	181			
8 – 28					
Place of birth					
Inborn	41	482	0.72	0.48 – 1.08	0.1098
Outborn	69	583			

*3 patients with disorders of sexual differentiation were subtracted from the total of 1065 babies discharged alive   CI – Confidence interval

DISCUSSION

The overall neonatal mortality was 9.4% which translates to 94/1,000 and this is remarkably high. However, hospital-based reviews may show high mortality especially at the tertiary health facility because many of the patients (Outborns) were extremely ill babies who could not be managed at the peripheral hospitals. The actual number of neonatal deaths in the developing countries may not be known since most births and deaths occur in the community and are unregistered or unreported. The mortality rate observed in the present study is however lower than the mortality rates ranging from 16.9% to 19.3% in similar retrospective studies reported in older Nigerian studies from Sagamu (2006), Kano (2007) and Calabar (2008).[8-10]The relatively lower rates in the present study compared to previous studies conducted over a decade ago may probably imply that the overall neonatal mortality rate of the country has shown some improvement between about 1990 to 2017.[4]The neonatal mortality rate of 9.4% observed in our study is however higher than the value of 6.3% that was reported from

Tigray, Ethiopia.[11]Unlike the present study, the Ethiopian study was a prospective cohort study and the study locations included specialist hospitals and comprehensive newborn health centres where health services were provided free of charge. Healthcare financing in our study setting is however different as cost of care is largely through out-of-pocket expenditure and this may limit prompt care and encourage late presentations and may indirectly be responsible for the higher mortality rate compared to the study from Ethiopia. This is without prejudice to the fact that the level of income was not a statistically significant predictor of mortality from the findings of this present study.

The leading causes of death in the present study are sepsis, perinatal asphyxia, prematurity, and acute bilirubin encephalopathy in descending order. Cases of neonatal sepsis are remarkably high in developing countries including Nigeria because many deliveries are unsupervised and occur in unhygienic environment. Many neonates also die annually in developing

countries from birth asphyxia, Nigeria inclusive. There is a high prevalence of maternal and fetal risk factors that are major predispositions to perinatal asphyxia in developing countries. [1] These include non-attendance and/or high cost of antenatal care, prolonged rupture of membranes, ante partum hemorrhage, pregnancy induced hypertension, ante partum/ intrapartum anemia and fetal risk factors like meconium stained liquor, multiple births, low birth weight infants and malpresentation.[13] which are still predominant in the developing countries. Also, newborn babies especially the low birth weight and preterms have systemic maturation challenges and are physiologically immunocompromised[13] which predispose them to high morbidity and mortality from multisystemic and multiorgan affectation including septicaemia.[13]

The results from the present study also show that neonatal sepsis is overtaking perinatal asphyxia as leading contributor to neonatal mortality. This finding was also reported in Kano in 2007.[9] This could mean improved knowledge of neonatal resuscitation in health facilities especially tertiary centres, resulting in relatively lower deaths from perinatal asphyxia among the inborn babies compared to outborn babies. It is however worthy of note that in our study though the deaths were lower among the inborns, the difference was not statistically significant. A recent review of morbidity and mortality in Enugu in 2018 still showed perinatal asphyxia as the leading cause of admissions and mortality among outborn babies in that study.[14]

Also, recent global and regional reports have suggested that deaths from complications of prematurity range from 30 -39% of neonatal mortality especially in the first week of life.[15] Preterm mortality is however

disproportionately high in developing countries, and this may not be unrelated to the fact that neonatal intensive care is limited in many facilities. The exorbitant cost of exogenous surfactants, mechanical ventilation and emergence of antibiotic resistance leads to high mortality from respiratory distress syndrome, and infections for many preterm babies.[2]

Studies have also shown that three-quarters of neonatal deaths happen in the 1st week, the highest risk of death is on the 1st day of life. [3,15] The results from our study are consistent with what has been earlier reported in a study done in Enugu State[14] showing that cumulative deaths in the 1st week of life accounted for approximately 75% of the total neonatal mortality. This is also similar to results from Cameroon which reported 83.3% of deaths occurring in the first week of life reflecting the critical nature of this phase of life which, therefore, warrants close monitoring and follow-up.[2] It has been suggested that neonatal mortality could be reduced by monitoring fetal wellbeing in pregnancy through adequate antenatal care, having skilled attendance at delivery, preventing and treating neonatal infections.[14,16]

Though our study was limited by factors such as the inadequacy of a retrospective hospital-based study at evaluating the true neonatal mortality rates in the community, the dearth of routine postmortem examinations to confirm the cause of death and the unavailability of blood gas analysis for diagnosis of perinatal asphyxia, the results of the study have shown that significant neonatal characteristics that were predictors of neonatal death were the gestational age (< 37weeks), the birth weight (< 2500grams) and the early neonatal period. The GA and the birthweight have traditionally

been linked with neonatal survival,[17] and this has been corroborated by the results from this present study. Unfortunately, different interventions proven to decrease neonatal deaths are not being effectively implemented. These include adequate antenatal care and administration of steroid to mothers with premature labour. Also, there is room for improvement in training and re-training of health workers on helping babies breathe, neonatal resuscitation skills, effective utilization and monitoring of essential newborn care program, management of hypothermia, kangaroo mother care, early breastfeeding, cord care with the use of 4% chlorhexidine gel and eye care with 0.5% eryrthromycin ointment.[18-20]

CONCLUSION

Neonatal mortality rate is still unacceptably high. Neonatal sepsis, perinatal asphyxia and complications of prematurity were the leading causes of neonatal deaths seen during the study period in our hospital. Neonatal characteristics like prematurity, low birth weight and the age on admission were the significant predictors of neonatal mortality. Even though neonatal intensive care is both skill and capital intensive, it is high time tertiary health facilities in developing countries acquired such skills and equipment so they could become the final referral centres for patients especially neonates. This would improve the newborn care available in-the country with the ultimate goal being the reduction of neonatal mortality. In this way healthcare providers can give hope to families and thereby make every baby count!

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ORIGINAL ARTICLE
CORD CARE PRACTICES AND THEIR DETERMINANTS AMONG MOTHERS OF UNDER-FIVES RESIDING IN BAYELSA STATE, NIGERIA

Chika O. Duru,[1] Abisoye Oyeyemi,[2] Adedotun Adesina,[3] Charles Tobin-West,[4] Alice Nte[5]

[1]Department of Paediatrics and Child Health,
Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria

[2]Department of Community Medicine, Niger Delta University,
Wilberforce Island, Bayelsa State, Nigeria

[3]Department of Medical Services, Nigerian Law School,
Yenagoa Campus, Agudama, Yenagoa, Bayelsa state, Nigeria

[4]School of Public Health, University of Port Harcourt,
Rivers State, Nigeria

[5]Department of Paediatrics and Child Health,
University of Port Harcourt, Rivers State, Nigeria

ABSTRACT

Background
The adoption of good cord care practices is key to ensuring newborn survival. The aim of this study was to determine cord care practices and their predictors among mothers of under-fives in Bayelsa State, South-South Nigeria.

Methods
This community-based, descriptive, cross-sectional study involved 600 randomly selected mothers of under-five children residing in Bayelsa State. A semi-structured questionnaire was used in collecting data, which included mother's socioeconomic characteristics, knowledge and practice of cord care and influencing factors. Responses to questions on cord care practices were categorized as 'poor' or 'good'. Multivariate logistic regression analysis was used to identify predictors of good cord care practices. Significance level was set at p-value<0.05.

Results
The mean age of the mothers was 30.2 (± 6.8) years, 73.2% of them were married and 76.3% had at least secondary education. Only a third of the mothers (34%) adopted "good" cord care practices. Although methylated spirit, a recommended antiseptic was used in 90.5% of cases, it was combined with other substances in up to 74% of cases. Only 25.5% used chlorhexidine gel for cord care. Majority (90.0%) used a clean object to cut the cord but less than half (47.5%) cleaned their babies' cords up to 3 times daily. Predictors of good cord care practices included sourcing information from health workers (aOR–1.76; 95%

CI: 1.07-2.88), urban residence (aOR–1.77; 95% CI 1.03 - 3.04), antenatal clinic (ANC) attendance at a health facility (aOR–3.33; 95% CI: 1.28 - 8.68) and Fair: (aOR – 1.78; 95% CI: 1.12 – 2.82) or good (aOR – 7.39; 95% CI: 3.79 - 14.40) level of knowledge of cord care.

Conclusion
Programmes aimed at encouraging uptake of antenatal care in health facilities and health education of rural-dwelling women on good newborn cord care practices are strongly recommended.

KEYWORDS: Determinants, newborn, cord care, practices, under-fives, mothers, Bayelsa State.

INTRODUCTION

Newborns continue to die from preventable conditions such as neonatal infections in low- and middle- income countries like Nigeria despite improvements in under-five mortality globally.[1,2] Infections of the umbilical cord are common in the neonatal period and together with neonatal tetanus and sepsis, account for up to 36% of all-cause of neonatal mortality.[1-3] The 2019 Nigerian Verbal and Social Autopsy Survey of the deaths recorded in the 2018 Nigeria Demographic and Health Survey showed that infections (sepsis, pneumonia, meningitis, diarrhoea and neonatal tetanus) accounted for 45.2-46.3% of the all cause neonatal deaths.[4]

Omphalitis, an infection of the umbilical stump, accounts for 7-15% of causes of neonatal mortality in developing countries especially in places where home deliveries are common.[1-5] Neonatal tetanus is also an important cause of neonatal mortality as there were an estimated 34,000 deaths recorded from neonatal tetanus worldwide in 2015.[6] Neonatal tetanus commonly occurs through the seeding of umbilical stump with the causative organism *Clostridium tetani* from poor cord care practices such as unsterile cutting of the cord and application of various substances to the stump.[6] The stump may serve as an important focus of infection in the neonatal period.[1-3]

Cord care is largely related to the immediate postnatal practices adopted by the nursing mother which is often influenced by persisting cultural beliefs and practices.[1,3,7] Appropriate umbilical cord care is one of the essential newborn practices recommended by the World Health Organization (WHO) as a key strategy to improving newborn survival.[8] Different strategies have been adopted to ensure that the cord is kept healthy and free from infection till it falls off, usually before the end of the first week of life. Recommended practices include keeping the stump clean and dry in settings where deliveries are conducted in public facilities or regular cleaning with methylated spirit or application of chlorhexidine gel in settings with poor obstetric care and high neonatal mortality rates.[8-10]

Despite these recommendations, potentially harmful and unbeneficial practices abound especially in low- and middle- income countries of sub-Saharan Africa and Asia.[11-13] These include the application of substances such as cow dung, toothpaste, petroleum jelly, breast milk and ash to the cord, hot fermentation of the cord and even the use of unsterilized sharps.[11-22] These practices are not considered harmful by the users because of their perceived ability to enhance drying,

promote healing and hasten cord separation which is desirable in most traditional settings.[1,13]

Socioeconomic factors such as the places of residence and delivery, maternal education and social class of parents have been reported as predictors of these poor cord care practices by several authors.[15-23] Several studies have described poor knowledge and practices of good and appropriate cord care by mothers in Nigeria and other countries in sub- Saharan Africa; however the underlying reasons for the adoption of these cord practices have not been fully elucidated.[1,11,12,15-23] This study was conducted to determine the cord care practices and their predictors among mothers of under-fives in Bayelsa State, Nigeria

METHODOLOGY

Study design
This was a state-wide, community-based, descriptive, cross-sectional study which was carried out in Bayelsa State, Nigeria over a 2-month period (1st May to 30th June 2021).

Study area
Bayelsa State is one of the southern States, located within the Niger Delta region of Nigeria. It has an estimated population of 2,633,466 by 2021 projected from the 2006 census. Bayelsa State is made up of 8 local government areas (LGAs) with 105 wards and its capital is Yenagoa. Bayelsa State is made up of both urban and rural LGAs and most of the inhabitants are civil servants and farmers. The state has two tertiary health institutions located in Yenagoa LGA, and several primary and secondary health centres in the urban and rural areas.

Study population
The study population was made up of women aged 15 to 49 years who had been residing in Bayelsa State for at least one year before the study period, who had at least one under-five

aged child and consented to participate in the study. Mothers who were ill or mentally incompetent to respond to the questionnaire were excluded from the study.

Sample size determination
Sample size for the study was estimated using the Cochran formula.[24] Using a prevalence of 61.4% (0.614) in a report by Ndikon et al, [25] a 95% confidence interval (Z=1.96), precision level of 5% (0.05) and a design effect factor of 1.5 to correct for clustering in a community study,[26] a minimum sample size of 547 was calculated and with an anticipated 10% non-response rate, a sample size of 607 was proposed for the study.

Sampling technique
A multistage probability sampling technique was used to select the participants for the study. This involved the selection of one local government area from each of the 3 senatorial districts of Bayelsa State (Central, East and West) by simple random sampling method. Thereafter, one ward was selected from each of the selected LGAs, and then, two communities were chosen from each ward by simple random sampling method. The six communities that were finally selected for the study were Tungbo and Tungbabiri from Angalabiri ward of Sagbama LGA, Ekeki and Azikoro from Epie III ward of Yenagoa LGA and Kolo I and Kolo II from Kolo ward of Ogbia LGA.

In each community, household mapping was done to select the houses by systematic random sampling. A sampling interval was determined by the number of houses enumerated in the mapping exercise divided by the number of participants to be recruited from each community. In the selected houses, where there was only one household that met

the criteria for participation, the mother in such household was recruited for the study. However, where there was more than one household, a household was chosen for the study by simple random sampling. In cases, where a mother declined participation, the next household was chosen before resuming the sequence of house selection. This was repeated until the desired sample size was obtained.

Study instrument

A self-developed interviewer-administered semi-structured questionnaire which assessed the knowledge and practice of cord care and the socio-demographic characteristics of the participants was used for the study. It had previously been pre-tested among 30 mothers residing in a local government area which was not involved in the main study.

The knowledge of good cord care was assessed among participants using 17 questions of the study questionnaire. Using the mean scores and standard deviations, participants were categorized as having 'poor', 'fair' and 'good' levels of knowledge. Participants who scored below the mean score were classified as having poor knowledge. Those who had scores ranging between the mean score and 1 standard deviation above the mean score were deemed to have fair knowledge and those whose scores were greater than the mean score plus 1 standard deviation were considered to have good level of knowledge.

Cord care practices were assessed by 11 items on the questionnaire that explored the instrument used in cutting the newborn's cord, frequency of cleaning, cleaning agents used, cord clamp practice and hand washing practice while caring for the cord. Good cord care

practices were defined as washing hands before and after cord care, cutting the cord with a clean and sterile instrument, clamping the cord with clean thread or cord clamp, application of an antiseptic (methylated spirit or chlorhexidine gel) and not applying any other substance on the cord and cleaning the cord 3 or more times a day after every nappy change. Participants who indicated preferred actions were scored 1 point and those who indicated otherwise were scored 0. Scores were summed and participants who scored at least 8 points were categorised as having 'good' cord care practice while those with less were classified as having 'poor' cord care practice.

Data analysis

Data was analyzed with Statistical Package for Social Sciences (SPSS) software version 25. Descriptive analysis was done to determine socio-demographic characteristics of the population, knowledge and sources of information about cord care practices. Association between cord care practice and various categorical variables was determined using chi-square test of proportions For those explanatory variables that were significantly associated with good cord care practices ($p < 0.05$), the strength of association was further explored using a multivariate logistic regression analysis. Explanatory variables that remained significantly related to good cord care were considered predictors of good cord care practice. The level of significance was set at p-value<0.05.

Ethical considerations

Ethical approval for the study was obtained from the Research Ethics Committee of the University of Port Harcourt, Rivers State with reference number: PH/CEREMAD/REC/ MM74/059. Permission for the study was

obtained from the Community Heads in all the selected communities before the commencement of the study. Written informed consent was obtained from all eligible participants before their participation.

RESULTS

The mean age of the 600 mothers who completed the study was 30.2 ±6.8 years. Most of them were married or co-habiting (73.2%), christians (96.8%), with about half having a secondary education (50.3%) and up to 1 in every 5 mothers (22.8%) being unemployed (Table 1).

Table 1: Socio-demographic characteristics of 600 respondents in the study

Characteristics	Frequency n = 600	Percent (%)
Age group		
<20 years	20	3.3
20 - 29 years	283	47.2
30 - 39 years	236	39.3
>40 years	61	10.2
Mean Age (± SD) years	30.2 ± 6.8	
Marital Status		
Single	96	16.0
Married/Co-habiting	439	73.2
Separated/Widowed/Divorced	65	10.8
Religion		
Christianity	581	96.8
Others	19	3.2
Educational attainment		
No formal education	45	7.5
Primary	97	16.2
Secondary	302	50.3
OND/NCE	84	14.0
University	72	12.0
Occupation		
Senior public servant/Manager	61	10.2
Intermediate grade public servant	58	9.7
Junior school teachers/artisans	72	12.0
Petty trader/labourers/messengers	272	45.3
Unemployed/homemaker/student	137	22.8

Number of children by respondents		
1 – 2 Children)	252	42.0
3 – 4 Children	226	37.7
≥ 5 Children	122	20.3
Locality		
Rural	400	66.7
Urban	200	33.3
Local government area		
Yenagoa	200	33.3
Ogbia	200	33.3
Sagbama	200	33.3

OND/NCE Ordinary National Diploma/ National Certificate of Education

Antenatal care (ANC) was sought mostly from government-owned primary health centres, traditional birth attendant (TBA) homes and government-owned secondary health facilities by 34.8%, 34.5% and 32.3% of mothers respectively. Other places where ANC was received included government tertiary health facilities, proprietary patent medicine ("chemist") shops and private hospitals in 13.8%, 9.3% and 9.0% of the mothers. Up to 7.2% of the mothers did not receive any antenatal care.

Majority of the women (93.5%) who participated in the study were aware of various cord care practices with the leading sources of information being the respondents' mothers (62.7%), health workers (60.8%), friends and neighbours (51.0%) and grandmothers (28.3%).

The minimum, maximum and mean knowledge scores were 0, 15 and 8.6 (SD± 2.8) points. A total of 296 (49.3%) mothers had a poor knowledge of good cord care practices while 201 (33.5%) and 103 (17.2%) had fair and good knowledge of good cord care practices respectively.

Majority of the participants knew that good cord care practices involved cutting the umbilical cord with a clean instrument (94.2%), cleaning the cord with methylated spirit (94.0%) and tying the cord stump with a clean thread/cord clamp (93.0%). However, up to 95.0% of the women did not know that in caring for their babies' cord, the cord could be exposed to air to dry.

The good cord care a practices adopted by the mothers included clamping the cord with clean thread or cord clamp (93.7%), cutting the cord with a clean instrument (90.2%) and the application of methylated spirit to the cord (90.3%) (Table 2). However, methylated spirit was applied in combination with other substances in up to 74% of cases.

Table 2: Response pattern to questions investigating Cord care practices among respondents

Questions	Responses – Frequency N = 600 (100%)		
	Yes	No	No response
Cord care practices adopted by respondents Washing my hands before and after handling the cord	516 (86.0)	70 (11.7)	14 (2.3)
Cleaning/ wash the cord with water only	90 (15.0)	494 (82.3)	16 (2.7)
Application of methylated spirit	542 (90.3)	44 (7.3)	14 (2.3)
Application of 4% chlorhexidine gel	153 (25.5)	433 (72.2)	14 (2.3)
Exposing the cord to air to allow it to dry	39 (6.5)	546 (91.0)	15 (2.5)
Applying substances[a] to the cord	444 (74.0)	142 (23.7)	14 (2.3)
Applying herb[b] to cord	220 (36.7)	366 (61.0)	14 (2.3)
Cutting the cord with a clean instrument	541 (90.2)	45 (7.5)	14 (2.3)
Clamping the cord with a clean thread or cord clamp	562 (93.7)	24 (4.0)	14 (2.3)
Instrument used to cut cord of Index child			
Cut cord with new razor blade	162 (27.0)	438 (73.0)	0 (0.0)
Cut cord with knife	15 (2.5)	585 (97.5)	0 (0.0)
Cut cord with surgical blade	131 (21.8)	469 (78.2)	0 (0.0)
Cut cord with scissors	232 (38.7)	368 (61.3)	0 (0.0)
Cord cleaning frequency in the Index child			
Clean cord once a day	2 (0.3)	585 (97.6)	13 (2.1)
Clean cord twice a day	108 (18.0)	121 (79.9)	13 (2.1)
Clean cord three times a day	285 (47.5)	302 (50.4)	13 (2.1)
Clean cord four times a day	54 (9.0)	533 (88.9)	13 (2.1)
Clean cord greater than four times a day	36 (6.0)	551 (91.9)	13 (2.1)
Clean cord after every nappy change	102 (17.0)	485 (80.9)	13 (2.1)

[a]substances include salt, ash, antibiotic cream such as penicillin ointment, vaseline, toothpaste
[b]Herb used was the "Africa never die leaf" combined with Alligator pepper;

The most common substances used for cord care in combination with methylated spirit were antibiotic ointment (71.1%), vaseline (55.0%) and tooth paste (27.2%). Another practice of cord care that was found to be common was the act of pressing the cord with dry heat or hot water which was reported by 87.0% of the mothers. Only 3.7% of the mothers used methylated spirit alone to clean their babies' cords. Chlorhexidine gel was used for cord care in only 25.5% of the respondents. Majority (90.0%) used a clean object to cut the cord but less than half (47.5%) cleaned their babies' cords up to three times daily. (Table 3).

Table 3: Substances mothers used in the care of newborn babies' cord.

Substance	Frequency n= 600	Percent (%)
Substances used for cord care		
Methylated Spirit	543	90.5
Hot water press	522	87.0
Antibiotic Ointment	430	71.1
Vaseline	330	55.0
Toothpaste	163	27.2
Chlorhexidine gel	154	25.7
Breast milk	89	14.8
Ash	45	6.7
Alligator pepper	12	2.0
Salt	12	2.0
Medicated powder	10	1.7
Cow or Human Urine	7	1.2
Cow dung	6	1.0
Mud	6	1.0
Honey	6	1.0

The minimum and maximum score for cord care practices were 0 and 10 point(s) respectively with a mean practice score of 6.9 (SD± 1.6) points. Overall, a third of the women (34.0%) had good cord care practices while 66% had poor cord care practices.

Of the socio-demographic characteristics investigated in this study, mothers' level of education (χ^2=13.41; p = 0.009), mothers' occupation (χ^2=10.92; p= 0.027), local government area (χ^2=16.22; p= 0.001) and locality of residence (χ^2=10.69; p =0.001) showed significant positive associations with the use of good cord care practices (Table 4).

Table 4: Association between socio-demographic factors and good cord care practices in Bayelsa State

Variable	Total	Good Practice	Poor Practice	Chi-square	P Value
Age group					
< 20 years	20	4 (20.0)	16 (80.0)	3.52	0.318
20 – 29 years	283	105 (37.1)	178 (62.9)		
30 – 39 years	236	76 (32.2)	160 (67.8)		
≥ 40 years	61	19 (31.1)	42 (68.9)		

Marital Status					
Single	96	29 (30.2)	67 (69.8)	1.20	0.550
Married/Co-habiting	439	150 (34.2)	289 (65.8)		
Separated/Widowed/ Divorce	65	25 (38.5)	40 (61.5)		
Religion					
Christianity	581	200 (34.4)	381 (65.6)	1.47	0.226
Others	19	4 (21.5)	15 (78.5)		
Respondent's Educational Level					
No formal education	45	10 (22.2)	35 (77.8)	13.41	0.009*
Primary	97	28 (28.9)	69 (71.1)		
Secondary	302	96 (31.8)	206 (68.2)		
OND/NCE	84	40 (47.6)	44 (52.4)		
University	72	30 (41.7)	42 (58.3)		
Respondent's Occupation					
Senior public Servant and Managers	61	31 (50.8)	30 (49.2)	10.92	0.027*
Intermediate grade officers and Senior secondary Teachers	58	21 (36.2)	37 (63.8)		
Junior Teachers/Artisans	72	25 (34.7)	47 (65.8)		
Pretty Trader	272	90 (33.1)	182 (66.9)		
Unemployed/ Homemaker	137	37 (27.0)	100 (73.0)		

Local government area					
Ogbia	200	70 (35.0)	130 (65.0)	16.22	0.001*
Sagbama	200	48 (24.0)	152 (76.0)		
Yenagoa	200	86 (43.0)	114 (57.0)		
Locality					
Rural	400	118 (29.6)	282 (70.4)	10.69	0.001*
Urban	200	86 (43.0)	114 (57.0)		

OND/NCE- Ordinary National Diploma/ National Certificate of Education

As shown in Table 5, a good knowledge was associated with the use of a good cord care practice (χ^2=49.22; p=0.001). Concerning the source of knowledge of cord care practice, only mothers who obtained information about cord care practice from health workers applied good cord care practice (χ^2=19.33; p=0.001).

Table 5: Association between Level of knowledge of cord care, Sources of information about cord care, Antenatal care attendance, Place of antenatal care and delivery, birth attendants and Good Cord care practice

Variable	Total	Good Practice	Poor Practice	Chi-square	P-Value
Level of Knowledge of cord care					
Poor knowledge	296	74 (25.0)	222(75.0)	49.82	0.001*
Fair knowledge	201	65 (32.3)	136 (67.7)		
Good knowledge	103	65 (63.1)	38 (36.9)		
Source of information about Cord care					
Mother	376	123 (32.7)	253 (67.3)	0.74	0.388
Grandmother	170	51 (30.0)	119 (70.0)	1.69	0.193
Health worker	365	149 (40.8)	216 (59.2)	19.33	0.001*
Friends/Neighbours	306	103 (33.7)	203 (66.3)	0.03	0.858
Media	57	23 (40.4)	34 (59.6)	1.13	0.287
Church	29	11 (37.9)	18 (62.1)	0.21	0.647
Others	8	2 (25.0)	6 (75.0)	0.29	0.589
Antenatal Care attendance					
Had ANC in last pregnancy	557	199 (35.7)	358 (64.3)	10.33	0.001*
No ANC in last pregnancy	43	5 (11.6)	38 (88.4)		

Place of Antenatal care					
Primary health care	209	73 (34.9)	136 (65.1)	0.12	0.726
Secondary health facility	194	63 (32.5)	131 (67.5)	0.29	0.585
Tertiary health facility	83	35 (42.2)	48 (57.8)	2.86	0.162
Private hospital	54	23 (42.6)	31 (57.4)	1.95	0.091
TBA homes	207	49 (23.7)	158 (76.3)	15.02	0.001*
Chemist	56	15 (26.8)	41 (73.2)	1.43	0.231
Home	54	11 (20.4)	43 (79.6)	4.91	0.027*
Place of delivery of the last child					
Primary health care center	115	39 (33.9)	76 (66.1)	17.23	0.008*
Secondary Government hospital	134	48 (35.8)	86 (64.2)		
Tertiary health facility	74	32 (43.2)	42 (56.8)		
Private hospital	68	31 (45.6)	37 (54.4)		
TBA home	76	16 (21.1)	60 (78.9)		
Church/Chemist	32	13 (40.6)	19 (59.4)		
Home	101	25 (24.8)	76 (75.2)		
Birth Assistant at delivery[a]					
Nurse	381	144 (37.8)	237 (62.2)	6.70	0.010*
Doctor	187	80 (42.8)	107 (57.2)	9.33	0.002*
Midwife	262	93 (35.5)	169 (64.5)	0.46	0.496
Traditional birth attendant	191	45 (23.5)	146 (76.5)	13.61	0.001*

ANC = antenatal care, TBA = traditional birth attendant

Mothers who had antenatal care from health workers (35.7%) had good cord care practices compared to those who did not have ANC (11.6%) (χ^2=10.33; p=0.001). The places where mothers delivered (χ^2=17.23; p=0.008) and the birth attendants (p<0.05) also had significant positive associations with the use of good cord care practices. Significantly, more mothers delivered by doctors (42.8%) and nurses (37.8%) used good cord care practices compared to those delivered by traditional birth attendants (23.5%), reflecting that deliveries by health workers were more associated with the use of good cord care practices than the deliveries conducted by non-health workers (Table 5).

Using multivariate logistic regression analysis (table 6), obtaining information about cord care from health care workers (aOR – 1.76; p = 0.025; 95% CI :1.07 – 2.88), living in Yenagoa local government area (aOR – 1.90; p =0.023; 95% CI: 1.09 – 3.29), urban residence (aOR – 1.77; p – 0.039; 95% CI: 1.03 – 3.04), having antenatal care from health facilities (aOR – 3.33; p – 0.014; 95% CI: 1.28 – 8.68) and level of knowledge of cord care (Fair: aOR – 1.78; p – 0.015; 95% CI: 1.12 – 2.82) Good: aOR – 7.39; p- 0.001; 95% CI: 3.79 – 14.40) were identified as significant positive predictors of good cord care practice.

Table 6: Predictors of good cord care among mothers of under-five children in Bayelsa State.

Characteristics (Reference group)	Univariate Analysis		Multivariate Analysis	
	Crude OR (95%CI)	p-value	aOR (95%CI)	p-Value
Educational attainment (No Formal Education)				
Primary	1.42 (0.62 – 3.25)	0.407	1.21 (0.41 – 3.55)	0.729
Secondary	1.63 (0.78 – 3.43)	0.197	1.38 (0.59 – 3.22)	0.456
OND/NCE	3.18 (1.40 – 7.25)	0.006*	0.95 (0.48 – 1.90)	0.892
University	2.50 (1.07 – 5.82)	0.033*	1.93 (0.89 – 4.19)	0.096
Occupation (Unemployed)				
Senior public Servant and Managers	2.79 (1.49 – 5.23)	0.001*	1.91 (0.85 ‾ 4.29)	0.118
Intermediate grade officers and Senior secondary Teachers	1.53 (0.80 ‾ 2.95)	0.200	0.95 (0.42 ‾ 2.17)	0.902
Junior Teachers/Artisans	1.44 (0.78 – 2.66)	0.247	1.49 (0.71 – 3.13)	0.298
Pretty Trader	1.34 (0.85 – 2.10)	0.210	1.44 (0.85 – 2.43)	0.173
Source of information(Non- health workers)				
Health worker	2.29 (1.56 – 3.37)	0.001*	1.76 (1.07 – 2.88)	0.025*
Local Government Area (Sagbama)				
Ogbia	1.71 (1.10 – 2.64)	0.001*	1.18 (0.65 – 2.15)	0.580
Yenagoa	2.39 (1.56 – 3.67)	0.016*	1.90 (1.09 – 3.29)	0.023*
Locality (Rural)				
Urban	1.79 (1.26 – 2.56)	0.001*	1.77 (1.03 – 304)	0.039*
Levelof Knowledge (Poor)				
Fair	1.43 (0.97 – 2.13)	0.074	1.78(1.12– 2.82))	0.015*
Good	5.13 (3.18 – 8.28)	0.001*	7.39(3.79– 14.40)	0.001*
Place of ANC (PHC)				
Tertiary government health facility	1.19 (0.61 ‾ 2.35)	0.612	1.11 (0.42 ‾ 2.88)	0.839
TBA	0.55 (0.36 – 0.85)	0.007*	0.63 (0.37 – 1.09)	0.098
Church	0.79 (0.49 – 1.24)	0.298	0.82 (0.48 – 1.41)	0.483
Home	0.96 (0.41 – 2.28)	0.943	1.09 (0.43 – 2.75)	0.856

Antenatal care (No ANC)				
Had ANC	4.23 (1.64 – 10.91)	0.003*	3.33 (1.28 – 8.68)	0.014*
Place of Delivery (PHC)				
Secondary govt hospital	1.70 (0.96 – 3.01)	0.071	1.10 (0.56 – 2.19)	0.779
Tertiary govt health facility	4.86 (1.46 – 16.23)	0.010*	1.30 (0.41 ¯ 4.15)	0.660
Private hospital	2.55 (1.32 – 4.91)	0.005*	0.83 (0.37 – 1.85)	0.647
TBA home	0.81 (0.40 – 1.65)	0.564	0.82 (0.27 – 2.47)	0.726
Chemist/Church	1.09 (0.36 – 3.32)	0.885	0.48 (0.18 – 1.26)	0.138
Home delivery	0.64 (0.35 – 1.16)	0.841	0.79 (0.36 – 1.75)	0.562
Birth Assistant at Delivery (Midwife)				
Nurse	1.61 (1.12 – 2.31)	0.010*	1.10 (0.62 – 1.97)	0.740
Doctor	1.74 (1.22 – 2.49)	0.002*	1.07 (0.59 – 1.95)	0.813
TBA	0.51 (0.33 0.91)	0.001*	0.81 (0.33 – 1.96)	0.638

aOR – Adjusted Odds ratio, TBA – Traditional birth attendant, PHC – Primary health care centre, ANC – Antenatal care. govt- Government

DISCUSSION

This study showed that the practice of good cord care by mothers of under-fives in Bayelsa State was low as only a third of the mothers adopted good cord care practices; an observation that has previously been reported by other authors.[15, 16, 27] Though a majority of the women used methylated spirit, a recommended antiseptic for cord care, most of them used it in combination with other substances like herbs, toothpaste, antibiotic cream, breast milk, salt and ash as previously reported by various authors in Nigeria and sub-Saharan Africa. [11-22, 28] The popularity of the use of these traditional substances was related to the belief that while the methylated spirit would sterilise the stump, the other agents would aid in drying the stump and therefore faster separation. [19-23] In other African countries like Uganda and Zambia, substances like chicken or lizard droppings and cow dung were reported to be commonly used by mothers for cord care,[22] a practice which has been found to increase the incidence of omphalitis and neonatal tetanus. The use of chlorhexidine gel, another potent antiseptic for cord care was also low in the present study despite the fact that it is recommended by the World Health Organisation for application to the umbilical cord stump in the early neonatal period for those born at home in settings with a high neonatal mortality.[29] The low use of chlorhexidine gel by the mothers in this study suggests that there is low awareness and knowledge of its usefulness by women in Bayelsa State. This may however be related to the fact that chlorhexidine gel prolongs separation time of the umbilical cord which has been found to reduce its cultural acceptability by mothers as reported by some authors.[21,30]

Various factors have been found to influence the adoption of good cord care practices by mothers. In this study, the low maternal knowledge of good cord care practice was a major factor influencing their practice; an

observation earlier noted by Ndikom et al in Ibadan[25], Mohammed et al in Jos[30] and Ango et al in Sokoto.[31] The major source of knowledge on cord care was from the participants' mothers which is likely to have had a major impact on their practice as had been noted by other authors.[15,32] Abhulimhen-Iyoha and Ibadin[32] found that information on cord care received by mothers influenced the cord care practice adopted by them. It is therefore possible that the information that the mothers in the present study received encouraged the use of these traditional substances thus accounting for the poor cord care practised by them.

Other factors such as maternal education, occupation and locality of residence, found to be significantly associated with the adoption of good cord care practices by mothers in this study were similarly reported by Opara *et al*[15] in Yenagoa in 2012. In their facility- based study, less educated mothers and those of lower socio-economic classes were found to be more likely to use potentially harmful substances for cord care than their educated counterparts. Similarly, Abhulimhen-Iyoha and Ibadin[14] found that the adoption of good cord care practices was higher among the more educated mothers but in contrast, they also noted an association with significantly older women and those who had male babies. It is possible that maternal education enabled the mothers to have a better understanding of the importance of good cord care practices while those with better occupations and urban residence had better financial means to afford the "modern" and recommended cord care agents.

Similar to the findings by Opara *et al*,[15] mothers who had antenatal care and delivered at health facilities assisted by health workers in this study adopted good practices compared to those whose deliveries were assisted by TBAs in their homes. This finding could be due to the poor knowledge and practice of cord care practices adopted by the TBAs during the antenatal, delivery and early postnatal period which could influence the information they give to the mothers.[32--34] Similarly, Abhulimhen-Iyoha and Ibadin[32] reported a significant relationship between cord care information and the cord care practices adopted by mothers and found that TBAs usually encouraged the use of cord care practices such as application of methylated spirit in combination with balm and hot compress. Furthermore, Lamawal *et al*[33] from their study of TBAs in Yenagoa noted that most TBAs recommended the use of methylated spirit followed by the application of local herbs to aid fast cord separation. These practices were encouraged because of their perceived "ability" to aid faster cord separation.[18, 33] In contrast, Isah *et al*[34] who interviewed 300 mothers in Jos reported that there was no significant association between the maternal educational level and the cord care practices they adopted. They also noted that the presence of a health facility and antenatal care attendance did not impact on the choice of good cord care practices in contrast to the findings in this study. The reasons for these disparities are unclear.

In the present study, sourcing information about cord care from health workers, living in an urban locality, having antenatal care and fair or good level of knowledge of cord care were identified as significant predictors of good cord care practice as previously reported by Afolaranmi *et al.*[18] Obtaining health information from the health facility during health talks is a main component of most antenatal services as the health workers have been trained to give accurate health .

information and thus are able to appropriately educate women on good and appropriate cord care practices.

The low level of practice of good newborn cord care among mothers in Bayelsa State and the fact that knowledge of cord care was a significant predictor of good cord care practice found in this study has been similarly reported by other authors.[18, 25] In contrast, Ango *et al* [31] in their study reported that though most of the respondents had a good knowledge of cord care, their practice was poor. It is to be expected that knowledge should influence practice of any health-care intervention as usually people need to have information and thereafter understand the need to adopt a particular practice. Unlike other studies, socio-demographic factors like income, older maternal age, number of children and religion were not predictors of good cord-care practice.[15,21,30,35] The reasons for these disparities are unclear but may point to the strong influence of cultural practices which vary across socio-economic and educational groups. This study had some limitations. It was based on self reports, and it is therefore possible that there could have been some information and recall biases which could have affected the responses by the participants.

CONCLUSIONS
The practice of good cord care by mothers of under five children in Bayelsa State is low. There is a high preponderance of the use of harmful substances for cord care among the mothers. Factors which significantly predict the adoption of good cord care practices are cord care information sourced from health workers, urban residence, health facility antenatal care attendance and fair or good knowledge of good cord care practices.

RECOMMENDATIONS
Health education of all women in the community on good newborn cord care practices should be encouraged through health communication and promotion programmes. Good cord care practices should also form a major part of health talks by health care workers during antenatal clinics to improve its knowledge among intending mothers.

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ORIGINAL ARTICLE:
REASONS FOR DISCHARGE AGAINST MEDICAL ADVICE IN A TERTIARY HOSPITAL IN A DEVELOPING COUNTRY

Vivian A. Odigie, Oyinye Mba, Daprim S. Ogaji

School of Public Health, University of Port Harcourt, Choba, Rivers state, Nigeria.
Running title: Discharge against medical advice in a developing Country

Corresponding Author:
Name: Vivian Azibalaguayam ODIGIE
Email: vivianrobinsonpeterodigie@yahoo.com; Phone +2348032645288
Qualification: MSc; ORCID ID: https://orcid.org/0000-0001-5338-6232

Co-authors
Name: Onyinye MBA
Email: onyimba6@gmail.com; Phone: +2348038283044
Qualification: FMCPH

Name: Daprim Samuel OGAJI
Email: daprim.ogaji@uniport.edu.ng; Phone: +2348177092225
Qualification: PhD; ORCID ID: http://orcid.org/0000-0002-4257-1579

ABSTRACT
Background: Discharge Against Medical Advice (DAMA) is a global health problem in hospitals with negative effects on individuals, healthcare workers and healthcare system.

Objective: The study sought to explore the reasons why patients opted for a discharge against medical advice in a tertiary hospital in a developing country.

Methods: The study employed a mixed method approach. Quantitative retrospective data collection and qualitative semi- structured in-depth interview were used to explore the reasons why patients sought to DAMA from a Federal tertiary hospital in Nigeria. Study reviewed records of DAMA patients from 1st January 2020 to 2nd January 2021 with a checklist and conducted semi-structured, in-depth interview via telephone with them.

Results: *More of the DAMA patients were males (20%), aged between 29-38 years, unemployed and had at least secondary level of education. The mean duration of hospital stay prior to DAMA was 3.3±1.4 days. DAMA was more prevalent among patients with febrile illnesses or trauma from road traffic accident. The reasons for DAMA were due to patient, staff and hospital-related factors. Patient-related factors were leading factors underlying patient request for DAMA.*

Conclusion: *DAMA was due to patient, staff and hospital-related factors. These can inform strategies for early recognition of patients with the tendency to DAMA in order to prompt individualised support.*

INTRODUCTION

Discharge Against Medical Advice (DAMA) is a critical and well recognized worldwide phenomenon in medical practice which occurs in both in-patient and out-patient units[1]. This phenomenon has continuously posed some serious challenges to not just the individuals but also the physicians and the hospital at large, as many patients continue to leave the hospital yearly against the advice of their healthcare provider[2-4]. It is commonly viewed as a scenario where patients opt to disengage from the hospital before treatment completion and contrary to the recommended medical plan of the managing physician[2,5,6].

Despite the fact that this act is not often beneficial to the patient's health, individuals or their authorized surrogates who refuse treatment have legal and ethical backing[7]. This action may lead to deteriorating health condition, increased mortality due to negative treatment outcomes, higher readmission rate and negative financial implications[8-12].

Factors associated with DAMA can be broadly categorized into the following: environmental /hospital related factor which include the cleanliness of the environment, availability of adequate and diagnostic tools etc, medical (healthcare) staff factors which include attitudes and conduct of the healthcare provider, poor access to skilled and qualified physicians and patients' factors which may include hopelessness with regards to the disease, socioeconomic status, preference for alternative therapy, mental instability, patients' inability to afford hospital expenses, prolonged hospital stay, patients' limited medical knowledge, family issues, doubt or mistrust of doctors, patients' dissatisfaction with hospital services[13-18]. Additionally, boredom, personal and family problems, tediousness of medical environment, lack of significant or slow improvement in medical conditions and dullness have been implicated as contributing factors for DAMA[19].

The rate of occurrence or uptake of DAMA among patients in tertiary hospitals vary across nations but is higher in the developing countries[20,21]. Reported incidence of DAMA in the USA was 1.44%[14], while 0.53% was reported in a rural community hospital in Canada[21,22]. In Iran, it was 10.3%, while the estimates from Nigeria ranged from 2% to 5.7%[20]. The variations in the incidence of DAMA cut across centres, cultures and social backgrounds[8,20]. This fact is corroborated by reported rates from different states in Nigeria such as Enugu (1.8%), Benin (1.94%), Port Harcourt (6.12%) and Ife (0.96%)[8,23]. These rates are perceived to be low because of underreporting by health facilities and lack of a centralised patient tracking system in developing countries like Nigeria.

Being a middle-income country (MIC), the healthcare delivery system in Nigeria receives low budgetary allocation of about 3.5% to 7% against the 15% recommended by WHO[24]. Additionally, the country has a poorly functioning referral system leaving about 60 – 90% of patient self-referred from one health facility to where they believe they can attain higher quality and standard of healthcare[25]. These tendencies affect continuity of care and contribute to higher rates of DAMA[1]. Exploring the factors associated with DAMA in this setting will provide basis for adequate understanding of the problem with an intent to reduce the rate of occurrence to the barest minimum. This will evidently result in increased quality of care which will eventually result in patients' satisfaction and facilitate the achievement of universal health coverage. This study explored the factors associated with DAMA in a Federal tertiary hospital in the south-south zone of Nigeria.

METHODS
This study was conducted in the Federal Medical Centre, Yenagoa (FMC Yenagoa), a tertiary healthcare centre in Bayelsa State. The state is one of the 36 states of Nigeria with a projected population of 2,633, 466[26]. This southernmost state in Nigeria is bounded by both Delta State and Rivers State. The residents are mainly rural dwellers who engage in fishing on a subsistence and commercial level due to the riverine and estuarine setting of the terrain. FMC Yenagoa is a foremost healthcare centre in the state which was initially established in 1957 as a district hospital and is situated in the capital city, Yenagoa. It is a 425-bed institution with 2,216 regular staff. The hospital provides specialty care in the field of Medicine, Obstetrics & Gynecology, Intensive Care Unit (ICU), Mental Health, Physiotherapy, Dialysis, Dental and Maxillofacial Surgery, Anatomical Pathology, Chemical Pathology, Hematology and Blood Bank, Medical Microbiology, Paediatric, Orthopaedic and Ophthalmology

The study design was a facility-based retrospective study which used a mixed method approach. The study population included adults who were duly admitted into various wards in FMC Yenagoa over a 13 months period (between 1st of January 2020 to 2nd January 2021) but opted for DAMA. These patients were expected to complete the DAMA form before their exit and study population were drawn from those filled for DAMA forms within the study period.

A purposive heterogeneous maximum variation sampling technique was deployed to select participant for the qualitative interview from the list of all cases of DAMA within the study time frame who had functional phone numbers on their folders at the centre. Interviews continued until data saturation was achieved.

Information such as the socio-demographic characteristics (age, sex, marital status, religion, occupation), working diagnosis and duration of admission of the patients, unit/ward of admission, as well as their medical history (for history of substance abuse or psychiatric disorder) was collected using checklists and through health records, clinical records and nursing unit reports of all patients admitted to the different wards of the FMC, Yenagoa who subsequently decided to DAMA. Cases of DAMA were defined as patients who left the hospital against the opinion of the managing physicians and who had some form of documentation regarding this in their case files. The case notes of these patients were retrieved from the medical records department and reviewed in detail.

The qualitative data for this study was collected with a semi-structured, in-depth interview guide via telephone interview. The interview guide covered questions relating to the circumstances associated with the patients' decision to DAMA. It was based on pre-acknowledged reasons for DAMA by previous hospital patients and potential causes mentioned in the literature. The interviews were digitally recorded in addition to the notes taken by the interviewer.

Data on sociodemographic characteristics of the patients were summarized as frequency counts and percentages and presented in tables. The recorded information was transcribed into notes and coded accordingly using qualitative software for data management (NVivo 10.x64). The coding of the interview transcripts involved reading each transcript and putting like elements of text into common themes and sub-categories, which were then systematically reviewed to establish core concepts and themes. After the identification of the broad themes, all interviews were reviewed again for the presence of each theme and to further characterize the range of responses within each theme. Selected extracts from the themes were reported in a prose or narrative form, along the identified themes. Representative quotes were abstracted during the analytic process and some vivid and compelling extracts selected from each theme and quoted verbatim to bring out salient points in the participants' responses.

Ethical clearance was obtained from the Research and Ethics Committee of the University of Port Harcourt (UPH/CEREMAD /REC/MM74/102, dated 18th March 2021) and the Research Ethics Committee of FMC, Yenagoa (FMCY/REC/ECC/2021/ February/296). Verbal consents were also obtained from the respondents via the telephone.

RESULTS

Records obtained from the discharge register of the FMC, Yenagoa over the study period showed that a total of 162 patients made the decision to DAMA. However, only 53 patients met the eligibility criteria and had phone numbers on their folders. Out of the 53, a total of 30 respondents participated in the in-depth telephone interviews while 5 declined from participating in the study, 2 numbers remained switched off and 7 contact numbers were incomplete The interview was stopped when no new information was gathered.

As shown in the table 1, this study comprised of 16 males (53.3%) and 14 females (46.7%), while overall age of respondents ranged from 18 to 88 years. The mean age of the patients who decided to DAMA was 39.8 ± 19.4 years. Many of the respondents (40%) completed secondary level while 6.7% had no formal education.

Table 1: Socio-demographic composition of patients that DAMA (N = 30)

Variables	Frequency	Percentage
Age category		
18 years	2	6.7
19 – 28 years	5	16.7

29 – 38 years	10	33.3
39 – 48 years	5	16.7
49 – 58 years	5	16.7
59 – 68 years	2	6.7
69 – 78 years	0	0.0
79 – 88 years	1	3.3
Sex		
Male	16	53.3
Female	14	46.7
Level of Education		
None	2	6.7
Primary	7	23.3
Secondary	12	40.0
Tertiary	9	30.0
Religion		
Christian	22	73.3
Muslim	5	16.7
Traditional	3	10.0
Occupation		
Student	4	13.3
Farmer	3	10.0
Trader	6	20.0
Civil servant	5	16.7
Self employed	2	6.7
Unemployed	10	33.3

The records showed that patients in the Male Medical Ward (MMW), Male orthopaedic ward (MOW), and Female Medical Ward (FMW) recorded the highest incidence of DAMA at 20% each (table 2).

Table 2: Categories of patients requesting DAMA

Variables	Frequency	Percentage
Ward of Admission		
Male medical ward	6	20.0
Male orthopaedic ward	6	20.0
Female medical ward	6	20.0

Emergency ward	3	10.0
Obstetrics and gynaecology	3	10.0
Female orthopaedic ward	3	10.0
Female surgical ward	2	6.7
Male surgical ward	1	3.3
Medical Condition		
Febrile illness	5	16.67
Injury from RTA	4	13.33
Head injury/trauma	3	10.00
CVDs and Hypertension	3	10.00
Ulcer and abdominal Pains	2	6.67
Appendicitis	1	3.33
Trauma to the neck	1	3.33
Diarrhoea	1	3.33
Body Pain	1	3.33
Facial palsy	1	3.33
Inability to walk	1	3.33
Breast cancer	1	3.33
prostate cancer	1	3.33
Thrombosis	1	3.33
Haemorrhoid	1	3.33
Stab wound	1	3.33
Facial injury	1	3.33
Hypochondrial pain	1	3.33

CVD = Cardiovascular disease, **RTA** = road traffic accident

Slightly more males (53.3%) opted for DAMA than female patients (46.7%). Patients who presented to the hospital with fever had the highest rate of DAMA, 5(16.7%). This was followed by those who sustained an injury by their involvement in a road traffic accident (RTA) 4 (13.3%). Most of the factors related to DAMA were patient related (table 3).

Table 3: Thematic analysis of factors associated with DAMA

Codes	Sub-themes
Experience in the hospital.	Patient-related factor
Lack of funds.	Patient-related factor
State of health at the time.	Patient-related factor

Prolonged stay/tired of staying.	Patient-related factor
Pressure to return to a duty or activity.	Patient-related factor
Other persons other than patient involved in decision making.	Patient-related factor
Sought other alternate health care option.	Patient related factor
Inadequate diagnosis.	Patient related factor
Poor services.	Patient related factor
Poor attitude and behaviour of physician or medical staff.	Medical staff factor
No respect from physician and other medical staff.	Medical staff factor
Inadequate attention given by physician and other healthcare workers.	Medical staff factor
No communication about diagnosis	Medical staff factor
Low level of expertise by physician and other healthcare workers.	Medical staff factor
View on facility/ward of admission.	Hospital environment factor
Unconducive hospital environment.	Hospital environment factor
Ill equipped hospital.	Hospital environment factor
Lack of comfort in the hospital.	Hospital environment factor

The emergent themes from the study were coded into three groups: patients factors (lack of funds, state of health at the time, prolonged stay/tired of staying, pressure to return to a duty, other persons involved in decision making, preference for alternate health care), medical staff factor (low level of expertise by physician and other healthcare workers, poor attitude and behaviour of physician or medical staff, inadequate attention given by physician and other healthcare workers, no communication about diagnosis, inadequate diagnosis and poor service) and hospital environment factor (view on facility/ward of admission, unconducive hospital environment, ill equipped, lack of comfort in the hospital). Table 4 provides further insights into the patient-related factors associated with DAMA.

Table 4: Patient-related factors associated with patient's decision to DAMA

Sub-themes	Illustrative Responses
Experience in the hospital that led to request to be discharged against medical advice.	"There was no improvement in my condition then" **Respondent 2 (Female, 26 years).** "There was no good response to me there. When I had this problem on my hand from accident and was going through pain, the doctors there didn't want to show up……one doctor will come and say one thing and another doctor will come and say another thing before they managed to attend to me. I was not happy. …I had to just leave because I was not having that good medical attention from them" – **Respondent 7 (Male, 32 years)**

"…They refused to treat me. I reported the doctors to the secretary of FMC, there was no reasonable action. So my husband took me and the baby by force to another place" – **Respondent 8 (Female, 32 years)**

"The hospital is trying but they don't carry out tests, they start to treat you first without carrying out test, it is after you have spent much money before they will say this… …. Sometimes, I will buy things they will not use it and they didn't refund t   he money" **Respondent 11 (Female, 25 years)**

"I made the decision to leave because in that hospital people die a lot…….I think the treatment is not good enough…." **Respondent 20 (Female, 52 years)**

Connection between decision to be discharged against medical advice and lack of funds.	"I was feeling better and no money to buy the drugs….." **Respondent 4 (Male, 27 years)** "It is a medical centre, they don't charge so much so it's not about the money. It's them attending to me to my own satisfaction…." **Respondent 26 (Male, 18 years)** "No it is not about money, I went there for something and I wasn't getting it" – Respondent 23 **(Male 64 years)**
Under pressure to return to duty or activity.	"Yes, I have 5 children and nobody to take care of them apart from my husband" – **Respondent 19 (Female, 40 years)** "Not at all" – **Respondent 21 (Male, 48 years)** "No it's just that my family want to be with me at that time" **Respondent 5 (Female, 23 years)**
Decision related to prolonged hospital stay (so felt fatigued and tired staying in one place).	"I was strong and didn't see why I needed to stay ……I was tired, don't like to stay in the hospital for so long. Since I felt better, decided to go" – **Respondent 14 (Female, 65 years)** "I am okay and wanted to go home, therefor e I decided to sign against medical advice" – **Respondent 17 (Male, 88 years)**
Others involved in making decision to be discharged against medical advice.	"My family and I" – **Respondent 2 (Female, 26 years)** "I took the decision alone" – **Respondent 7 (Male, 32 years)** "Yes, my brother. My brother was angry with how they refused to attend to me" – **Respondent 18 (Male 39 years)**
Connection between decision and state of health at the time.	"Yes, I needed urgent help. I was just sitting down doing nothing…..the pain was too much" **– Respondent 25 (Female, 56 years)**

"I was in critical condition (prostate enlargement) and they were delaying" – **Respondent 30 (Male, 32 years)**

Consider diagnosis made inadequate.	"The diagnosis is not correct; I know it is asthma. If it is ulcer, I will be feeling it in my chest. My father had ulcer so I know the symptoms….." – **Respondent 10 (Female, 23 years)**

DISCUSSION

Findings from this study revealed that among the 162 duly admitted patients that made the decision to DAMA from various wards in the FMC, Yenagoa between January 2020 to January 2021, only 53 patients had complete documentation with regards to parameters like educational qualifications, religious affiliations, marital status, contact details (especially telephone contact) and reasons for taking DAMA. Similar findings have been previously reported in the study of Akinbodewa et al.[27] as well as that of Fadare et al.[5] which stated that complete documentation was found in only 54% of all patients that were DAMA. This as described by Akinbodewa et al.[27], can be because of little or no attention paid to the details in DAMA processing by the healthcare workers as they may be overtly reliant on the signature of the patients as a reason to be exonerated from legal penalty in the event of litigation.

Among adults who obtained DAMA within the period under review, more males opted for DAMA compared with their female counterparts. This is like findings in the study of Akinbodewa et al.[27] and other previous studies[4, 5, 28, 29]. Though, Paul and Gautam[30] in their study showed that there was no gender bias related to DAMA, a Pakistani study by Hasan et al.[31] demonstrated that females were slightly more likely to request for DAMA. The preponderance of DAMA among males could be linked to the social responsibility on men who according to societal expectation should care for their families, their higher risk-taking attitude in making decisions and less likelihood of compliance with the medical staff's prescriptions when compared with women[32]. Some studies indicate that the phenomenon of DAMA is common in the middle age groups from 30-60 years[4].

The lower mean age of DAMA cases in this study with respect to other previous studies[5, 33] could be because the largest age sub-group in the study was that of patients aged between 29 – 38 years.

The economic status as well as educational level of individuals also influence their decision to DAMA as patients with lower economic value and educational level were most likely to DAMA. In this study, prevalence of DAMA was found to be higher among the unemployed (33.3%) and patients with at most secondary level of education (40.0%) while the least (6.7%) occurred among those with no formal education. Contrary to these findings, Taghizadieh et al.[34] reported that DAMA is more among patients with lower educational level, while Vahdat et al.[33] stated that 55.6% of people who decided to DAMA were either illiterate or had under high school education However, the higher prevalence of DAMA among enlightened individuals could be linked to their high level of expectation, demand for communication, inclusiveness in their care, respect and courtesy as well as their high rate of dissatisfaction in comparison with low-educated people, all of which leads to

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clamour for hospital discharge[34]. Also, the financial well-being of the individuals as well as the state of health plays a vital role in deciding for DAMA as many of the unemployed individuals may have opted to this based on financial constraints and the consequences of extending their stay at the facility.

While most of these LTMCs are non-communicable and may not pose significant risk to others in the community if these patients retire home or seek local remedies, the higher likelihood to DAMA may be due to the difficulties patients with LTMCs have in this situation[35].

Specific conditions like febrile illnesses or trauma were dominant in this study. This is in contrast with to findings of Fadare et al.[5] where majority of the DAMA cases in South-West Nigeria were cardiovascular diseases (14.7%) and diabetes mellitus (13.7%). Mitra et al.[36] also reported that patients in critical conditions were more prone to DAMA, while Mohseni et al.[29], in Iran did estimate the rate of DAMA in emergency departments to be 11.8%, with one of the main reasons for this issue identified as overcrowding nature of the emergency departments. Like this study, Ogunrewo et al.[37] showed that trauma from motorbike and motor vehicle accidents accounted for over 80% of the etiology of patients who decided to DAMA in their study.

The chance of DAMA among orthopaedic male and female patients was high. This is higher than the findings in other studies of DAMA among orthopaedic patients in Ido-Ekiti (7.1%) [38], Calabar (5.9%)[39] and Makurdi (13.9%)[40]. This high prevalence of DAMA in orthopaedic patients may be due to the high cost of treating fractures at hospitals or the widespread belief among Nigerians that traditional bone setters are better than orthodox practitioner at treating fractures[38-40].

Patients in this study were probed to further understand the reason behind their decision to DAMA. It was revealed that their disappointed expectation to be involved in their care plan and desire of a greater level of engagement than what was offered were reflected as the most prominent reason prompting their decision to DAMA. They were also concerned about the lack of any significant improvement in their health condition or a sense of improved health outcome and recovery from sickness upon admission in the facility, as well as a lack of funds, the rate of death among patients on admission and pressure to return to duty. According to the discovery of Taghizadieh et al.[34], feeling of recovery and financial problems were the statistically significant factors related to patients' factors for DAMA while some patients had the feeling that continual stay in the hospital would be ineffective. Mitra et al.[36] also discovered in their study that loss of hope for improvement may provoke a next of kin to request for DAMA and proceed to a low-cost setting or home for patients whose conditions remained status quo or deteriorated even after treatment in a hospital. Furtherance to this, Mohseni et al.[29] added that the most important causes contributing to DAMA included patient's perception of feeling of wellbeing and presence of financial problems while Noohi et al.[32] in an earlier study reported that patients who already feel well have a higher tendency to request for DAMA.

Also, a Nigerian study conducted in the Southwestern region by Fadare et al.[5] showed that financial constraints, progression of the disease condition and opting out for alternative/complimentary medical care were major determinants of DAMA.

The issue of financial constraints plays a major role in cases of DAMA as hospitals that serve low-income populations will most definitely have a higher index of DAMA[19,31]. Noohi et al.[32], added that patients' financial situation and their proclivity to be present at work may have influenced their decision while family problems, the need for handling personal affairs at home, concern about the situation of children[41], also stand as major contributors.

Personal reasons adduced for DAMA in this study like widespread poverty, financial constraints, domestic problems, and lack of insurance coverage by most of our populace have been linked with increased rate of DAMA in previous report[31]. Other studies have reported that substance abuse, poor social support, psychiatric illness, and lack of health insurance are major personal determinants for DAMA[8, 15, 23]. The National Health Insurance Scheme (NHIS) still has limited coverage especially across the informal sector and scope of services covered and available for the insured. As such, most of these patients in this setting face dire financial consequences with the prevalent out-of-pocket payment system[37, 42, 43]. The poor financial risk protection remains a major barrier to universal health coverage and the delivery of quality healthcare in Nigeria as well as a major factor predisposing our patients to DAMA.

The implications of the findings of this study include the need for the local administrators to set up a system for early recognition of the patients with tendencies to DAMA, institute a more effective supervision and training of staff on the technical and interpersonal aspects of their duties as well as improve cleanliness of the hospital and its environment. Enhancing the involvement of patients in the care process will empower and give them a voice as the system emphasizes patient-focused quality improvement.

Study limitations
A major limitation of this study was the small sample size. This did not allow for reasonable inferential statistics in the quantitative aspect of the study. Comparison between variables was done in the light of simple proportions without statistical testing. The record of DAMA patients was retrieved for this study but more than half of the patients who decided to DAMA had incomplete documentation in their folders with regards to parameters like educational qualifications, religious affiliations, marital status, contact telephone, and reasons for taking DAMA. This study did not explore the implications of DAMA on the patients and further care received by patients after leaving the hospital.

CONCLUSION
Cases of DAMA were higher among males from male medical and orthopaedic wards in the hospital. Reasons for DAMA were mostly patient-related, followed by medical staff related factors. Resilient systems of care premised on universal health coverage that can provide adequate assessment, tracking and response to the needs of individual patients should be the goal of stakeholders.

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CASE REPORT
DECAPITATED SNAKE BITE ENVENOMATION:
A REPORT OF TWO CASES

Stephen A. Ayinbuomwan[1,2], **Abimbola O. Opadeyi**[1,2],
Onimisi P. Osho[3], **Ambrose O. Isah**[1,2]

[1]Department of Clinical Pharmacology and Therapeutics,
University of Benin Teaching Hospital, Benin-City.

[2]Department of Clinical Pharmacology and Therapeutics,
University of Benin, Benin-City, Nigeria.

[3]Department of Orthopaedics and Plastics,
University of Benin Teaching Hospital, Benin-City, Nigeria.

Corresponding Author
Ayinbuomwan, Stephen. A.
Department of Clinical Pharmacology and Therapeutics,
University of Benin, Benin-City, Nigeria
Email Address: stephen.ayinbuomwan@uniben.edu

Abstract

Background: Snake bite envenomation (SBE) remains a critical health challenge especially in Sub-Saharan Africa (SSA). Envenomations from decapitated snake heads are not common in our environment.

Case Presentation: We present two cases of decapitated snake bite envenomations associated with coagulopathy, compartment syndrome and ascending cellulitis.

Conclusion: There is great need to heighten the education and sensitization of the general public about the danger of a lifeless or decapitated snake.

KEYWORDS: snake bite, decapitated, puff adder, envenomation, Nigeria.

Introduction

Snake bite envenomation (SBE) remains a critical health challenge especially in Sub-Saharan Africa (SSA). The World Health Organisation (WHO) finally recognised SBE as a neglected tropical disease of high priority in June 2017 with a target of 50% death and disability reduction by 2025.[1] This development provides access to greater funding of research activities to address SBE and its potentially life-threatening situations.

Sub Saharan Africa accounts for 20% of all documented cases of SBEs worldwide.[2] The highest burden is seen in countries with less efficient health systems and sparse medical resources. The incidence of SBE is usually under reported as a result of the poor health seeking behaviour of the victims which may be influenced by their socio-economic status and cultural practices.[3] A large proportion of the victims patronize traditional healers and only present later to hospitals when there is either

failure of treatment or development of complications. Farmers, hired labourers or rural dwellers are usually at risk of snake bite especially during the wet seasons at the peak of farming activities.

In Nigeria, four families of venomous snakes are usually encountered, which include: Viperidae, Elapidae, Colubridae and Actraspididae. The carpet viper (*Echis ocellatus*), black-necked spitting cobra (*Naja nigricollis*) and puff adder (*Bitis arietans*), which belong to the previous two families are the most implicated in SBEs.[4] The puff adder is described as the most common and widespread specie, accounting for more bites and deaths when compared to other African snakes.[5] The antidote to SBEs are Anti-snake Venom (ASV), which may be univalent or polyvalent; however they are not readily available in health centres and are usually of high cost leading to inadequate treatment in most cases.[6]

Amongst farmers, there is usually a practice to decapitate a snake so as to neutralise the potential dangers posed. Envenomations from decapitated snake heads are not common in our environment, though they have been earlier documented, and may be life-threatening with attendant sequelae if not promptly addressed.[7] We present two cases of decapitated snake bite envenomations associated with coagulopathy, compartment syndrome and ascending cellulitis.

Case Presentations
Case 1
A 35-year-old male labourer while working in the farm with other colleagues, killed a snake, described as a puff adder. He was given the detached head of the snake as his share because the puff adder is regarded as a delicacy by the locals. With the aid of his cutlass on his left hand he propped up the decapitated snake by inserting the tip of his instrument through the mouth. The disembodied head then slid down the cutlass and bit his finger with minimal bleeding initially. He was taken to a traditional healer where herbal concoction was prepared with the snake head. The patient was given the mixture to drink, and also had it applied topically, in addition to the application of a tourniquet to the affected arm. He later presented to the hospital emergency room after 13 hours with profuse bleeding from the wound, blisters, bullae, extravasation of blood, and swelling of the affected limb, extending from the finger to the left shoulder, with multiple discolouration of the ring and little fingers. There was also a history of haematemesis. On examination, the patient was conscious, pale, tachycardic (pulse rate of 120 beats per minute) hypotensive (blood pressure of 90/60 mmmHg) and tachypneic (respiratory rate of 28 beats per minute). There was no neurological deficit. The bed side whole blood clotting time was greater than 20 minutes. Notable laboratory results include a packed cell volume of 33%, leucocytosis of 14,000 per mm^3, with predominant neutrophilia (89.5%), platelet count was 18000 per mm^3, partial thromboplastin time of 42 seconds (control of 38 seconds). The patient was diagnosed as a case of snakebite envenomation complicated by compartment syndrome in the ipsilateral hand with gangrenous ring and little finger. He received polyvalent antisnake venom (PASV) after reconstitution via intravenous infusion. Administration of PASV commenced 24 hours after patient's presentation due to a delay in purchasing the vials. He eventually had a total dose of 80 mls over a 72-hour period, in addition to intravenous antibiotics;

levofloxacin and metronidazole. He was also given tetanus toxoid injection, intravenous fluids, tramadol tablets, and 6 units of fresh whole blood. He could not afford fresh frozen plasma as prescribed by the Haematology team. He also had debridement of the left upper limb with fasciotomy over the dorsum of the left hand and Ray amputation done with elevation by the plastic surgery team. He was discharged after 16 days on admission.

Case 2

A 39-year-old male hired farmer presented in the hospital medical emergency with complaints of left-hand swelling and pain, 48 hours after being bitten by a decapitated head of the puff adder. He had described the snake as black in colour, about 100cm in length and 6cm thick. The snake (regarded as a delicacy by locals) was initially captured, killed and decapitated by his co-workers. The decapitated head was said to have bitten him on his left hand when he attempted to pick it up. He developed severe pain and bleeding from the wound with progressive swelling of the affected limb which later extended to the shoulder joint. His co-workers applied a tourniquet firmly to the affected limb and took him to a traditional healer, where incisions were made with concoctions applied. There was no history of bleeding from other parts of the body. On examination, the patient was conscious, but pale (PCV 29.5%) and tachycardic (pulse rate, 116 bpm, regular normal volume). Other vital signs were normal and there was no neurologic deficit. The whole blood clotting time was 110 minutes (normal: 2-8 minutes), platelet count was 62000 per mm^3 (normal: 150-450 per microliter) E/U/Cr revealed urea-96mg/dl (normal: 6-24mg/dl) and Cr 4.4mg/dl (normal: 0.74-1.35mg/dl). A diagnosis of snake bite envenomation complicated by cellulitis of the left upper limb and renal impairment was made. He was given intravenous fluids, tetanus toxoid injection, tramadol tablets and intravenous antibiotics including levofloxacin and metronidazole. The patient could not afford fresh frozen plasma or fresh whole blood, and was given only 4 vials of PASV due to financial constraints. The Plastic surgical team commenced IV crystalline penicillin, wound dressing using normal saline, sufratulle, povidone iodine and elevation of affected limb. He however discharged against medical advice the following day due to financial constraints.

Discussion

We have presented two cases of snake bite envenomations following bites from decapitated heads of the puff adder snake. The WHO estimates that there are about 5.4 million cases of snake bites every year, with 1.8 to 2.7 million cases of envenomations.[8] In addition, there are between 81, 410 and 137, 880 recorded deaths, with about three times as many amputations and other permanent disabilities annually. Most of these occur in Sub-Saharan Africa, South-East Asia and Latin America[8]. In Africa, the puff-adder (*Bitis arietans*), has been regarded as the most commonly encountered African snake and is responsible for most recorded bites and deaths in humans and domestic animals when compared to all the other African snakes put together.[5] This may be attributable to a combination of factors such as its enviromental spread, huge size, more potent venom which is produced in adequate amounts, long fangs, ability to mask its scent as well as its ability to camouflage and stay quietly when approached. Beyond Africa, *Bitis arietans* are exotic snakes and thus recorded cases of bites are usually from zoos, research establishments and licensed private persons.

Documented records of bites from decapitated puff adder as highlighted in the above two cases are not common in our clime. Reptiles are generally cold-blooded animals and unlike warm-blooded animals, have low cellular metabolism and low oxygen requirements especially to the head. Following decapitation, their low cellular metabolism helps to sustain their internal organs for longer duration when compared to the warm-blooded animals, causing them to die completely far more slowly. There have been documented activity of the snake head for as long as an hour after decapitation.[9] Thus venomous puff adder bite reflex can be retained and may be pre-programmed to bite and inject its venom in response to a stimulus.[10] Both patients presented with features of cytotoxicity and vasculopathy, which are prominent presentations of vasculotoxic snake envenomation.

Puff adder envenomation is characterized by serious local and systemic complications such as prominent tissue necrosis, coagulopathy, thrombocytopenia, spontaneous bleeding and hypotension. The increased vascular permeability of plasma proteins and red blood corpuscles especially in the splanchnic regions, contributes significantly to hypovolemic shock, circulatory collapse, and death.[11,12] A major component of the puff adder venom is thrombin-like enzymes (TLEs), which facilitates the consumption of fibrinogen with the risk of life-threatening hemorrhage. Venom-induced consumption coagulopathy (VICC) is regarded as the commonest and most important systemic presentation caused by snake envenoming. However the type, duration and severity of coagulopathy differ depending on the type of procoagulant toxin present.[13] Although fraught with limitations, the 20 minutes whole blood clotting time (20MWBCT) is still the most widely used in the diagnosis of VICC, especially in resource poor setting. More reliable and accurate routine investigations that have been recommended include: the prothrombin time (PT), international normalised ratio (INR), activated partial thromboplastin time (aPTT), and thrombin clotting time (TCT). Early antivenom administration remains the recommended antidote to snake envenomations and its complications. However, despite its efficacy and ability to bind to the multiple venom toxins, it may not be effective in reversing the clotting factor deficiencies if it is not administered early. For this reason, the administration of FFP which contains clotting factors has been advocated as an adjunct treatment for VICC. Fresh Frozen Plasma is most widely available and supplies almost all the important factors, such as fibrinogen, factor V, factor VIII, and factor X.[14,15] Both patients in the case report could not afford FFP due to its high cost, despite been recommended by the haematology team.

Renal impairment may occur following snake envenomation as seen in the second patient. Acute kidney injury (AKI) following haemorrhage could develop, hypotension, intravascular haemolysis, or rhabdomyolysis, though in a few cases it may be as a result of direct venom toxicity or the development of thrombotic microangiopathy (TMA).[16]

Despite these complications, high quality PASV still remains the standard of care and the most effective treatment in the management of snake envenomations and its sequelae, especially if administered early.[17] Most victims of snakebites present late to hospital facilities because of initial preference for traditional healers as well as time wasting procedures such as tourniquet application, incisions for application of native herbs, ice packs or electric shock which have no proven benefit.[18] The use of tourniquets or constricting bands following envenomations should be avoided since it may worsen ischemia and necrosis unless the snake

was recognized as severely neurotoxic, such as *Naja haje* and *Dendroaspis* spp. Michael et al[19] evaluated the outcome of pre-hospital care in venomous snake bite victims in Nigeria in 2011 and found a correlation between tourniquet application and other first aid measures with prolonged hospital stay and higher antivenom requirement. Polyvalent Antisnake Venom is not only expansive but also not readily available in many poor resource settings. The Federal Ministry of Health (FMOH) in Nigeria established the National Snakebite Control Programme (NSCP) in the early 1990s, in order to improve supply and expedite its local production[6] While this may have improved availability, there is still no local production of antivenom in the country. Furthermore, only a few countries have the capacity to manufacture antivenoms of adequate quality.[20]The expert contributions of the plastic surgeons and the haematologists in the management of these patients as seen above help to mitigate or minimize complications following their late presentations.

Conclusion

There is great need to ensure health education and enhance sensitization of the general public especially farmers and labourers about the danger of a lifeless or decapitated snake. The management of snake bite envenomation is still very costly and out of reach to many victims who are mostly Artisans and small-scale farmers. There is an urgent need for government to subsidize the cost of antisnake venom so as to improve early access and reduce associated sequelae

Conflicts: None declared
Consent: Consent was sought before publication of these cases.

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Figure 1: Case 2 showing oedema, and extravasation of blood of the left hand (48 hours after bite by decapitated puff adder snake)

CASE REPORT:
ACUTE KIDNEY INJURY SECONDARY TO RHABDOMYOLYSIS IN A 29 YEAR OLD NAVAL CADET OFFICER: A CASE REPORT

[1]**Victor O. Ndu,** [2]**Richard Oko-Jaja,** [1]**Terhide Ujah**

[1]Department Of Internal Medicine, Federal Medical Centre,
Yenagoa, Bayelsa State, Nigeria

[2]Department Of Internal Medicine,
University Of Portharcourt Teaching Hospital Port
Harcourt, Nigeria

Corresponding Author
Dr Victor Onyebuchi Ndu
Department Of Internal Medicine, Federal Medical Centre,
Yenagoa, Bayelsa State, Nigeria
Email: nduvictor5@gmail.com

ABSTRACT

Introduction: *Acute kidney injury(AKI) affects between 5% and 10% of general hospital admissions,: a worldwide prevalence of apprioximately 2,100 per million population. Majority of cases of AKI are community acquired. The actual incidence in Nigeria is not known. Sepsis and Nephrotoxic drugs are the major causes in our environment. However there are other rare causes that contribute to its burden. One of such is rhabdomyolysis.*

Case Report:*This is a 30 year old naval officer who was managed for acute kidney injury(AKI) secondary to rhabdomyolysis when he presented with sudden onset severe muscle pains and anuria following 15 hours of vigorous physical exercise. He had 2 sessions of haemodialysis during the course of his addmission; his condition improved within ten days and he was subsequently discharged in good clinical state.*
The objective of this case report is to highlight the need for a high index of suspicion for rhabdomyolysis and its complications including AKI in patients with traumatic or non-traumatic injury

Conclusion: *Acute kidney injury may occur in patients with rhabdomyolysis. Early recognition and prompt management is important in ensuring successful outcome.*

KEYWORD: Acute kidney injury, Rhabdomyolysis, Uraemic encephalopathy, Hyperkalemia

INTRODUCTION

Rhabdomyolysis is a serious syndrome due to a direct or indirect muscle injury. It results from the death of muscle fibers and release of their content into the blood stream. This can lead to serious complication such as include parenthesis (AKI).

AKI in rhabdomyolysis results from hypovolaemia due to influx of fluid into injured muscle, and haemorrhage. This causes renal vasoconstriction and hypoperfusion. In rare cases, rhabdomyolysis can cause death. However prompt treatment often brings good outcome

CASE REPORT

Heis a 30 years old naval officer who was apparently well until 3 days prior to presentation when he developed gradual onset of inability to move his upper and lower limbs, first noticed in the lower limbs.There was associated history of muscle weakness and severe pain in the limbs which affected ambulation and lifting of objects.

There was no associated paraesthesia or numbness. He had no history of headache, fever, blurring of vision or facial asymmetry.
There was preceding history of about 15 hours of vigorous physical training which involved repetitive squat-jumps, crawling, jogging, press-ups, rolling and climbing as part of the pre- employment Naval cadet activities over several days. There was also history of excessive perspiration in humid weather conditions with forced fluid deprivation for over 24 hours.

A day later, he noticed a reduction in urinary output to about 100mls of dark coloured urine daily, but there was no associated dysuria, nocturia, frequency or frothiness of urine. He subsequently developed bilateral leg swelling which progressed proximally to the knees but had no facial or abdominal swelling.

Within this period,he developed anorexia, nausea and vomiting. The vomiting was non-projectile and contained recently ingested food. There was no jaundice, epigastric pain,

altered sleep pattern, irrational talk, seizures or loss of conciousness. He had no cough, dyspnoea, paroxysmal nocturnal dyspnoea or orthopnoea.

He was initially treated in the Naval Clinic at the onset of illness but was later referred to our centre due to persistence of symptoms.
There had been no history of similar illness in the past and he was neither a known hypertensive nor diabetic. He was not on any long term medication and not allergic to any drug. There was no family history of hypertension, diabetes or kidney disease. He did not use alcoholic beverages or tobacco products and he denied ingestion of psychoactive substances.

General physical examination revealed an acutely ill-looking young man, not in any respiratory distress. He was mildly pale, anicteric, not cyanosed but mildly dehydrated. He had no significant peripheral lymphadenopathy but had bilateral leg oedema upto the knees. He weighed 76kg with a height of 1.8metres and body mass index (BMI) of 23.5kg/m^2.

The plse rate was 68 beats/minute, full volume and regular. He had no thickened arterial wall or locomotor brachialis. Blood pressure was 140/90mmHg. The jugular venous pressure (JVP) was not raised. Apex beat was localized at 5th left intercostal space mid-clavicular line, not heaving and no thrill. The heart sounds were 1st and 2nd with no added sounds or murmur.

His respiratory rate was 20 cycles/minute, the trachea was central, there was equal chest movement bilaterally. There were no signs of consolidation and pleural effusion.

His abdomen was flat, moved with respiration with no area of tenderness. Liver and spleen were not palpably enlarged and kidneys were not ballotable. Liver span was 10cm. He had moderate ascites demonstrable by shifting dullness.

He was conscious and alert, well oriented in time, person and place. He had no cranial nerve deficit, and his muscle bulk were normal globally with tenderness in the quadriceps and biceps group of muscles. He had normal tone globally but power was grade 4 in all the limbs. The reflexes were also normal globally. He had asterixis.

A clinical impression ofacute kidney injury secondary to Rhabdomyolysis to exclude acute glomerulonephritis was. Dip stick urinalysis showed proteinuria of 1+ (30mg/dl) and blood of 3+. Other parameters were normal. Urine microscopy showed epithelial cells of 0-1 per HPF and pus cells of 1-2 per HPF.

There were no casts nor crystals. No red blood cell seen. Urinary myoglobin(+). Urine culture yielded no growth after 48hours incubation. The haematologic and biochemical results are shown in table 1.

The kidney function test done at the Naval clinic 2 days before referral had shown creatinine of 460umol/l, urea of 28mmol/l and potassium of 6.2mmol/l.The serological test for HIV, hepatitis B and Hepatitis C were negative.

Chest x-ray showed normal study; abdominal ultrasound scan revealed right kidney of 12.30cm x 5.4cm and left kidney of 12.10cm x 6.08cm with normal echogenecity and good corticomedullary differentiation.The liver was normal in size, outline and echotexture, the intrahepatic channels were normal.
The ECG done showed tall tented T-waves in lead II and V_1 with widening QRS complexes and flattening of p-waves.

Table 1. The haematological and biochemical results of the patient at presentation.

Investigations	Results	Reference range
Haematology		
Haemoglobin(g/dl)	9.2	12-16
White blood cell(/L)	8.5×10^9	$4\text{-}11 \times 10^9$
Platelet (/L)	256×10^9	$140\text{-}400 \times 10^9$
Neutrophil(%)	76	40-75
Lymphocyte(%)	20	20-45
Eosinophil (%)	4	1-6
ESR (mm/hr)	20	5-7
Biochemistry		
Serum Urea (mmol/l)	53.7	2.4-6.0
Serum creatinine(mmol/l)	1445	60-120
Sodium (mmol/l)	135	135-145
Potassium(mmol/l)	6.5	3.5-5.0
Bicarbonate (mmol/l)	18	24-30
Serum calcium(mmol/l)	1.4	2.2-2.6

Phosphate (mmol/l)	1.7	1.1-1.7
Uric acid (mmol/l)	520	120-420
Total protein(g/l)	73	62-80
Serum albumin(g/l)	32	36-50
AST (IU/L)	42	≤35
ALT (IU/L)	38	≤45
ALP (IU/L)	89	30-120
Total bilirubin(umol/l)	6.2	5-17
Creatine Kinase (IU/L)	1286	25-195
Lactate dehydrogenase(IU/L)	920	70-250
Total cholesterol(mmol/l)	4.4	<5.2
Triglyceride (mmol/l)	1.0	0.3-1.7
HDL (mmol/l)	0.6	>1.12
LDL(mmol/l)	3.3	<2.6

At presentation, the serum creatinine had increased by 3.0 times the baseline creatinine at admission in the Naval Clinic and serum potassium was 6.2mmol/l. The patient was staged at AKI stage 3 using KDIGO staging. He was placed on strict fluid input and output monitoring.

The patient was rehydrated with intravenous nomal saline 500mls to run at 8 hours interval. He was on this for 48 hours with daily urine output ranging between 200mls and 300mls. He was later placed on daily fluid regimen of 1000ml plus previous day urine output. Hyperkalaemia was treated using 10iu of soluble insulin in 50mls of 50% dextrose over 10minutes on two different occassions; this was preceeded by initial administration of 10mls of 10% calcium gluconate intravenously over 10 minutes for cardioprotection.

He had alternate day electrolyte, urea and creatinine monitoring as shown in table 2 to determine the level of response to therapy. He subsequently had two sessions of haemodialysis for complicating uraemic encephalopathy and worsening hyperkalemia. He was placed on intravenous frusemide 40mg twice daily to relieve oedema and improve diuresis and intramuscular metoclopramide 10mg twice daily for 3 days to abate vomiting.

He was placed on dietary low salt intake (<6.0g/day) and protein of high biological value(0.8g/kg/day). He was also placed on tablet allopurinol 300mg daily for hyperuriceamia.

Following the commencement of haemodialysis, he showed a good clinical improvement, the pain subsided, the urine output improved and the serum creatinine gradually declined. He was discharged to follow-up after 14 days on admission

Table 2: Results of renal function and urine output of the patient over days on admission.

Parameter	1st day	3rd day	5th day	7th day	9th day
Na(mmol/l)	135	135	136	137	137
K^+(mmol/l)	6.5	6.5	3.2	3.4	3.6
Hco_3(mmol/l)	18	18	20	23	23
Cr (umol/l)	1445	1645	900	420	280
Urea(mmol/l)	53.7	74.0	32.6	20.5	10.0
Urine output(mls/hr)	100	300	620	2600	3500

He remained stable, the serum urea and creatinine by his first follow-up visit 2 weeks after discharge was 7.5mmol/l and 135umol/l respectively

DISCUSSION

Kidney Disease Improving Global Outcome (KDIGO) defined AKI as any of the following: Increase in serum creatinine by ≥0.3mg/dl (≥26.5umol/l) within 48hours or increase in serum creatinine by ≥1.5 times baseline which is known or presumed to have occurred within prior 7 days or urine volume <0.5ml/kg/hour for 6hours.[1,2] This patient met all the criteria. The incidence of AKI depends on the population studied and the definition use. It affects between 5% and 10% of general hospital admissions and a worldwide prevalence of approximately 2,100 per million population, the majority of which are community-acquired.[3] The incidence of AKI varies between 30-70% among clinically ill patients and about 50% of all ICU admissions where it acts as an independent risk factor for mortality of 20-60%, depending on AKI stage.[2,4]

Sepsis and nephrotoxic drugs are the major causes of AKI in our environment.[7-10]However, there are other rare causes of AKI that also contribute to the burden of AKI. One of such causes is rhabdomyolysis.

Rhabdomyolysis is a clinical condition resulting from traumatic and non-traumatic injuries. In the United State of America, 26,000 cases of rhabdomyolysis were reported in 2002 and presentation ranges from insignificant signs of muscle injury to acute kidney injury.[11] During the second world war, Bywaters and colleague reported an association between crushed muscle injuries and AKI.[12] The AKI was due to injury to the skeletal muscle with leakage of intracellular contents into plasma leading to potential life threatening complications called rhabdomyolysis and myoglobin was implicated as the main nephrotoxin.[13] A 19kDa weak oxygen carrier, myoglobin is usually bound to plasma proteins.When in excess, the ferric form is freely filtered and concentrated leading to intraluminal cast formation. Tubular degradation generates highly toxic ferryl-Mb, with direct oxidant tubular cell injury. A key feature of rhabdomyolysis is the large quantities of fluid retained in inflamed muscle, causing profound hypovolemia, in addition to toxic renal injury

A clinical triad of myalgia, weakness and dark urine characterizes rhabdomyolysis.[14]The clinical presentation of rhabdomyolysis varies

from dark urine without evidence of muscle injury to acute kidney injury. The muscle injury when present is usually self limiting, and resolves within days or weeks.[14,15] The index patient presented with myalgia, weakness, dark urine and AKI. Other presentations of rhabdomyolysis are elevated muscle enzymes, electrolyte abnormalities, compartment syndrome, and disseminated intravascular coagulopathy (DIC).[16] The patient had elevated muscle enzymes (creatine kinase and lactate dehydrogenase) and electrolyte abnormalities.

Acute kidney injury occurs in 15-33% of patients with rhabdomyolysis.[14] Patients with crushed limb injuries were reported to develop AKI in absence of appropriate intervention.[14,17] This patient was not fluid replete at the onset of illness, and this could have contributed to the development of AKI.
The AKI in rhabdomyolysis results from hypovolaemia due to influx of fluid into injured muscle, and haemorrhage. This causes renal vasoconstriction and hypoperfusion. Also injury to the muscle leads to release of protease enzymes that damage the renal tubules, and myoglobin in acidic urine aggregates with Tammshorsfall protein to obstruct the renal tubules. Also myoglobin and ferrous ion are both oxidized to methaemoglobin and ferric ion respectively, and their products damages the renal tubules. Delay in intervention leads to rapid progression of AKI. Dip stick cannot distingiush between myoglobin and haemoglobin. Classically, urine is dipstick positive for blood but with no red cells on

microscopy, Approximately 20% of patients will have a negative urinalysis. Serum creatinine: urea ratio is often high, increased albumin if volume deplete or hypoalbuminamia if capillary leak. There is increase potassium, phosphate, urate, lactate and anion gap acidosis. There is decrease calcium, often with avid calcium sequestration in injured muscle.

Appropriate rehydration with saline and occasionally alkaline solution to maintain the urinary output at 200-300ml per hour and PH above 6.5 will prevent hypovolaemia, myoglobin aggregation, oxidation and thus the renal toxicity.[18,19]

However, there should be caution in the use of alkaline infusion as it may worsen the hypocalcaemia encountered early in rhabdomyolysis. Mannitol infusion or loop diuretics has been useful in improving urinary output especially in well-hydrated oliguric patient.[18-20] Twenty-eight to thirty-five percent of patients will require haemodialysis.[21] This is indicated in the setting of persistent oliguria, hyperkalaemia and metabolic acidosis. Haemodialysis is indicated in patients with uraemia, pulmonary oedema or congestive cardiac failure. Daily haemodialysis is preferred for patients with AKI as it is better tolerated and maintains better haemodynamic state.[20,21] Our patient had hyperkalemia, warranting harmodiaytic therapy to which he responded well.

The prognosis is good if the causative insult is removed, and renal function will return to normal in the majority even in those who require an extended period of support.[14]

CONCLUSION

This is a short summerized review on AKI induced by rhabdomyolysis. Early recognition and prompt management are crucial to successful outcome. Renal renal replacement therapy may play a supportive role though not the first line of treatment for AKI induced by rhabdomyolysis.

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