

Prevalence, risk factors and short-term outcome of babies with Neonatal Jaundice in a secondary facility with free-health services in South-West, Nigeria

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ABSTRACT

Background: Neonatal Jaundice (NNJ) is a common occurrence in about 60% of term infants and 80% of preterm infants worldwide and a leading cause of hospitalization during the first week of life. Available evidence suggests that low- and middle-income countries (LMICs) bear the greatest burden of severe neonatal jaundice characterized by very high rates of morbidity, mortality and long-term sequel compared to high-income countries (HICs). **Aims:** To document the prevalence, risk factors and short-term outcome of babies with neonatal jaundice in a secondary health facility with free health services in South-West Nigeria. **Method:** Babies were recruited from both in-born and out-born arms of the Special Care Baby Unit (SCBU). It was a prospective study of all babies admitted for neonatal jaundice from January to December 2014; the babies were followed up till discharge. Patients' information including socio-demographic characteristics, risk factors, treatment modalities and outcomes were collected and entered directly into an Excel sheet. **Results:** There were a total of 1,309 admissions: 734 males and 575 females giving a M: F ratio of 1.3:1. NNJ was present in 125 (9.5%) of them. Thirty-five (28%) of the affected babies were preterm babies while 90 (72%) were term babies. Ten (8%) of them presented within the first 24 hours of life, 103 babies (82.4%) presented between 1st and 7th day of life while 12 (9.6%) presented after the 7th day of life. Neonatal sepsis, prematurity, perinatal asphyxia and prolonged rupture of membrane (PROM) were the leading causes and risk factors for NNJ in our setting. One hundred and seven (85.6%) of them had only phototherapy as treatment modality while 18 (14.4%) had exchange blood transfusion (EBT). One hundred and twenty babies (96%) were discharged alive, 5 (4%) had bilirubin encephalopathy and 2 babies (1.6%) died. **Conclusion:** Neonatal Jaundice is common in our setting with possible dire consequences. Health education of the public on its associated modifiable risk factors is desirable.

Keywords: neonatal jaundice, prevalence, risk factors, outcome

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Introduction

Neonatal jaundice (NNJ) is a leading cause of hospitalization during the first week of life worldwide¹⁻⁴ and if inappropriately



managed, significant bilirubin-induced mortality or long term sequel may result especially in the low- and middle-income countries (LMICs).^{5,6} NNJ occurs in about 60% of term infants and 80% of preterm infants.^{7,8} Jaundice is yellowish discolouration of the skin, sclera and mucous membranes resulting mainly from breakdown of red blood cells. The resultant medical, economic and social burden on the patients' families and the society at large is still a nightmare when it is complicated by acute bilirubin encephalopathy and subsequently kernicterus.^{7,9} The prevalence, aetiology, risk factors and outcomes differ in geographical distribution with worse indices in the developing world. In high income countries (HICs), fetomaternal blood incompatibility is more prominent while sepsis, asphyxia, prolonged rupture of membranes, prematurity, ingestion of local herbs and ABO incompatibility prevail in the low-income countries (LICs).⁷

Two types of jaundice have been described: conjugated and the unconjugated. The unconjugated hyperbilirubinaemia is often the more dangerous form because it stains the brain leading to kernicterus spectrum disorders. It can also be physiologic or pathologic. Physiologic jaundice usually is a diagnosis of exclusion, appearing at about the 2nd to 3rd day of life, peaks by the 5th day and gradually disappears by the 7th to 10th day in term babies while it can persist up to 14 days in the preterm babies. The baby is usually otherwise normal and serum bilirubin (SB) levels are not more than 12mg/dl in the term baby and 15mg/dl in the preterm baby.¹⁰ Pathologic jaundice on the other hand occurs in ill babies, yellowness may appear earlier or later than physiologic jaundice, SB is greater group, G6PD assay in suspected cases and coomb's tests were also documented. Babies

than 13mg/dl and disappearance may be prolonged.^{7,11}

There was no prior evaluation of the impact of NNJ in the Mother and Child Hospital Akure, which is one of the busiest public health facilities with neonatal services in the state. Consequently, this study assessed the burden of NNJ and its predisposing factors in the setting.

Subjects and Methods

The study setting: The study was carried out in the Mother and Child Hospital Akure (MCHA), a 100-bed capacity hospital comprising of 60 Obstetrics and 40 Paediatric beds of which 12 beds are in the SCBU and 10 are in the out-born unit. It is an ultra-modern public health facility that provides specialized free and effective maternal and child health services to the people of Ondo State and neighbouring states. Akure is the capital city of Ondo State, located in the South-West geo-political zone of Nigeria with a land area of 15,000 square kilometres.

Study subjects: Babies were recruited from both inborn and out-born arms of the Special Care Baby Unit (SCBU) of MCHA. Term otherwise-healthy neonates with serum bilirubin (SB) levels less than 12mg/dl between the 2nd and 10th day of life were monitored on out-patient basis and not included in this work. This was a prospective study of all babies admitted for NNJ from January to December 2014. Interviews were conducted for the babies' mothers. Participants were followed up till discharge and their relevant clinical information including socio-demographic features, risk factors, treatment modalities and outcomes were entered into an excel sheet. The results of laboratory tests such as Full blood count, SB, babies' blood group, mothers' blood were said to have neonatal sepsis (NNS) if there was risk factor for sepsis, clinical



features in addition to white cell count indices suggestive of sepsis. Babies were categorized into ABO incompatibility if the setting was present and Coomb's test was positive. The total number of deliveries and live births during the study period were determined from the hospital delivery register.

Ethical clearance: This was obtained from the Research and Ethics Committee of the MCH, Akure. Verbal consent was obtained from parents of each study subject. Each baby was followed up till discharge.

Data Analysis: The data were analyzed using the STATA statistical package. Frequencies and proportions of discrete variables were presented as tables. The Means (\pm SD) of participants' age, weight and SB were computed. Student t-test was used to assess for significant difference between two means. Multivariate logistic regression, Odds ratio (OR) and 95% confidence interval (CI) were calculated for the association between possible risk factors and presentation with jaundice. P-value <0.05 was considered statistically significant.

Results

Clinical-demographic characteristics of the participants

There were a total number of 6,521 live births in our centre in the year 2014 out of which 887 babies were admitted into the SCBU and 422

babies were referred to us from other centres, mission homes, farms and traditional birth attendants (out-born) making a total of 1,309 admissions. In all there were 734 males and 575 females giving a M: F ratio of 1.3:1. Altogether, 125 babies (9.5%) presented with jaundice; 76 (60.8%) of them were males and 49 (39.2%) were females giving a male: female ratio of 1.6:1.

Table 1 shows the demographic features of the participants. Of the jaundiced babies, 76 (60.8%) were males and 49 (39.2%) were females. Ten babies (8%) presented within the first 24 hours of life, 103 (82.4%) presented between the 1st and the 7th day of life while 12 (9.6%) presented after one week of life. The mean weights for males and females were 2.791 ± 1.425 kg and 2.397 ± 1.540 kg respectively. Majority of the babies (95.2%) were born in healthcare facilities while 4.8% of them were born in other places such as farms and homes. Table 2 shows that 35 (28%) were preterm and 90 (72%) were term babies. One hundred and seven babies (85.6%) were treated with phototherapy while 18 (14.4%) had exchange blood transfusion (EBT) in addition. One hundred and twenty (96%) of them were discharged home, 3 (2.4%) discharged against medical advice (DAMA), 5 (4%) had bilirubin encephalopathy and there was 1.6% mortality.



Table 1: Demographic Characteristics of the Participants

Characteristics	Frequency (N=125)	Percentage, %
Gender		
Male	76	60.8
Female	49	39.2
Age at presentation		
< 24 hours	10	8.0
1-7 days	103	82.4
> 7days	12	9.6
Place of delivery		
MCHA	97	77.6
Primary Health centers	22	17.6
Others	6	4.8
Order of birth		
First	51	40.8
Second	33	26.4
≥ Third	41	32.8

MCHA = Mother and Child Hospital Akure, "Others" = places other than hospitals (home, farm, church, Traditional birth attendants etc.)

Table 2: Clinical Parameters of the Participants

Clinical parameters	Frequency (N=125)	Percentage, %
Gestational age		
Preterm	35	28.0
Term	90	72.0
Mode of treatment		
Phototherapy	107	85.6
EBT	18	14.4
Outcome		
Discharged	120	96.0
DAMA	3	2.4
Died	2	1.6

MCHA = Mother and Child Hospital Akure, DAMA = Discharge Against Medical Advice, EBT = Exchange blood Transfusion.

Risk factors for NNJ

The risk factors for NNJ among subjects are shown in Table 3. Eighty-four (67.2%) of them were delivered by spontaneous vertex delivery (SVD), 33 (26.4%) by Caesarean section and 2 (1.6%) by forceps extraction. Neonatal sepsis (NNS) was present in 91 (72.8%) of the NNJ cases while ABO blood group incompatibility accounted for 8% of them. There was record of herbal concoction ingestion in 6 babies (4.8%). Fourteen (36.5%) of the babies had siblings who had



NNJ. No specific risk factor was found in 13.6% of them. There were no complications in 118 (94.4%) of them but 5 babies (4.0%) had acute bilirubin encephalopathy.

Table 3: Risk factors among participants with NNJ

Variables	Frequency (N=125)	Percentage, %
Modes of delivery		
Vaginal delivery (spontaneous)	84	67.2
Forceps extraction	2	1.6
Caesarean sections	33	26.4
Breech extraction	3	2.4
Other Risk factors		
Neonatal sepsis	91	72.8
Induction of labour	3	2.4
Congenital malaria	3	2.4
Prematurity	35	28.0
Perinatal asphyxia	25	20.0
Blood group incompatibility	10	8.0
Jaundice in siblings	14	11.2
Herbal concoction ingestion	6	4.8

SVD= *spontaneous vertex delivery*

Multivariable analysis (Table 4) shows that infants who presented within 24 hours were 22 times less likely than those who presented later to have NNJ (OR: 0.0046; 95% CI: 0.003-0.739). Also, infants with no risk factor for jaundice were 5 times less likely to have NNJ (OR: 0.215; 95%: 0.0073-0.628). There was a significant difference ($p<0.05$) in the age at presentation and serum bilirubin levels of in-born and out-born babies, with the latter having higher values (Table 5).



Table 4: Multivariate logistic regression analysis for Neonatal Jaundice by selected clinical and demographic characteristics

Variables	OR	95%CI	p-value
Place of birth			
In-born	0.207	(0.022-1.984)	0.17
Out-born	1		
Age at Admission			
< 24 hours	0.046	(0.003-0.739)	0.05
≥24 hours	1		
Place of delivery			
Health facilities	0.352	(0.016-7.579)	0.50
Others	1		
Mode of delivery			
C/S	0.687	(0.256-1.844)	0.46
Assisted vaginal delivery (forceps)	1		
Birth-weight			
Low	0.348	(0.053-2.308)	0.27
Normal	1		
Risk factors for NNJ			
Absent	0.215	(0.073-0.628)	0.01
Present	1		

C/S = Caesarean section; SVD = spontaneous vertex delivery, NNJ= Neonatal jaundice

Table 5: Comparison of age and serum bilirubin levels of inborn and out-born infants at admission (N=125)

Variables	In-born(n=97)	Out-born(n=28)	t-value	p-value
Mean age (hours)				
	85.55±84.94	127.86±92.42	-2.28	0.025
Mean Serum Bilirubin (mg/dl)				
	11.59±4.70	14.86±5.34	-2.97	0.004

Discussion

The year in review recorded a large number of deliveries due to referred cases from other centres for specialized free health services available in our centre. The prevalence of neonatal jaundice (NNJ) in the current study was 9.5%; this is quite lower than the range of

16.9% - 35.0% reported by researchers from various zones within the country.^{7,9} It is also lower than the level reported by foreign researchers among neonates with severe ABO incompatibility.¹⁵ The different prevalence observed in the foregoing studies may be



influenced by the varied risk factors and comorbidities present among the participants. Significantly, more of the babies in the current study presented after 24 hours of life especially the out-born babies. This is comparable to the report from Sagamu and Ilesha where 73% of the study subjects presented between the 3rd and 6th day of life.¹⁶ Also, the serum bilirubin level was significantly higher among the out-born babies, similar to earlier reports.^{10,17} Neonatal sepsis (NNS) was the leading risk factor for sepsis in the current study. Other identified risk factors in this study include ABO blood incompatibility, prematurity, congenital malaria and Glucose-6-phosphate dehydrogenase (G6PD) deficiency, consistent with previous studies elsewhere in Nigeria: Yenegoa South-South,⁷ Abakaliki South-East,⁹ Ile-Ife, Ilesha and Sagamu South-West^{16,17} as well as Zaria in North-Central Nigeria.¹⁰

Moreover, several studies have demonstrated exposure to icterogenic agents or oxidant stressors such as insecticides, menthol-based creams, naphthalene-camphor products, sulfonamides or sulfa-containing drugs and herbal concoctions as important contributors to the incidence of NNJ especially in G6PD-deficient babies.^{1,5,7,18} Likewise, herbal concoction was a predisposing factor in this study. No particular risk was identified in 13.6% of the affected participants.

Prematurity is a major risk factor for NNJ in the current study, reflecting the systemic immaturity of preterm newborns. They are particularly prone to NNJ due to their inefficient bilirubin conjugating system, higher rate of haemolysis, increased entero-hepatic circulation and decreased caloric intake^{9,19}.

Furthermore, preterm babies with perinatal asphyxia and those whose mothers had

PROM are further predisposed to sepsis, with increasing likelihood of NNJ.

In the current study, 4% of the affected infants already had bilirubin encephalopathy at admission. Late presentation to health facilities is common in our setting with resultant complications and avoidable EBTs, comparable to earlier reports in Nigeria.^{10,16} This highlights the poor health-seeking behaviour rampant in the country. Although, financial constraint can lead to a primary delay in seeking health care, this is alleviated in our free health-care facility. There is a need for public enlightenment of the causes and consequences of neonatal encephalopathy.

The EBT rate found in this study is comparable to the 17% rate in Ebonyi State University Teaching Hospital (EBSUTH) Abakaliki²⁰ but higher than the 5.8% in Ile-Ife Nigeria.²⁰ Also, it is lower than what is obtainable in HICs countries of North America and Europe where EBT is now rarely done because of the availability of powerful and efficient phototherapy units,²¹⁻²³ and interventions like the use of supplementary fiberoptic phototherapy blankets, prophylaxis with metallo-porphyrins and casein-containing infant formulae.^{22,25,26} Nonetheless, the EBT rate in this study is lower than in Federal Medical Centre (FMC) Abakaliki South-Eastern Nigeria (20.8%).⁹

One hundred and twenty babies (96%) were discharged home alive and well in the current study in contrast to the 59.1% discharged in the bi-centre study in Ilesha and Sagamu, south-west Nigeria.¹⁷ Three babies (2.4%) left against medical advice (DAMA) in the current study to seek alternative cure, this is comparable to the findings in the bi-centre study. The latter study however reported a high mortality rate of 36.5%.¹⁷ Again, the mortality in the current study was lower than



5.5% reported by Emokpae *et al* in a referral paediatric hospital in Lagos.¹²

In conclusion, NNJ is common in our setting with possible dire consequences. Health education of the public including mothers, families and health care providers on its associated modifiable risk factors and complications is desirable.

Conflict of interest: The authors declare that they have no conflict of interest.

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