

Neonatal Jaundice; Evaluating Knowledge and Practice Among Mothers Attending Immunisation Clinics of Secondary Health Care Facilities of Sokoto Metropolis

Asma'u Adamu, Khadijat Omeneke Isezuo

Department of Paediatrics, Usmanu Danfodiyo University Teaching Hospital, Sokoto

*Correspondence: Dr Asma'u Adamu Department of Paediatrics Usmanu Danfodiyo University Teaching Hospital, PMB 2370, Sokoto, Nigeria. Tel: +2348033809987 E-mail: nanadamu@gmail.com

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ABSTRACT

Background: Neonatal Jaundice (NNJ) is a common cause of paediatric emergency in Nigeria and effects in neonates are often irreversible. This study aims to evaluate the knowledge, practices and associated factors of mothers attending immunisation clinics of secondary health facilities in Sokoto metropolis on neonatal jaundice. **Methods:** The study was a descriptive and cross sectional, carried out among 335 mothers that brought their children to the immunisation clinics of Sokoto metropolis. Data was obtained using a pre-tested questionnaire. The secondary health facilities were selected by simple random sampling technique using balloting, proportionate allocation was done to allocate study subjects to the selected secondary health facilities. Data analysed using SPSS version 21. **Result:** The mean age of the mothers was 30.1 ± 7.6 years. Most of the respondents 286(85.4%) have heard of NNJ. Almost half 151(45.1%) of the respondents do not know any cause of NNJ, 107(31.9%) knew infection. Majority 147(43.4%) of the respondents knew not any of the preventive measures of NNJ. Only about a quarter 83(24.8%) of respondents had appropriate practice regarding NNJ treatment, while about a third 102(30.4%) of the respondents would appropriately take a baby immediately to the hospital. The mothers' knowledge of NNJ is significantly associated with the mothers age, place of residence and social class ($p < 0.05$) respectively. **Conclusion:** The mothers had inadequate knowledge about the causes, complication and treatment of NNJ and also had misconceptions on NNJ. There is need for a review of new-born health policies and the designing programs at the state level to address neonatal jaundice with focus on education, prevention, early detection and prompt and proper management.

Key words: Neonatal jaundice, mothers, knowledge, practice, Sokoto

INTRODUCTION

Neonatal Jaundice affects at least 60% of full-term and 80% of preterm neonates, suggesting that about 84–112 million of the 140 million babies born yearly worldwide.^[1] It also

contribute to global neonatal morbidity and mortality.^[2] About one in ten new-born babies are likely to develop clinically significant hyperbilirubinemia requiring close monitoring and

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treatment.^[3] The global burden of neonatal jaundice reported that the African region has the highest incidence of severe neonatal jaundice per 1000 live births (667.8 to 738.5), followed by the Southeast Asian (251.3 to 473.2) and American and European regions (4.4 and 3.7) respectively.^[4] The precise total serum bilirubin threshold of clinically significant jaundice is variable and influenced by postnatal age, race, comorbid prematurity, sepsis, and haemolytic disorders.^[3] The bilirubin level in neonates is much higher than in adults because the life span of the erythrocytes is relatively short and the capacity for bilirubin elimination is lower than in adults.^[4] The incidence, aetiological and contributory factors to neonatal jaundice in Nigeria vary according to ethnic and geographical differences.^[5] Unlike in the developed countries where foeto-maternal blood group incompatibilities are the main causes of severe neonatal jaundice, it is mostly prematurity, G6PD deficiency, infective causes, as well as effects of negative traditional and social practices such as consumption of herbal medications in pregnancy, application of dusting powder on baby, use of camphor balls to store baby's clothes that mainly constitute the aetiology in the developing countries.^[6,7] Neonatal Jaundice (NNJ) is a common cause of paediatric emergency in Nigeria.^[8,9] The effects of NNJ are often irreversible^[10] and can lead to acute bilirubin encephalopathy or kernicterus with a significant risk of neonatal mortality,^[11] bilirubin encephalopathy causes lethargy, poor feeding, high pitched cry, and long-term neurologic damage such as cerebral palsy, sensory neural hearing loss, gross developmental delays,^[11] hypertonia, seizures, and mental retardation.^[10] Severe NNJ also increases the economic and social burden on the patient's families and societies.^[4]

Unlike most neonatal disorders, much of NNJ cannot be prevented, therefore, the goal of any intervention is to prevent its progression to potentially fatal acute bilirubin encephalopathy and kernicterus, even in hospitals with the best facilities, bilirubin encephalopathy and the associated adverse consequences are irreversible

beyond certain levels of severity.^[12]

Previous studies have revealed worrisome varying degrees of ignorance and deficiency in the knowledge of risk factors, complications, treatment and attitude of care givers regarding neonatal jaundice in different areas of the world.^[13,14,15] In Nigeria, studies conducted on NNJ amongst women attending immunisation clinics in Port Harcourt^[6] reported a high awareness and recognition of symptoms among the mothers, but however, there was poor knowledge of causes and danger signs. Misconceptions by mothers on the causes of NNJ were reported by different studies^[6,9,13] and included drinking of cold water, eating of groundnuts, eating of yellow-coloured foods during pregnancy. These show gaps in knowledge concerning NNJ that need to be addressed, considering the common occurrence of NNJ and the high morbidity it poses if not recognised early enough to be properly managed, it is therefore important to evaluate the knowledge, practices and factors associated with the knowledge and practice of mothers attending immunisation clinics of selected Secondary health facilities in Sokoto metropolis on neonatal jaundice, in order to put in place strategies that can enhance early detection and presentation to the hospitals and prevention of sequelae associated with Neonatal jaundice.

METHODOLOGY

This study was descriptive cross-sectional carried out between 1st September-30th November 2021, among women of reproductive age (15–49 years) that brought their children to the immunisation clinics of secondary health facilities of Sokoto metropolis.

The calculated minimum sample size for this study was determined using Fisher's formula for sample size estimation for descriptive studies.^[17] The statistical assumptions were a type 1 error rate of 5%, 68.9% knowledge of the condition^[9] and a precision of 5%. The calculated minimum sample size was 335 women.

The study was carried out in secondary health facilities of Sokoto metropolis that were selected by simple random sampling technique using balloting option, 3 out of the 6 secondary health facilities in the metropolis (Specialist Hospital and Maryam Abacha Women and Children Hospital and Women and Children Welfare Clinic) were selected. Proportionate allocation was done to allocate study subjects to the selected secondary health facilities based on average weekly attendance of the mothers at immunisation clinics of the health facilities. All the mothers that presented at the immunisation clinics in the selected secondary health facilities during the period of the study were enrolled until the allocated sample was obtained.

Data was collected using a structured pre-tested interviewer administered questionnaire. The instrument was developed after a careful review of literature on the subject. The instrument enquired about the socio-demographic characteristics like age, socio-economic class of both parents using Oyedeji's classification,^[18] and also if the mothers had ever heard of NNJ, the sources of information, knowledge of causes, complications, danger signs and actions that they will take if their children developed NNJ, what they will do to prevent jaundice and how to treat the condition. The questionnaire was pre-tested in a different secondary health facility which is not among the secondary health facilities selected for the study. Socio-economic index scores was awarded to the occupations and educational attainments of each parent or caregiver using the Oyedeji's socio-economic-classification scheme.^[18] The mean of four scores (two for the father and two for the mother) approximated to the nearest whole number was the social class assigned to the child.^[18] Socio-economic- classes I and II are the upper socio-economic class, class III is the middle class, while socio-economic- classes IV and V form the lower socio-economic class.^[18] Data was collected by the principal investigator and six trained research assistants (registrars) of the department of paediatrics, Usmanu Dan Fodiyo University

Teaching Hospital, Sokoto.

Data analysis was done using SPSS version 22. A total of twenty-two questions were used to assess the knowledge of NNJ. From these, 20 were sub-questions from four parent questions that require multiple responses while two questions required selection of one best option. Any correct response was scored '1' while wrong and 'I don't know' responses were scored '0'. Total scores were computed by summing item responses. Scores on the total knowledge scale had a possible range of 0 to 22. Respondents' knowledge score was converted into percentages and then graded into good and poor knowledge. Those with total knowledge proportion of $\geq 70\%$ were categorized into good knowledge while respondents with total knowledge proportion of $\leq 69\%$ were categorized into poor knowledge. The treatment practice was assessed from responses to seven self-reported actions about the treatment of NNJ to be taken by the respondents and was categorized as appropriate where only one correct treatment practice was identified or inappropriate where an incorrect treatment practice was identified singly or in combination with a correct practice.

Ethical consideration

Ethical approval for this study was obtained from Sokoto State Ministry of Health Ethical Committee (SMH/1580/V.IV). Permission to carry out the study was sought from the respective heads of the Secondary health facilities. In addition, written informed consent was also obtained from the study participants. The study participants were assured of strict confidentiality of their responses and were also informed that their participation is voluntary.

RESULTS

Three hundred and thirty-five of the respondents were recruited for the study. The ages of the respondents ranged between 15 and 49 years, with a mean of 30.1 ± 7.6 years. Majority 286(85.4%) of the respondents had heard about NNJ. One hundred and four (36.4%) of the mothers heard NNJ from family members, 82(28.7%) from health workers,

55(19.3%) from neighbours. while 41(14.3%) from the radio (Table 1).

Table 1: -Awareness and source of information on NNJ among respondents

Awareness of NNJ	Frequency	Percentage
Yes	286	85.4
No	49	14.6
Source of Information on NNJ		
Family members	104	36.4
Health workers	82	28.7
Neighbours	55	19.3
Radio	41	14.3
Television	4	1.4

More than half of respondents (51.3%) correctly identified jaundice as a yellowish discolouration of the eyes and or skin. About one -hundred and seven (31.9%) and 73(21.8%) of the respondents knew infection and blood group incompatibility respectively as causes of NNJ, while 26(7.8%) of the respondents mentioned putting Naphthalene balls in baby's clothing. Other causes of jaundice included drinking of cold water and eating of groundnuts by the mother during pregnancy as well as mosquito biting the baby and giving new-born traditional concoction were mentioned as causes of NNJ by 23(6.9%) of the respondents, largest proportion 151(45.1) of the respondents do not know any of the causes of NNJ (Table 2). Over half of the respondents 179(53.4%) mentioned the eyes as the first place in the body where jaundice is first noticed, 61(18.2%) mentioned the face, while 67(20.0) do not know the first place in the body where jaundice is first noticed (Table 2). Refusal of feeds 102(30.4%) and fever 98(29.3%) were the most frequently identified danger signs of NNJ mentioned by the respondents. Similarly, the most correctly identified complications of NNJ by the respondents were physical handicap 69(20.6%), brain damage 64(19.1%), and death 49(14.6%), majority 96(28.7) of the respondents incorrectly mentioned that NNJ has no effect. Almost a third of the respondents 98(29.3%) and only 22(6.6%) knew that regular attendance at antenatal care

clinics and avoidance of herbal medications are methods of preventing NNJ among babies respectively. Overall, only 16.7% of respondents had good knowledge regarding NNJ. (Table 2).

Table 2: Knowledge of neonatal jaundice (NNJ) among respondents

Variable	Frequency (n = 335)	Percentage
Definition		
Yellowness of the skin and or eyes	172	51.3
Redness of the eyes	34	10.2
Infection of the skin	58	17.3
Don't know	71	21.2
Causes (Multiple responses allowed)		
Infection	107	31.9
Blood group incompatibility	73	21.8
Putting naphthalene balls in baby's clothing	26	7.8
Prematurity	41	12.2
Don't know	151	45.1
Others		
23	6.9	
Part of the body where Jaundice is first notice		
Eyes	179	53.4
Face	61	18.2
All over the skin of the body	28	8.4
Don't know	67	20.0
Danger signs (Multiple responses allowed)		
Fever	98	29.3
Refusal to feed	102	30.4
High-pitched cry	23	6.9
Convulsion	46	13.7
Don't know	52	15.5
Preventive measures (Multiple responses allowed)		
Attending ANC	98	29.3
Prompt treatment of infection	31	9.3
Avoid the use of herbal concoction for babies	22	6.6
Avoid the use of Naphthalene balls on babies clothing	20	5.9
Avoid drinking cold water during pregnancy	17	5.1
Don't know	147	43.4
Complications (Multiple responses allowed)		
No effect	96	28.7
Death	49	14.6
Physical handicap	69	20.6
Deafness	33	9.9
Brain damage	64	19.1
Seizures	26	7.8
Delayed development	23	6.9
Don't know	72	21.5
Knowledge grade		
Good	56	16.7
Poor	279	83.3

*Others include: drinking cold water during pregnancy, eating groundnuts during pregnancy and mosquitoes biting the new born

About a third 102(30.4%) of respondents reported that if their neonates developed jaundice, their initial likely action would be to take the baby to the hospital, while 93(27.8) of the mothers mentioned exposing the baby to sunlight, 52(15.5%) reported that they would treat with herbs. Overall, about a quarter (24.8%) of respondents had appropriate practice regarding NNJ treatment. (Table 3).

Table 3: Respondents' Treatment Practices Regarding Neonatal Jaundice

Variable	Frequency (n = 335)	Percentage
Treatment practices		
Hospital treatment	102	30.4
Exposure to sunlight	93	27.8
Herbal medication	52	15.5
Do nothing	69	20.6
Apply henna to the limbs	17	5.1
Glucose containing water	16	4.8
Giving oral antibiotics	13	3.9
Treatment practice category		
Appropriate	83	24.8
Inappropriate	252	75.2

There was a statistically significant association in this study between age and knowledge grade of the respondents on NNJ, 21.8% of respondents in the 15–24-year age range had good knowledge about NNJ when compared to 33.3% of those who were 45 years and older ($\chi^2 = 11.277$, $P = 0.010$). (Table 4).

Table 4: Sociodemographic Factors Associated with the Knowledge of NNJ Among Respondents

Variable	Knowledge grade		Test statistic p value
	Good n (%)	Poor n (%)	
Age (years)			
15 – 24	12 (21.8)	75 (78.2)	$\chi^2 = 11.277$ p = 0.010
25 – 34	37 (29.6)	125 (70.4)	
35 – 44	4 (12.7)	65 (87.3)	
≥ 45	3 (33.3)	12 (66.7)	
Tribe			
Hausa	38 (24.8)	176 (75.2)	$\chi^2 = 0.494$ $p = 0.920$
Yoruba	9 (29.3)	49 (70.7)	
Igbo	4 (21.4)	24 (78.6)	
Others	5 (14.3)	30 (85.7)	
Religion			
Islam	45 (24.6)	236 (75.4)	$\chi^2 = 0.617$ $p = 0.432$
Christianity	11 (22.2)	43 (77.8)	
Place of residence			
Urban	46 (28.6)	185 (71.4)	$\chi^2 = 5.463$ p = 0.019
Rural	10 (14.4)	94 (85.6)	
Marital status			
Married	38 (23.7)	257 (76.3)	$\chi^2 = 26.101$ $p = 3.242$
Unmarried	18 (27.5)	22 (72.5)	
Social class			
Upper class	21 (35.5)	55 (64.5)	$\chi^2 = 11.983$ p = 0.003
Middle class	26 (23.2)	125 (76.8)	
Lower class	9 (17.6)	99 (82.4)	

Respondents who live in urban setting had a much higher percentage good knowledge of NNJ than those that live in rural setting (28.6% versus 14.4)

and the difference was statistically significant ($\chi^2 = 5.463$, $P = 0.019$). Social class also showed a statistically significant association with the maternal knowledge of NNJ ($\chi^2 = 11.983$, $P = 0.003$). (Table 4).

Ethnicity was significantly associated with the NNJ treatment practice among respondents. More than one-third of the respondents (37.9%) from the Yoruba ethnic group and about a quarter (23.8%) of those from the Hausa ethnic group had appropriate practice about treatment of NNJ ($\chi^2 = 8.235$, $P = 0.004$). Respondents that were married had a higher proportion (26.8%) of those with good practice compared to those that were not married (10%), and the difference was statistically significant ($\chi^2 = 5.321$, $P = 0.021$). Age, social class, and level of knowledge have no significant association with the practice of NNJ treatment ($P > 0.05$ each). (Table 5).

Table 5: Sociodemographic Factors Associated with the Treatment Practice of NNJ Among Respondents

Variable	Practice grade		Test statistic p value
	Appropriate n (%)	Inappropriate n (%)	
Age (years)			
15 – 24	17 (19.5)	70 (80.5)	$\chi^2 = 3.485$ $p = 0.322$
25 – 34	46 (28.4)	116 (71.6)	
35 – 44	18 (25.4)	53 (74.6)	
≥ 45	2 (13.3)	13 (66.7)	
Tribe			
Hausa	51 (23.8)	163 (76.2)	$\chi^2 = 8.235$ p = 0.041
Yoruba	22 (37.9)	36 (62.1)	
Igbo	4 (14.3)	24 (85.7)	
Others	6 (17.1)	29 (82.9)	
Religion			
Islam	71 (25.3)	210 (74.7)	$\chi^2 = 0.225$ $p = 0.635$
Christianity	12 (22.2)	42 (77.8)	
Place of residence			
Urban	58 (25.1)	173 (74.9)	$\chi^2 = 0.044$ $p = 0.834$
Rural	25 (24.0)	79 (76.0)	
Marital status			
Married	79 (26.8)	216 (73.2)	$\chi^2 = 5.321$ p = 0.021
Unmarried	4 (10.0)	36 (90.0)	
Social class			
Upper class	17 (22.4)	59 (77.6)	$\chi^2 = 1.066$ $p = 0.587$
Middle class	36 (23.8)	115 (76.2)	
Lower class	20 (18.5)	88 (81.5)	
Knowledge grade			
Good	11 (19.6)	45 (80.4)	$\chi^2 = 0.951$ $p = 0.330$
Poor	72 (25.8)	207 (74.2)	

DISCUSSION

The awareness of NNJ among the respondents in this study is high (85.4%), this finding is similar to reports from other studies in Nigeria,^[4,6,9,19] and outside Nigeria.^[20] The high level of awareness of NNJ among respondents in this study, is however different from the findings of previous studies conducted in Gwoza, Borno State, Nigeria.^[21] The high level of awareness among the respondents might be explained by majority of the respondents having secondary level education and above.

Most of the respondents (36.4%) received information on NNJ from family members, this finding is compatible with the finding of a previous study done in Baghdad.^[22] but in variance with the findings of other studies that reported health workers were the commonest source of information to mothers on NNJ.^[6,19,22,23] The finding of family members being the commonest source of information to mothers in this study is worrisome as mothers can be misinformed, misguided on the management of NNJ and educative health messages may not be passed to the mothers. Despite the high level of awareness among the mothers, knowledge was low on many aspects of the condition, the respondents had inadequate knowledge of the causes of NNJ, the only well known cause of NNJ in this study was infection (31.9%), this is higher when compared to 12% reported among mothers in Nepal,^[24] this may be because highest proportion of the studied respondents had secondary level of education and above, while knowledge of other common causes were remarkably low, 21.8% of the respondents in this study knew blood incompatibility as a cause of NNJ, this is similar to the findings of previous studies that reported 10%,^[24] while in a study done in Lagos, Nigeria, in their study 9.9% of the mothers correctly mentioned blood group incompatibility, infection in baby and prematurity as causes of NNJ.^[25] Only 7.8% of the respondents in this study correctly mentioned putting Naphthalene balls in baby's clothing as a cause of NNJ, this corroborates the finding of previous report,⁹ despite the fact that this icterogenic

substance is widely used by mothers to preserve babies clothing. It is worthy of note that largest proportion (45.1) of the respondents in this study do not know any cause of NNJ, this is also in agreement with the findings of previous studies.^[4,6,9,24,25] Few (12.2%) of the mothers in this study mentioned prematurity as a cause of NNJ, this is in consonance with the finding of a study in Northern Nigeria that reported 4.7%, whereas another study by Salia et al reported 53% among the studied respondents.^[26]

There were also some misconceptions about the causes of jaundice by some of the respondents in this current study, 6.9% of the mothers erroneously believed that drinking of cold water and eating of groundnuts by the mother during pregnancy as well as mosquito biting the baby were causes of NNJ. This corroborates the findings of previous studies^[9,24,25,26] where respondents had different misconceptions about food and NNJ. These misconceptions about NNJ highlight the need to conduct health education and promotion programs to enhance women's knowledge on the causes of NNJ and correct erroneous misconceptions about NNJ, there should be a major focus on formulating appropriate preventive and interventional strategies in the state. Inadequate knowledge of causes of NNJ among mothers' places them at a very high risk of ignoring possibly avoidable predisposing factors.

Refusal of feeds was the commonest danger sign of NNJ mentioned by the mothers in this study, this corroborates the findings of other studies.^[9,27] The first site of jaundice detection as stated by the mothers in this study was the eyes followed by the face in 53.4% and 18.2% of the respondents respectively, 20.0% do not know the site of jaundice detection, result of another study showed 36.2% for skin, 32.1% for eyes, 29.5% for face,^[22] while Goodman et al reported 87.0% for the eyes, 4.8% all over the body, 5.6% do not know any site.^[9] The knowledge of complication of NNJ was also low among the respondents, as majority of the

respondents said NNJ has no effect, this is in agreement with the findings from previous study that reported 38.5%,^[9] in the current study only 19.1% of the respondents knew that NNJ can cause brain damage, while another study reported that 34.0% of the mothers knew that NNJ can cause brain damage,^[9] 42.2% of mothers in a report from Baghdad knew that NNJ can cause brain damage,^[22] while in another study carried out in Ghana reported 41.1% of the mothers knew that NNJ can cause brain damage.^[26]

This current study revealed that most of the respondents demonstrated poor knowledge of preventive measures as almost half (43.4%) of the mothers do not know any preventive measure for NNJ, while 29.3% of the mothers mentioned attending ANC can prevent NNJ. This study, like prior reports^[9,10,11] demonstrates the need for focused educational campaign among the most vulnerable groups of mothers. Inadequate knowledge about the causes, treatment, complications, and danger signs of NNJ coupled with various misconceptions about the condition may adversely affect the actions of the mothers in the prevention of some of the causes of NNJ such as neonatal sepsis as may occur from poor umbilical cord hygiene and haemolysis in G6PD-deficient babies from the use of icterogenic substances.^[27]

About one third (30.4%) of the mothers mentioned hospital treatment for the treatment of NNJ this is in agreement with the finding of an earlier studies.^[19,27] But however, despite the high literacy level of the mothers in this study, almost one third (27.8) of the respondents mentioned exposing baby under sunlight as a modality of treatment of NNJ, similarly Goodman et al^[9] reported 57.8% of mothers in their study mentioned putting their babies under sunlight as a treatment of NNJ, while another study in Nepal reported 87% of the mothers mentioned exposing the neonate under sunlight as a treatment of NNJ.^[28] But in variance with the finding of a study carried out in Ghana in which majority (45.5%) of the mothers mentioned

phototherapy as a modality of treatment of NNJ.^[26] Few of the respondents in this study incorrectly mentioned the use of antibiotic, herbal concoction, applying henna to the limbs of jaundiced neonate and giving glucose containing water for treatment of NNJ, other reports also reported use of antibiotics by the mothers to treat NNJ.^[6,11] A study carried out in rural northern Nigeria reported that mothers apply henna to the limbs of their babies to treat NNJ^[29] Henna a traditional cosmetic agent is an important chemical ingredient that contain 2 hydroxy-1,4-naphthoquinone, whose structure and redox potential is similar to 1,4 -naphthoquinone, a metabolite of naphthalene, and potent oxidant of G6PD deficient cells.^[30]

The overall knowledge score of the respondents on the condition in this study was poor (16.7%), this compares with the findings of previous reports.^[9,19] There was a significant association between age and knowledge grade the of respondents on NNJ, in this study, older mothers had good knowledge of NNJ than young mothers, this is in keeping with the finding of a study by Ogunlesi et al^[10] but in contrast to the finding of a studies done in Nigeria,^[9,19] Ghana^[26] and Ethiopia.^[31] Social class also showed a significant association with the maternal knowledge of NNJ, this is similar to the findings of other reports that reported association with maternal high level of education^[10,27] in variance with the findings of a studies from Nigeria²³ and Ghana.^[26] Significant association was found between place of residence and knowledge of NNJ, respondents who live in urban setting had a much higher percentage good knowledge of NNJ than those that live in rural setting, our finding is consistent with the finding of another study.^[31] This might be due to the fact that urban residents have more information and access to mass media and might have good healthcare-seeking behaviour for the encountered problems of the newborn.^[31]

In this study, majority (75.2) of the respondents overall practice regarding NNJ treatment was inappropriate. A similar study in rural community in northern Nigeria reported 62%,^[19] but in contrast to the findings of this study, high attitude scores

was reported in a study conducted at the University of Benin Teaching Hospital, Nigeria, where 91% of mothers had good attitude toward the management of NNJ.^[27] Age have no significant association with the practice of NNJ treatment in this study, this corroborate the finding of previous reports,^[26,27] but is inconsistent with the finding of other studies,^[9,26] social class showed no significant association with the practice of NNJ treatment in this study.^[9,27]

CONCLUSION

This study shows that the mothers attending secondary Health facilities in Sokoto metropolis had poor knowledge about the causes, complication and treatment of NNJ.

Our findings highlight the need for a review of new-born health policies and the designing programs at the state level to address neonatal jaundice with focus on prevention, early detection and prompt and proper management. Health education on NNJ by health care providers via electronic media, at ANC and at places of worship, communal and social gatherings to enlighten mothers.

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Declaration of competing interest

The authors have no competing interests to declare.

REFERENCES

1. UNICEF. The state of the world's children 2017. Children in a digital world. December, 2017. https://www.unicef.org/publications/index_101992.html
2. National Institute for Health and Care Excellence. Neonatal jaundice: cg98 Clinical guideline 2010. <https://www.nice.org.uk/guidance/>
3. Guesh GA, Teklay GG, Hailemariam N, Mengistu WG, Merhawi B, Kidane Z, Teklewoini MZ, Abrha H, Woldu AA, Surafel AH, Areaya GH, Brhane Hagos B, Ebud AD, Fsaha GT, Fissaha Tekulu W. Determinants of Neonatal Jaundice among Neonates Admitted to Neonatal Intensive Care Unit in Public General Hospitals of Central Zone, Tigray, Northern Ethiopia, 2019: a Case-Control Study. *Bio Med Res Internl* 2020(3):1-8.
4. Onyearugha CN, Onyire BN, Ugboma AA. Neonatal jaundice: Prevalence and associated factors as seen in Federal Medical Centre Abakaliki, Southeast Nigeria. *J Clinical Med Res* 2011;(3)3:40-45
5. Olusanya BO, Akande AA, Emokpae A, Olowe SA. Infants with severe neonatal jaundice in Lagos, Nigeria. *Trop Med Int Health* 2009;14(3): 301-310.
6. Eneh AU, Ugwu RO. Perception of neonatal jaundice among women attending children outpatient and immunization clinics in Port Harcourt. *Niger J Clin. Pract* 2009;12(2):187-191.
7. Udo JJ, Anah MU, Ochigbo SO, Etuk IS, Ekanem AD. Neonatal morbidity and mortality in Calabar, Nigeria: A hospital-based study. *Niger J Clin Pract* 2008; 11:285-9
8. Ekwochi U, Ndu IK, Nwokoye IC, Ezenwosu OU, Amadi OF, Osuorah D. Pattern of morbidity and mortality of newborns admitted into the sick and special care baby unit of Enugu State University Teaching Hospital, Enugu state. *Niger J Clin Pract* 2014;17:346-51
9. Goodman OO, Kehinde OA, Odugbemi BA, Femi-Adebayo TT, Odusanya OO. Neonatal Jaundice: Knowledge, Attitude and practices of mothers in Mosan-Okunola community, Lagos, Nigeria. *Niger Postgrad Med J* 2015; 22:158-63

10. Ogunlesi TA, Abdul AR. Maternal knowledge and care-seeking behaviors for newborn jaundice in Sagamu, Southwest Nigeria. *Niger J Clin Pract* 2015; 18:33-40.
11. Ezeaka CV, Ugwu RO, Mukhtar-Yola M, Ekure EN, Olusanya BO. Pattern and predictors of maternal care-seeking practices for severe neonatal jaundice in Nigeria: A multi-centre survey. *BMC Health Serv Res* 2014; 14:192.
12. Bhutani VK, Zipursky A, Blencowe H et al. Neonatal hyperbilirubinemia and Rhesus disease of the newborn: incidence and impairment estimates for 2010 at regional and global levels. *Pediatric Res* 2013;74:86-100
13. Olusanya BO, Teeple S, Kassebaum NJ. The contribution of neonatal jaundice to global child mortality: findings from the GBD 2016 study. *Pediatrics* 2018;141
14. Slusher TM, Zamora TG, Appiah D Et al. Burden of severe neonatal jaundice: a systematic review and meta-analysis. *BMJ Paed Open* 2017;1:1:e000105.
15. Su Yuen N, Chong S. What do mothers know about Neonatal Jaundice? Knowledge attitude and practice of mothers in Malaysia. *Med J Malaysia* 2014; 69:6:2:252-6
16. UNFPA. Healthcare services in: UNFPA Assisted States of Nigeria, Sokoto state report. Abuja Nigeria: UNFPA Nigeria Country Office A; 2010.
17. Araoye M.O. Sample size determination In: *Research Methodology with Statistics for health and social sciences*. Nathadex Publishers Saw-mill Ilorin 2003; 115-21.
18. Oyedeji GA. Socio-economic and Cultural Background of Hospitalized Children in Ilesha. *Nig J Paed* 1985;12 (4):111-7.
19. Igboanusi CJ, Nmadu AG, Joshua IA, Onoja-Alexander MO, Olatubosun B. Knowledge and attitude on neonatal jaundice among women of reproductive age group in rural community in northern Nigeria. *Sahel Med J* 2020; 23:184-90
20. Bon NY, Gan CV, Gan YW. Malaysian Mothers Knowledge and practice on care of neonatal jaundice. *Med J Malaysia* 2011; 66(3):239-49.
21. Bello M, Yahaya SJ, Amodu M, Sa'ad YM, Simon P. Neonatal jaundice: Knowledge, attitude and practice of mothers in Gwoza local government area of Borno state, North-Eastern Nigeria. *Int J Health Sci* 2014; 1:7-12.
22. Maral FT. Knowledge regarding neonatal jaundice among a sample of mothers attending some Primary Health Care centers in Baghdad, Diyala J Med, 2019;17:(1):77-84
23. Ogunfowora OB, Adefuye PO, Fetuga MB. What do expectant mothers know about neonatal jaundice? *Int Electron J Health Educ* 2006; 9:134-40.
24. Sharmila S, Marcia AP, Sarita S, Sabita M. Knowledge about neonatal jaundice among Nepalese mothers, *Sri Lanka Journal of Child Health*, 2019; 48(3): 215-220
25. Ezeaka VC, Ekure EN, Fajolu IB, Ezenwa BN, Akintan PE. Mothers' perception of neonatal jaundice in Lagos, Nigeria: An urgent need for greater awareness, *SAJCH* 2016;10(4):227-30
26. Salia SM, Afaya A, Wuni A, Ayanore MA, Salia E, Kporvi DD, et al. Knowledge, attitudes and practices regarding neonatal jaundice among caregivers in a tertiary health facility in Ghana. *PLoS ONE*. (2021) 16(6): e0251846.
27. be BA, Ofili AN, Isara AR, Onakewhor JU. Neonatal jaundice and its management: Knowledge, attitude, and practice among expectant mothers attending antenatal clinic at University of Benin Teaching Hospital, Benin City, Nigeria. *Niger J Clin Pract* 2013;16:188-94.
28. Shretha S, Maharjan S, Shretha S, Petrini MA. Knowledge about Neonatal Jaundice among Nepalese Mothers. *JBPKIHS* 2019;2(1):34-42
29. Iliyasu Z, Farouk Z, Lawal A, Bello MM. Nass NS, Aliyu MH. Care-seeking behavior for neonatal jaundice in rural northern Nigeria, *Public Health Pract* 2020;11(1)
30. Abdelmoneim K, Israa G, Sara G, Wisal

- Ahmed. Life-threatening haemolysis induced by henna in a Sudanese child with glucose-6-phosphate dehydrogenase deficiency. *EMHJ*2017;23(1)
31. Demis A, Getie A, Wondmieneh A, et al. Knowledge on neonatal jaundice and its associated factors among mothers in northern Ethiopia: a facility-based cross-sectional study. *BMJ Open* 2021;11:e044390.