

# Maternal knowledge and care-seeking behaviors for newborn jaundice in Sagamu, Southwest Nigeria

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## Abstract

**Background:** Delay in the presentation of infants with jaundice at the hospital is a reason for the persistence of the severe forms of jaundice.

**Objective:** The aim was to determine the influence of maternal knowledge on newborn jaundice on their care-seeking practices.

**Methods:** In a cross-sectional survey, mothers whose infants presented with significant hyperbilirubinemia were assessed for knowledge about jaundice in relation to their care seeking behaviors.

**Results:** Out of 98 mothers, 57.1% had good knowledge on newborn jaundice. Most of the mothers with good knowledge had tertiary education ( $P = 0.004$ ), had good care-seeking behavior for newborn jaundice ( $P = 0.027$ ) and their infants did not develop kernicterus ( $P = 0.0001$ ). Mothers with tertiary education also had significantly better performances on the knowledge and care-seeking evaluation scales.

**Conclusion:** Maternal knowledge on newborn jaundice, as well as tertiary maternal education, influenced appropriate care-seeking behavior for infants with jaundice and reduced the risk of complications.

**Key words:** Health care-seeking behavior, maternal knowledge, neonatal jaundice, neonatal mortality

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## Introduction

Jaundice has been a leading cause of newborn admission and deaths in Nigeria<sup>[1,2]</sup> and other parts of the developing countries.<sup>[3,4]</sup> A review of Nigerian literatures showed that the high contribution of jaundice to neonatal mortalities over the last four decades have not changed remarkably.<sup>[1,5-7]</sup> Therefore, it is essential to continue searching into the plausible reasons why this pattern has persisted.

Jaundice is regarded as a serious illness in the newborn, because severe forms of the illness may be associated with mortality or some irreversible sequelae such as severe motor deficits and hearing impairments.<sup>[8,9]</sup> The burden of severe newborn jaundice also includes the challenges of care, particularly exchange blood transfusion which is frequently employed as the most rapid way of reducing serum bilirubin levels in the developing world.<sup>[10]</sup> Most affected infants

are only brought to medical attention as dire emergencies when jaundice is severe and complicated. This explains the high rate of kernicterus complicating newborn jaundice in Nigeria, even in the 21<sup>st</sup> century.<sup>[11]</sup> Indeed, studies have suggested that newborn jaundice remains a major clinical challenge in Nigeria mainly for reasons of late presentation of affected infants for optimal effective care in the hospital in addition to lack of effective interventions such as phototherapy.<sup>[12]</sup> It is instructive to know why that is so. Some socio-cultural and socio-economic factors have been identified to strongly influence the timing of care-seeking for newborn jaundice.<sup>[13]</sup> It is plausible that the pattern of care-seeking behavior of mothers may also be influenced by the scope of information at their disposal with respect to the illness. Attention is focused on mothers compared to fathers

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as studies have shown that maternal factors influence child care practices more than paternal factors.<sup>[14]</sup>

Therefore, the present study was designed to determine the influence of maternal knowledge about newborn jaundice on their care-seeking practices for their newborn infants with jaundice.

## Methods

This cross-sectional survey was carried out at the Special Care Baby Unit of the Olabisi Onabanjo University Teaching Hospital (OOUTH), Sagamu between February 2012 and February 2013. The unit provides specialized neonatal services for high-risk infants delivered in the maternity unit of the hospital as well as those referred from other health facilities within and outside Sagamu, Ogun State and other neighboring Lagos and Ondo States. Institutional ethical approval was obtained and informed verbal consent was also obtained from primary care givers of the infants.

The study population was mother-infant pairs admitted into the OOUTH on account of newborn jaundice. The inclusion criteria included: (1) Referred status of infants (parental personal referral or official referral from another health facility) and (2) significant hyperbilirubinemia requiring intervention in the form of phototherapy and/or exchange transfusion.

Consecutively presenting mothers who gave informed consent were enrolled into the study. The interviews were conducted at the point of admission, while infant data were completed at the point of discharge.

The research tool was a semi-structured questionnaire, which was adapted from a previous study,<sup>[13]</sup> in addition to the qualitative data obtained from a previous focus group discussion. The discussion focused on causes, care and problems associated with newborn jaundice (unpublished data). The discussants were six mothers who were randomly selected from the population attending the hospital's immunization clinic. The nine-item knowledge evaluation scale addressed the known causes of newborn jaundice, the items to be avoided in the prevention of jaundice, the possible effects (risk of death and brain damage among survivors) of jaundice on the newborn infant, the forms of effective care for jaundiced infants (phototherapy and exchange transfusions were described as "placing jaundiced infants under white lights" and "exchange of the jaundiced infant's blood with another blood" respectively), the danger signs in newborn jaundice and the complications of jaundice in later life. The questionnaire was designed to be researcher-administrable. The interview was conducted in English or Yoruba language and where relevant, medical terminologies were interpreted or described in the local dialect.

Care-seeking behavior were classified as appropriate or inappropriate based on delay >47 h (interval between observation of jaundice in the infant and presentation at the hospital for care) as well as the use of home remedies (drugs, herbal mixtures, and exposure to unfiltered sunlight) for jaundiced infants as earlier documented.<sup>[13]</sup>

Assessment of knowledge was done in two steps: The first step assessed the response to each of the items on the knowledge evaluation scale separately while, in the second step, all the nine items were assessed together. In the first step which dwelt on individual assessment of knowledge items, some items had lists of possible answers attached to them while other items did not have a list of possible answers attached to them as they were basically didactic types of questions. For the former, a correct response earned one mark while a wrong response or nonresponse was scored zero. The total scores were summed and converted to the percentage of total. Good knowledge level was defined by a score of at least 50% while scores lower than 50% were regarded as poor knowledge level. For the latter, the correct response was equated to good knowledge while a wrong response or a nonresponse was equated to poor knowledge.

In the second step which dwelt on the overall assessment of knowledge, at least one correct response per item was required to earn one mark while every item with nothing but wrong response or nonresponse earned no mark. The scores for all the items were summed and converted to a percentage of nine which is the total obtainable score.

The mothers were classified into dichotomous groups based on variables such as age (<25 years and >25 years), parity (1 and > 1), education (tertiary and secondary/primary) and places of delivery (orthodox and unorthodox). Orthodox places of delivery included teaching hospitals, specialist hospitals, general hospitals, primary health centers, and private clinics) while traditional birth homes, spiritual birth homes and residential homes were classified as unorthodox places of birth. The care-seeking behavior of the mothers was related to their knowledge levels. Further, the maternal educational qualification was also related to the knowledge level.

The data were processed with SPSS version 17.0 software (SPSS Inc, Chicago) using descriptive and inferential statistics. Mean values and standard deviations were compared using the Student's *t*-test, while proportions were compared using the Z-test and the Chi-squared test ( $\chi^2$ ). Statistical significance was defined by *P* less than 0.05.

## Results

### General description

A total of 100 mother-infant pairs was enrolled into the survey, but two were excluded due to incomplete data. The

**Table 1: Assessment of the knowledge of Mother's about newborn jaundice**

Items	Appropriate responses	Inappropriate responses	Test of significance
Knowledge of the causes of jaundice	53 (54.1)	45 (45.9)	Z= 1.12; P=0.264
Knowledge of drugs and substances to be avoided in jaundice	29 (29.6)	69 (70.4)	Z=5.60; P<0.001
Knowledge of effective care for jaundice	15 (15.3)	83 (84.7)	Z=9.52; P<0.001
Knowledge of risk of death in jaundice	54 (55.1)	44 (44.9)	Z= 1.40; P=0.162
Knowledge of risk of brain damage in jaundice	63 (64.3)	35 (35.7)	Z=3.85; P<0.001
Knowledge of the danger in delay in seeking care	66 (67.3)	32 (32.7)	Z=4.72; P<0.001
Knowledge on the unreliability of visual detection of jaundice	38 (38.8)	60 (61.2)	Z=3.01; P=0.003
Recognition of at least one danger sign in an infant with jaundice	74 (75.5)	24 (24.5)	Z=7.01; P<0.001
Recognition of at least one complication of newborn jaundice later in childhood	79 (80.6)	19 (19.4)	Z=8.44; P<0.001

**Table 2: Comparison of the socio-clinical profile of the Mother's with good or poor knowledge about newborn jaundice**

Parameters	Good knowledge (n=56)	Poor knowledge (n=42)	Test of significance
Age (years)			
<25	3 (5.4)	8 (19.0)	$\chi^2=4.51$ ; P=0.034
>25	53 (94.6)	34 (81.0)	
Parity			
1	22 (39.3)	15 (35.7)	$\chi^2=0.13$ ; P=0.718
>1	34 (60.7)	27 (64.3)	
Education			
Tertiary	31 (55.4)	11 (26.2)	$\chi^2=8.33$ ; P=0.004
Secondary and primary	25 (44.6)	31 (73.8)	
Place of delivery			
Orthodox*	44 (78.6)	30 (71.4)	$\chi^2=0.66$ ; P=0.416
Nonorthodox**	12 (21.4)	12 (28.6)	
Previous child with jaundice			
Yes	13 (23.2)	0 (0.0)	$\chi^2=11.82$ ; P=0.001
No	43 (76.8)	42 (100.0)	

\*Orthodox=Teaching, specialist, general, and private hospitals; \*\*Traditional birth homes, spiritual birth homes

remaining 98 mothers were aged 19–39 years with a mean of 29.5 ± 4.6 years; half of them were aged <30 years. The parity ranged from 1 to 8 with a mean of 2.3 ± 1.6. Thirty-seven (37.8%) mothers were primiparous, while

**Table 3: Relationship between Mother's knowledge about newborn jaundice and the pattern of care-seeking and severity of newborn jaundice**

Parameters	Good knowledge (n=56)	Poor knowledge (n=42)	Test of significance
Care-seeking			
Appropriate*	27 (48.2)	11 (26.2)	$\chi^2=4.90$ ; P=0.027
Inappropriate	29 (51.8)	31 (73.8)	
Delay**			
Yes	23 (41.1)	17 (40.5)	$\chi^2=0.004$ ; P=0.953
No	33 (58.9)	25 (59.5)	
Place of initial care			
Home care	19 (33.9)	25 (59.5)	$\chi^2=6.35$ ; P=0.002
Outside/hospital care	37 (66.1)	17 (40.5)	
Presence of kernicterus			
Yes	10 (17.9)	23 (54.8)	$\chi^2=14.63$ ; P=0.0001
No	46 (82.1)	19 (45.2)	

\*Absence of delay in presentation at the hospital and nonuse of home remedies, \*\*Interval between observation of jaundice and presentation at the hospital >47 h

61 (62.2%) were multiparous. All the mothers had formal education. The educational qualifications of the mothers were as follows: Primary (16; 16.3%), secondary (40; 40.8%), and tertiary (42; 42.9%).

The infants were aged between 12 h and 336 h at the point of admission with a mean age of 119 ± 65 h. The infants were distributed by age as follows: <48 h (14, 14.3%), 48–96 h (64; 65.3%), 97–168 h (18; 18.4%), and >168 h (2; 2%). These infants were delivered at private hospitals (53; 54.1%), traditional birth homes (18; 18.4%), teaching and specialist hospitals (17; 17.3%), general hospitals (4; 4.1%), spiritual birth homes (4; 4.1%), and at residential homes (2; 2.0%).

**Patterns of care-seeking behavior and severity of jaundice**

The first person to notice jaundice in the infants was the parent in 47 (47.9%) cases (father in 4 and mother in 43 cases), healthcare workers in 32 (32.7%) cases and the relations in 19 (19.4%) cases. The initial care for the jaundiced infants was given in a hospital in 32 (32.7%) cases, at home in 30 (30.6%) cases, in other places outside the home (primary health centers [3], private clinics [7], and drug stores [12]) in 22 (22.4%) cases, while 14 (14.3%) received no initial care. Of the 30 infants who received the initial care at home, 20 (66.7%) had various drugs (antibiotics), 18 (60.0%) had herbal mixtures, 6 (20.0%) were exposed to sunlight, while 2 (6.6%) had breast milk instillation to the eyes. Fifty-eight (59.2%) babies presented at the study site within 47 h of the appearance of jaundice while 40 (40.8%) presented after 47 h. The infants of mothers with appropriate care-seeking behavior were significantly younger on admission

**Table 4: Relationship between knowledge of Mother's about newborn jaundice and appropriateness of health care-seeking behavior for newborn jaundice**

Parameters	Appropriate behavior (n=38)	Inappropriate behavior (n=60)	Test of significance
Knowledge of the causes of jaundice			
Good	23 (60.5)	30 (50.0)	$\chi^2=1.041$ ; $P=0.308$
Poor	15 (39.5)	30 (50.0)	
Knowledge of drugs and substances to be avoided in jaundice			
Good	15 (39.5)	14 (23.3)	$\chi^2=2.90$ ; $P=0.088$
Poor	23 (60.5)	46 (76.7)	
Knowledge of effective care for jaundice			
Good	11 (28.9)	4 (6.7)	$\chi^2=7.12$ ; $P=0.008$ (Yate's)
Poor	27 (71.1)	56 (93.3)	
Knowledge of risk of death in jaundice			
Good	29 (76.3)	25 (41.7)	$\chi^2=11.29$ ; $P=0.001$
Poor	9 (23.7)	35 (58.3)	
Knowledge of risk of brain damage in jaundice			
Good	33 (66.8)	30 (50.0)	$\chi^2=13.75$ ; $P=0.0002$
Poor	5 (13.2)	30 (50.0)	
Knowledge of the danger in delay in seeking care			
Good	32 (84.2)	34 (56.7)	$\chi^2=8.02$ ; $P=0.005$
Poor	6 (15.8)	26 (43.3)	
Knowledge on the unreliability of visual detection of jaundice			
Good	8 (21.1)	30 (50.0)	$\chi^2=8.21$ ; $P=0.004$
Poor	30 (78.9)	30 (50.0)	
Recognition of at least one danger sign in an infant with jaundice			
Good	34 (89.5)	40 (66.7)	$\chi^2=5.78$ ; $P=0.016$ (Yate's)
Poor	4 (10.5)	20 (33.3)	
Recognition of at least one complication of newborn jaundice in childhood			
Good	35 (92.1)	44 (73.3)	$\chi^2=5.24$ ; $P=0.022$
Poor	3 (7.9)	16 (26.7)	

compared with the infants of mothers with inappropriate care-seeking behavior ( $81.5 \pm 39.6$  h vs.  $143.6 \pm 67.2$  h;  $t = 5.15$ ,  $P < 0.0001$ ). Thirty-three (33.7%) infants were hospitalized with features of kernicterus such as poor suck, abnormal cry, rowing and pedaling limb movements, opisthotonus, exaggerated Moro reflex and seizures, while 67 (68.4%) required exchange blood transfusion.

**Table 5: Relationship between maternal educational qualifications and pattern of health care-seeking behavior and severity of newborn jaundice**

Parameters	Tertiary (n=42)	Elementary/secondary (n=56)	Test of significance
Age (years)			
<25	1 (2.4)	10 (17.9)	$\chi^2=4.32$ ; $P=0.0038$ (Yate's correction)
>25	41 (97.6)	46 (82.1)	
First person to notice jaundice in the infant			
Parents	15 (35.7)	32 (57.1)	$\chi^2=4.41$ ; $P=0.036$
Others*	27 (64.3)	24 (42.9)	
Place of initial care			
Home care	14 (33.3)	30 (53.6)	$\chi^2=3.97$ ; $P=0.046$
Hospital/outside care	28 (66.7)	26 (46.4)	
Herb/drug use			
Yes	8 (19.0)	16 (28.6)	$\chi^2=1.17$ ; $P=0.278$
No	34 (81.0)	40 (71.4)	
Previous child with newborn jaundice			
Yes	9 (21.4)	4 (7.1)	$\chi^2=4.25$ ; $P=0.039$
No	33 (78.6)	52 (92.9)	
Presence of kernicterus			
Yes	3 (7.1)	30 (53.6)	$\chi^2=21.13$ ; $P<0.0001$ (Yate's correction)
No	39 (92.9)	26 (46.4)	

Others=Relations and health workers

### Maternal knowledge about newborn jaundice

Fifty-three (54.1%) mothers identified at least one cause of newborn jaundice. In all, the causes of newborn jaundice identified included blood group incompatibilities (35; 35.7%), blood infections (29; 29.6%), and prematurity (25; 25.5%). Home remedies (in the form of herbal mixtures, exposure to sunlight, glucose drinks and antibiotics) were identified as the only known effective care for jaundice by 49 (50%) mothers, while the other half knew about phototherapy and exchange blood transfusion. Of the latter group, 34 (69.4%) also believed that the listed home remedies were effective, while the remaining 15 (30.6%) identified only phototherapy and exchange blood transfusion as effective care for newborn jaundice.

Seventy-four (75.5%) mothers identified at least one danger sign of jaundice in infants. Overall, the identified danger signs included poor suck (58; 59.2%), abnormal cry (33; 33.7%), convulsions (25; 25.5%), and stiffness (19; 19.4%). Seventy-nine (80.6%) identified at least one complication of newborn jaundice in childhood. The complications identified included inability to sit and walk (71; 72.4%), epilepsy (23; 23.5%), and deaf-muteness (19; 19.4%).

The knowledge of the mothers on newborn jaundice is described in Table 1. Significantly higher proportions of the

**Table 6: Relationship between maternal educational qualifications and knowledge about newborn jaundice**

Parameters	Tertiary (n=42)	Elementary/ secondary (n=56)	Test of significance
Knowledge of the causes of jaundice			
Good	29 (69.0)	24 (42.9)	$\chi^2=6.62$ ;
Poor	13 (31.0)	32 (57.1)	$P=0.01$
Knowledge of drugs and substances to be avoided in jaundice			
Good	15 (35.7)	14 (25.0)	$\chi^2=1.32$ ;
Poor	27 (64.3)	42 (25.0)	$P=0.250$
Knowledge of effective care for jaundice			
Good	9 (21.4)	6 (10.7)	$\chi^2=2.12$ ;
Poor	33 (78.6)	50 (89.3)	$P=0.145$
Knowledge of risk of death in jaundice			
Good	29 (69.0)	25 (44.6)	$\chi^2=5.77$ ;
Poor	13 (31.0)	31 (55.4)	$P=0.016$
Knowledge of risk of brain damage in jaundice			
Good	35 (83.3)	28 (50.0)	$\chi^2=11.61$ ;
Poor	7 (16.7)	28 (50.0)	$P=0.001$
Knowledge of the danger in delay in seeking care			
Good	33 (78.6)	33 (58.9)	$\chi^2=4.21$ ;
Poor	9 (21.4)	23 (41.1)	$P=0.004$
Knowledge on the unreliability of visual detection of jaundice			
Good	16 (38.1)	22 (39.3)	$\chi^2=0.01$ ;
Poor	26 (61.9)	34 (60.7)	$P=0.985$
Recognition of at least one danger sign in an infant with jaundice			
Good	36 (85.7)	37 (66.1)	$\chi^2=4.87$ ;
Poor	6 (14.3)	19 (33.9)	$P=0.027$
Recognition of at least one complication of newborn jaundice in childhood			
Good	36 (85.7)	43 (76.8)	$\chi^2=1.22$ ;
Poor	6 (14.3)	13 (23.2)	$P=0.269$

mothers did not know the drugs and substances to be avoided in the prevention of newborn jaundice (70.4%), effective care for newborn jaundice (84.7%), and unreliability of visual assessment of the severity of jaundice (61.2%). Similarly, significantly higher proportions of the mothers were aware of the risk of brain damage in newborn jaundice (64.3%), recognized that delay in seeking medical care for newborn jaundice may be dangerous (67.3%), recognized at least a danger sign in newborn jaundice (75.5%), and recognized at least a complication of newborn jaundice in childhood (80.6%). Only about half of the respondents knew the causes of newborn jaundice as well as the risk of death in newborn jaundice.

Overall, 56 (57.1%) mothers had good knowledge while 42 (42.9%) had poor knowledge about newborn jaundice. The infants of mothers with good knowledge of newborn jaundice were significantly younger on admission compared to the infants of mothers with poor knowledge ( $107.1 \pm 59.0$  h vs.  $135.9 \pm 70.2$  h;  $t = 2.02$ ,  $P = 0.03$ ).

Table 2 compares the socio-clinical profile of the mothers with good or poor knowledge about newborn jaundice. Significantly higher proportions of the mothers with good knowledge were aged  $>25$  years ( $P = 0.034$ ), had tertiary education ( $P = 0.004$ ), and had a previous child with jaundice ( $P = 0.001$ ). Similar proportions of mothers with good or poor knowledge were primiparous and utilized orthodox delivery services.

As shown in Table 3, significantly higher proportions of the mothers with good knowledge had appropriate care seeking behavior ( $P = 0.027$ ), sought care outside the home ( $P = 0.002$ ) and had infants presenting with kernicterus ( $P = 0.0001$ ). On the other hand, similar proportions of mothers in both groups had delayed presentation.

Table 4 depicts the relationship between the care-seeking behavior and level of knowledge about newborn jaundice. Significantly higher proportions of the mothers with appropriate care-seeking behavior had good knowledge with respect to effective care for newborn jaundice ( $P = 0.003$ ), risk of death in newborn jaundice ( $P = 0.001$ ), risk of brain damage in newborn jaundice ( $P = 0.0002$ ), danger in delaying care for newborn jaundice ( $P = 0.005$ ), the unreliability of visual assessment of the severity of jaundice in the newborn ( $P = 0.004$ ), recognition of at least one danger sign in newborn jaundice ( $P = 0.011$ ) and recognition of at least one complication of newborn jaundice in childhood ( $P = 0.022$ ). Similar proportions of mothers with appropriate and inappropriate care-seeking behavior had good knowledge with respect to the causes of newborn jaundice as well as drugs and substances to be avoided in newborn jaundice.

### Maternal educational qualification and knowledge about newborn jaundice

The infants of mothers with tertiary education were younger on admission compared to the infants of mothers with lesser education but without statistical significance ( $113.9 \pm 54.0$  h vs.  $123.7 \pm 72.9$  h;  $t = 0.71$ ,  $P = 0.479$ ). Table 5 shows that significantly higher proportions of the mothers with tertiary education were aged  $>25$  years ( $P = 0.0038$ ), sought initial care outside home ( $P = 0.046$ ), did not have a previous child with newborn jaundice ( $P = 0.039$ ) and had infants without kernicterus ( $P = 0.0001$ ). Similar proportions of mothers with or without tertiary education used drugs and herbs as home remedies for newborn jaundice.

As shown in Table 6, significantly higher proportions of mothers with tertiary education had good knowledge in respect of the causes of newborn jaundice ( $P = 0.01$ ), risk of death in newborn jaundice ( $P = 0.016$ ), risk of brain damage in newborn jaundice ( $P = 0.001$ ), danger in delaying care for newborn jaundice ( $P = 0.004$ ), and recognition of at least a danger sign in newborn jaundice ( $P = 0.027$ ). Similar proportions of mothers with and without tertiary education had poor knowledge of drugs and substances to be avoided in newborn jaundice, knowledge of effective care in newborn jaundice, unreliability of visual detection of jaundice in the newborn and recognition of at least one complication of newborn jaundice in childhood.

## Discussion

The present study assessed the knowledge of mothers in relation to their pattern of care-seeking behavior as distinct from a previous study conducted at the same center,<sup>[13]</sup> which sought the pattern of care-seeking behavior in relation to the socio-demographic parameters of the affected families without considering the level of knowledge about jaundice. This is different from previous studies of maternal knowledge of newborn jaundice conducted in Nigeria, which were focused on either expectant mothers attending antenatal clinics or the mothers at the children out-patient clinics.<sup>[15-17]</sup> For obvious reasons, the present study has the advantage of relating the level of knowledge of the mothers to their care-seeking behavior for newborn jaundice.

Overall, most of the mothers in the present study appreciated the danger in delaying effective care for jaundiced infants. That is not unexpected as their infants were hospitalized with significant jaundice with or without complications. Nevertheless, they had poor knowledge of the drugs (especially the sulfur-containing agents) and substances which need to be avoided as part of the prevention of jaundice unless on prescription by the attending physicians. This is relevant with respect to glucose-6-phosphate dehydrogenase deficiency which is a common cause of newborn jaundice in Nigeria.<sup>[18]</sup> Although newborn infants are not routinely screened for this enzymopathy, mothers are usually counseled to avoid possible oxidants (examples are commonly used drugs such as co-trimoxazole, sulphadoxine-pyrimethamine, chloramphenicol, acetyl salicylic acid, quinine, and substances like naphthalene and menthol), particularly those contained in items traditionally employed as cosmetic applications for newborn care. However, 29.6% awareness rate with respect to avoidance of icterogenic substances was a remarkable improvement over the previous report from the same center in which none of the respondents knew any such preventive measure.<sup>[15]</sup>

It is also important that most of the mothers did not know the effective care for newborn jaundice. This can be explained in terms of the widespread erroneous beliefs in the use of

certain drugs and other home remedies of unproven efficacy for the treatment of newborn jaundice as earlier reported.<sup>[13,15]</sup> The use of such forms of home remedies had earlier been identified as a cause of delay in seeking appropriate care for jaundiced infants.<sup>[13]</sup>

More than half of the population studied had good knowledge about newborn jaundice. That rate was lower than 77% reported in Iran but higher than 46% reported in Turkey.<sup>[19,20]</sup> It is possible to attribute the differences to the use of different questionnaires on different populations of mothers. Given the peculiarity of the population surveyed in the present study, a good knowledge rate is re-assuring. Perhaps, this may explain why about a third of the infants with severe hyperbilirubinemia had features of encephalopathy at presentation in the present study unlike close to half (49.3%) earlier reported in a similar population at the same center between 2008 and 2009.<sup>[11]</sup>

Interestingly, the mothers with good knowledge were relatively older, had tertiary education, had a previous experience with newborn jaundice and brought their infants at an earlier age for treatment. This is similar to the reports from Turkey and Iran that maternal education and previous experience with newborn jaundice influenced maternal knowledge about the condition.<sup>[20,21]</sup> The positive relationship between maternal education and knowledge of newborn jaundice was similarly reported in a population of expectant Nigerian mothers.<sup>[17]</sup> Further, mothers with good knowledge in the present study had appropriate care-seeking behavior and had no infant with kernicterus. With good knowledge, most of the mothers in this group appreciated the need to seek effective care early enough. This observation underscores the need to increase the access of women in the reproductive age to important health information in order to further reduce the burden of newborn jaundice in Nigeria. Although, the sources of health information were outside the scope of the present study, it is essential to use the platform of antenatal clinic health-talk sessions to educate mothers on health problems of the baby rather than over-concentrate only on the problems of pregnancy and labor as it presently subsists in most centers. This trend had been previously reported with regards to maternal knowledge about perinatal asphyxia, another leading cause of newborn mortality.<sup>[22]</sup>

Unfortunately, delay of at least 48 h was common to mothers with good and poor knowledge about newborn jaundice. Mothers with good knowledge, despite the general delay in seeking care in our hospital, presented relatively earlier compared to those with poor knowledge and that will plausibly explain the fact that none of the infants of the former had encephalopathy at presentation. We speculate that the delay could have been multi-factorial from several socio-cultural and socio-economic issues. Yet, a lot need

to be done with regards to educating mothers on the need to avoid delays in seeking optimal effective care when newborn infants develop jaundice.

Similarly, mothers with tertiary education sought care outside homes compared with the less educated group. However, the use of drugs and herbs as home remedies was common to both groups. This may be explained in terms of the cultural pressure from less educated relations who often prescribe these remedies and to whom, the young mothers are culturally obliged to defer. Extensive health education of the whole populace will be required to demystify the age long tradition of using drugs and herbal mixtures in the care of jaundiced infants. The platforms of trade unions and religious bodies can be used to reach and educate the bulk of the population outside health facility settings.

The knowledge of the mothers about complications of newborn jaundice later in life appeared generally better than the knowledge about danger signs of jaundice during the newborn period. This is unlike the report from Malaysia where similar percentages of mothers (71% and 69%) knew about the risks of death and brain damage respectively in newborn jaundice.<sup>[23]</sup> Similarly, a recent Nigerian study reported that 67% of mothers knew the complications of newborn jaundice.<sup>[17]</sup> This observation in the present study can be explained in terms of the likelihood of recognition of danger signs by only the mothers who have had previous experience with newborn jaundice. On the other hand, parents, relations and neighbors are likely to know when children who had jaundice earlier in life develop abnormal features like motor deficits and hearing impairments. Thus, the general population is more likely to know about the complications rather than the warning danger signs early in life. The emphasis in this instance is that health education should highlight the danger signs, but emphasis should be placed on seeking effective care even before the appearance of the danger signs as bilirubin encephalopathy, often causes irreversible brain damage.

Mothers with tertiary education in the present study had good knowledge about the causes of jaundice in the newborn, the danger in delaying care-seeking for jaundice and recognition of danger signs in newborn jaundice. Therefore, these mothers have the advantage of taking better precautionary measures with respect to the causes of jaundice and are likely to seek medical care for their jaundiced infants early enough.

It is essential to emphasize the significantly younger age of the infants of mothers with good knowledge and mothers with appropriate care-seeking behavior compared to mothers with poor knowledge and mothers with inappropriate care-seeking behavior. This suggests that with good knowledge about newborn jaundice, mothers

are likely to seek medical care for their jaundiced infants pretty early. However, the lack of influence of maternal tertiary education on the mean age of infants at presentation suggests that the reinforcement of knowledge about newborn jaundice is required irrespective of high scholarly rating of the mothers.

## Conclusion

The present study showed that good maternal knowledge about newborn jaundice and high maternal education positively influenced appropriate care-seeking behavior for infants with jaundice and reduced the risk of complications. Health education needs to be intensified, and emphasis should be widened to include the general population rather than just the women in the child-bearing age. In addition to clinic-based health education sessions, patient information pamphlets written in different languages can also be used to disseminate appropriate information about newborn jaundice. We acknowledge as limitations, the nondistinction between the care-seeking patterns for preterm and term infants as well as the relatively small sample size studied.

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