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A Qualitative Analysis of Challenges Encountered in the Management of Neonatal Jaundice Among Health Workers in Selected Health Facilities in Ondo State

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ABSTRACT

Background: Neonatal jaundice (NNJ) is a common condition in the newborn period and remains a significant cause of preventable morbidity and mortality in many low-and-middle-income countries, including Nigeria. Healthcare workers' capacity to provide evidence-based care is often constrained by systemic, infrastructural, and sociocultural challenges. This study explored the challenges encountered by healthcare workers in the management of neonatal jaundice among preterm and high-risk term neonates in selected tertiary health facilities in Ondo State, Nigeria.

Methods: A descriptive, cross-sectional qualitative design was employed between April and May 2025. Key informant interviews (KIIs) were conducted among doctors and nurses working in the neonatal units of three selected tertiary healthcare facilities. Eighteen participants (six from each facility) were purposively selected. Data were audio-recorded, transcribed verbatim, and analysed using thematic content analysis with the aid of NVivo version 11 software.

Results: The majority of participants were male (10/18). Several barriers to optimal management of neonatal jaundice were identified, including caregivers' impatience and non-compliance with treatment, frequent power outages affecting diagnosis and phototherapy delivery, limited availability of functional equipment, financial constraints, and sociocultural and religious beliefs influencing healthcare-seeking behaviour.

Conclusion: Neonatal jaundice remains a major clinical and public health challenge in Nigeria. Systemic, infrastructural, and sociocultural barriers significantly hinder effective care. Strengthening neonatal services through improved infrastructure, consistent power supply, provision of appropriate diagnostic and treatment equipment, workforce training, and expanded health insurance coverage is essential to improve neonatal outcomes.

Keywords: Neonatal jaundice; Hyperbilirubinemia; Qualitative study; Healthcare workers; Phototherapy; Nigeria

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INTRODUCTION

Neonatal Jaundice (NNJ) remains one of the most prevalent clinical conditions in newborns worldwide. It is estimated that over 60% of term and 80% of preterm neonates develop jaundice within the first week of life, largely due to the immature hepatic system and increased red blood cell turnover characteristic of the neonatal period.[1,2] While in many cases NNJ is physiological and self-limiting, it can progress to severe hyperbilirubinemia if not appropriately monitored and managed.[3,4] The clinical significance of neonatal jaundice lies in its potential to progress to Bilirubin-Induced Neurologic Dysfunction (BIND), which includes acute bilirubin encephalopathy and kernicterus, a permanent and debilitating condition associated with cerebral palsy, sensorineural hearing loss, and cognitive impairment.[5,6] The World Health Organization (WHO) identifies NNJ as a major contributor to neonatal morbidity and mortality, particularly in low- and middle-income countries (LMICs), including Nigeria, where timely access to appropriate diagnostic and therapeutic interventions is limited[7,8.]

According to Moges et al. (2024), NNJ is one of the top five causes of neonatal mortality in sub-Saharan Africa.[9] In Nigeria, neonatal jaundice contributes significantly to neonatal hospital admissions and avoidable neonatal deaths.[7] A cross-sectional study conducted in Osun State, South West, Nigeria, reported that many health workers demonstrated inadequate understanding of the causes, complications, and thresholds for initiating treatment for NNJ. The study identified overreliance on visual assessment, particularly in dark-skinned neonates, which is unreliable, and limited availability of bilirubinometers and phototherapy units.[10] Similar trends were identified in other regions of the country, with common themes including insufficient knowledge among health workers, inadequate training and supervision, limited access to diagnostic tools and phototherapy equipment, and socio-cultural factors that contribute to delayed care.[11-13]

Health workers play a pivotal role in the identification, evaluation, and management of NNJ. However, their ability to deliver evidence-based care is frequently undermined by systemic barriers, including shortages of functional phototherapy equipment, a lack of laboratory diagnostic tools (e.g., bilirubinometers and serum bilirubin analyzers), inconsistent electricity supply, and limited access to updated treatment guidelines.[14,15]

A review of the current literature reveals that inadequate knowledge and inconsistent practices among health workers further compound the problem. Some studies have documented poor understanding of the threshold for initiating phototherapy, the duration of treatment, and signs of bilirubin neurotoxicity among nurses, midwives, and community health workers.[16,17] These knowledge gaps are often exacerbated by inadequate continuing professional development opportunities and insufficient supervision from senior clinical staff. Also, sociocultural beliefs and health-seeking behaviours in Nigeria contribute to the suboptimal management of NNJ. In some communities, neonatal jaundice is believed to result from spiritual attacks, maternal dietary taboos, or exposure to cold weather, leading to delayed hospital presentation and reliance on traditional remedies.[11,18] Health workers often face resistance from caregivers when attempting to initiate formal care, and this dynamic can further frustrate timely diagnosis and intervention.

Ondo State, located in the southwestern region of Nigeria, has made commendable efforts toward improving maternal and child health outcomes through strategic health initiatives, including community-level sensitization, maternal newborn and child health (MNCH) programs, and strengthening of primary health care services. Nonetheless, anecdotal evidence shows that neonatal jaundice remains a persistent challenge, with poor outcomes often linked to delays in detection, inappropriate treatment, and ineffective referral systems. While quantitative studies have established the prevalence and clinical outcomes of NNJ in Nigeria, qualitative inquiries into the contextual and experiential factors affecting its management are scarce. Specifically, there is limited understanding of how health workers in diverse healthcare settings within Ondo State perceive and navigate the multifaceted challenges associated with NNJ care. Qualitative research offers an avenue to explore these complexities by capturing the nuanced experiences, attitudes, and systemic constraints encountered in real-world practice. Also, in light of the national and global emphasis on reducing neonatal mortality, as outlined in Sustainable Development Goal 3.2, generating contextually grounded evidence is imperative. This study, therefore, seeks to fill this critical gap by providing an in-depth, qualitative analysis of the challenges encountered by health workers in the management of neonatal jaundice in selected health facilities across Ondo State.

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METHODS

Study area: This study was conducted in Ondo State, one of the states in Nigeria's southwestern region. The State has 18 local governments and three senatorial districts: Ondo North, Ondo Central, and Ondo South. Its capital is Akure; it has social infrastructure that supports well-being, including universities, polytechnics, colleges of education, healthcare facilities, an airport, housing estates, cultural centres, and sports facilities. The population is approximately 4.5 million, with a density of roughly 230 people per square kilometer. Ondo State's health facilities include two tertiary hospitals: the Federal Medical Centre and the University Medical Science Hospital, along with other state-owned hospitals. Ondo State was selected due to limited data on neonatal jaundice despite its burden.[5]

Study period: The study was conducted between April and May 2025. This comprised an introductory entry activity, during which approval and introduction letters were presented at the respective administrative levels of the selected facilities. Three hospitals with adequate equipment for treating jaundice were purposively selected from the state.

Study design and population: The study employed a cross-sectional descriptive qualitative design among health workers in the neonatal wards of the selected health facilities. The health workers in the neonatal wards were recruited for the study because they are the ones who take care of neonates with jaundice in the selected health facilities. Participants were doctors and senior nurses who had worked in the neonatal unit for at least one year in the selected facilities, and were willing to participate in the study. The health workers in the study were doctors and senior nurses.

Data collection: The data were collected using Key informant interviews. The participants for the KIIs were health workers. A total of 18 Key informant interviews (KIIs) were conducted, six in each of the selected facilities. Each KII lasted between 30 and 45 minutes. A total of 18 health workers participated in the study. With the number of KIIs conducted, at this stage, the saturation point where no new information was obtained was reached.[9] The KII interview guide was developed by the researcher using questions adapted from relevant studies. An in-depth understanding of the challenges faced by the health workers in the management of jaundice among neonates was obtained through KII using open-ended questions.

The KIIs were conducted in English, at locations that allowed participants to talk freely without fear. A team of three health workers comprised the research team that gathered the data. Eligible participants were provided with sufficient and accurate information about the study, and their written consent was obtained before the interviews commenced. This ensured that participation was fully voluntary and informed.

Data entry, processing, and analysis: Interviews were recorded using an audio recorder, and handwritten notes were taken. Data were analysed using a thematic analysis. After the qualitative data had been collected, accuracy and quality control were ensured by checking the field notes alongside the transcripts. The transcripts were imported into NVivo 11 software, where inductive codes were generated and arranged into themes. The codes were assigned to recurring words and phrases in the text, identifying common challenges encountered by health workers in the management of neonatal jaundice in the selected health facilities. This allowed for the thematic content analysis that was carried out to explain the generated themes discussed by the health workers on the challenges encountered in the management of neonatal jaundice among preterm and full-term neonates, and excerpts from the transcripts were used for emphasis. The audio recordings and transcripts are securely kept in a password-protected folder.

Ethical consideration: A letter of introduction was obtained from the HOD, Nursing Department, Afe Babalola University; ethical approval obtained from Health Research Ethical Committee of Afe Babalola University with Protocol Number ABUADHREC/29/01/2025/792. Ethical clearance was obtained from the Health Research Ethical Committee of Federal Medical Centre, Owo, with approval number FMC/OW380/VOL.CCXIV/162, the Ondo State Health Research Ethics Committee with approval number 0SHREC/31/01/2025/799, and approval letter from the University of Medical Sciences Teaching Hospital with ref no: UNIMEDTH/ERC/025/016. The approval and introduction letters were presented at respective administrative levels where the research was conducted, while recruiting assistants and participants for this study, all demands relating to human rights were duly considered and respected. Permission was obtained from respondents before administering the questionnaire, and informed consent was ensured orally. All information obtained from health workers was

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securely protected and made accessible only to the researcher and the researcher's supervisor.

RESULTS

Table 1: Sociodemographic Characteristics of Participants

Variables	Freq(n=18)	Percentage
Age		
29-33	1	5.56
34-38	3	16.67
39-43	2	11.11
44-48	5	27.78
49-53	3	16.67
54-58	4	22.22
Sex		
Male	10	55.56
Female	8	44.44
Marital Status		
Married	18	100.00
Ethnic group		
Yoruba	15	83.33
Igbo	2	11.11
Hausa	1	5.56
Designation		
Consultant	11	61.11
Senior registrar	1	5.56
DDNS	4	22.22
ADNS	1	5.56
Registrar	1	5.56
Religion		
Christianity	17	94.44
Islam	1	5.56
Years of experience		
5-9	11	61.11
10-14	7	38.89
Educational qualification		
MBBS	7	38.89
FWACP	6	33.33
BNSc	1	5.56
BSc	2	11.11
MSc	1	5.56
PhD	1	5.56
Point of service		
Tertiary health facility	18	100.00

Table 1 presents the sociodemographic characteristics of participants in. The largest group is aged 44–48 years, accounting for 27.78%, most respondents are male (55.56%). All participants are married (100%). A majority identify as Yoruba, representing 83.33%; most respondents hold consultant roles (61.11%), followed by DDNS (22.22%), The group is predominantly Christian (94.44%). Majority have 5–9 years of experience (61.11%). The most common qualifications are MBBS (38.89%) and FWACP (33.33%). All participants work in tertiary health facilities (100%).

Challenges in the Management of Jaundice: The study explored the management of jaundice among the healthcare workers in the selected location. Specifically, the study assessed the challenges and the recommendations for the effective management of jaundice among healthcare workers. To achieve a comprehensive understanding of the concept, the participants were asked what they knew about jaundice, and they explained that jaundice is a common occurrence among neonates. It was mentioned that it occurs both in preterm and full-term babies. Participants identified it as a common morbidity among newborns. Below are some of the mentioned points to clarify the concept of jaundice among health workers.

Jaundice is a common condition in newborns: The study revealed that most healthcare workers were of the opinion that jaundice is a frequent occurrence among newborns. However, the risk is higher among preterm babies due to their underdeveloped liver function. A 56-year-old female consultant from a tertiary hospital said, "*Okay, neonatal jaundice is the most common morbidity in the newborn. At least about One-third of every newborn baby will have jaundice. Part of this whole number, the ones that will require treatment, is less than 10% of all, and it's more common in premature babies than in term babies".* Similarly, another participant was also of the opinion that preterm neonates were more likely to be affected than full-term ones. She further revealed, saying, "*So, generally, we can say the condition runs much more commonly in newborns with* high *bilirubin levels, which leads to the yellowish discoloration of the skin, eyes, nails, and pale toes. So, mainly it is more common in preterm than full-term babies". (54-year-old female consultant, tertiary)*

Jaundice is a yellowing of the eyes: While exploring the healthcare workers' understanding of jaundice, particularly how they recognize and describe the condition in newborns. Most of them were of similar views, describing jaundice as a noticeable yellow discoloration in specific parts of the body, especially in preterm infants. A 29-year-old male registrar from a tertiary facility revealed that jaundice is particularly common in preterm babies, she said "*Yes. It is higher in*

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preterm infants, and then it simply involves the yellowish colouration of the eyes and the body in all those children". Similarly, a participant who also described jaundice as the yellowness of the skin and mucous membranes, said, "*Neonatal jaundice is Jaundice itself is yellowness of the skin, the mucous membrane. So, in babies, you see it as yellowness of the eyes, conjunctiva, then the sclera, the skin, and it's relatively a common problem in newborns" (45-year-old female consultant, tertiary).*

Another 51-year-old female Deputy Director of Nursing Services (DDNS) who also emphasized the visible nature of jaundice, said, "*Jaundice is something we see based on experience. When you see a jaundiced child, you will see it, yellowness of the sclera, yellowness of the body, they do a side lab, serum bilirubin on the main lab, you see full term, it can easily be diagnosed".*

Most cases of Jaundice do not need treatment: The study revealed that healthcare workers generally agreed that while a large number of newborns develop jaundice, most cases are mild and are resolved without treatment. A participant who revealed that minimal jaundice cases need treatment said, "*At least about 1/3 of every newborn baby will have jaundice. Part of this whole number, the ones that will require treatment, is less than 10% of all, and it's common in premature babies than in term babies". (56-year-old female consultant, tertiary).* Similarly, a 47-year-old male paediatric consultant further revealed that most cases of neonatal jaundice are physiological and resolve without intervention. He said "*As the common phenomena that most babies have jaundice at birth, most babies, but most of them are physiologic, if you don't do anything, jaundice will resolve by itself, however, there are some that you have to intervene, you have to treat, if not, it will progress to, to affect the baby's neurological function So, so we can say, conveniently that most babies will have jaundice at birth, but out of all of them, maybe less than 10% will get to the hospital that will need treatment. Most of them are physiological and will resolve even without doing anything".* Another participant who believed that although jaundice is one of the leading reasons for neonatal admissions, and also asserted that not all cases require hospitalization or treatment, said," *So, I will say that neonatal jaundice is one of the leading causes of admission in the neonatal ward and one of the leading presentations in the neonatal period. About 8 out of 10 preterm neonates and 6 out of 10 term neonates develop jaundice, although not all of them will need admission or treatment". (48-year-old male Paediatrics consultant, tertiary).* Similarly, another participant with a similar opinion said, "*Now, jaundice, neonatal jaundice is, very common. It's seen commonly in up to eighty percent. Eighty percent of all newborns, but in varying percentages, meaning that some may have just a mild form of jaundice, by mild, we mean jaundice that is not so serious, that may not need treatment, among them. However, in less than 10% of them, their jaundice may need one form of treatment or the other". (47-year-old male consultant, tertiary).*

Jaundice is common in preterm neonates: The study also revealed that most health workers believed that preterm babies are more susceptible to developing jaundice due to their underdeveloped weight, liver function, higher red cell turnover, and vulnerability to infections. A 45-year-old female consultant who believed that many preterm babies may develop jaundice said, "*About 80% of preterm babies may come down with jaundice, depending on their gestational age, how preterm they are, although the very preterm babies, we call them the very low birth weight preterm. So, you may have up to eight out of every one of them having neonatal jaundice".* Another participant, who explained that the severity and frequency are higher in preterm babies, said, "*Okay, neonatal jaundice is a common disease that usually plagues term and preterm babies. However, the prevalence is somewhat higher in preterm babies because of their prematurity, and then when compared to term babies"* he said further*, "the prevalence varies across different geopolitical regions of Nigeria that could be as high as 10 to 20% depending on whichever geopolitical region you are referring to, the severity tends to be worse in the premature because in them, most of the metabolic processes and their organs are not fully developed" (37-year-old male Paediatric consultant, tertiary).*

Jaundice can be Physiological or pathological: The study also revealed healthcare workers' understanding of the different types of neonatal jaundice, particularly the distinction between physiological and pathological jaundice. Most healthcare workers acknowledged that neonatal jaundice is not a uniform condition, and accurate classification is essential for proper management. A participant who revealed that not all cases of jaundice are automatically considered physiological unless thorough investigations rule out other causes said, "*Let me talk generally now, in the neonatal period, most commonly it is physiologic jaundice. However, we don't, we don't label every patient with jaundice as having physiologic jaundice, unless thorough investigations have been done to be sure that the jaundice is pathologic or physiologic. So, when we don't have any other reason to attribute the cause of the jaundice, then you can say the patient has physiologic jaundice, plus the fact that it must have fulfilled certain criteria. And for instance, in the first 24 hours, if you see jaundice in the first 24 hours, it is not likely to be physiologic. That means there is a particular cause to it that must be treated. And that kind of jaundice tends to be severe*

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if it's not well-treated. So again, if jaundice is still present after 14 days. So that jaundice is not likely to be physiologic, especially in term babies. Then, if you do the value of the jaundice and it's greater than 12 mg/dl, then it's not likely to be physiological. So those are some of the criteria you must have to say that a patient has physiologic jaundice". (45-year-old female consultant, tertiary).

Another 47-year-old male consultant who was of the opinion that 6 in 10 babies experience one form of jaundice or the other said "*if I want to put statistically, we use to say 60% of babies will experience one form of jaundice or the other in the first week of life for term babies, this is so because, we say 60% because majority of the jaundice is not pathological and there are two forms of neonatal jaundice, so it can be pathologic or physiologic, so, most of the first week is physiological, however, this is a diagnosis we don't make, we only make it after excluding other causes of pathologic jaundice. Statistically also, 8 out of every 10 preterm babies tend to have jaundice within that first few days of their lives like I said and most times this jaundice is also their normal way, when we say physiological, it means something that has to do with their normal growth or their normal way of life because they are born with some, the things that we need, that will usually produce jaundice in our body is not fully developed in them or what we use to eliminate jaundice in their bodies is not fully developed. So, as such ehm it is a common problem". (47-year-old male consultant, tertiary)*

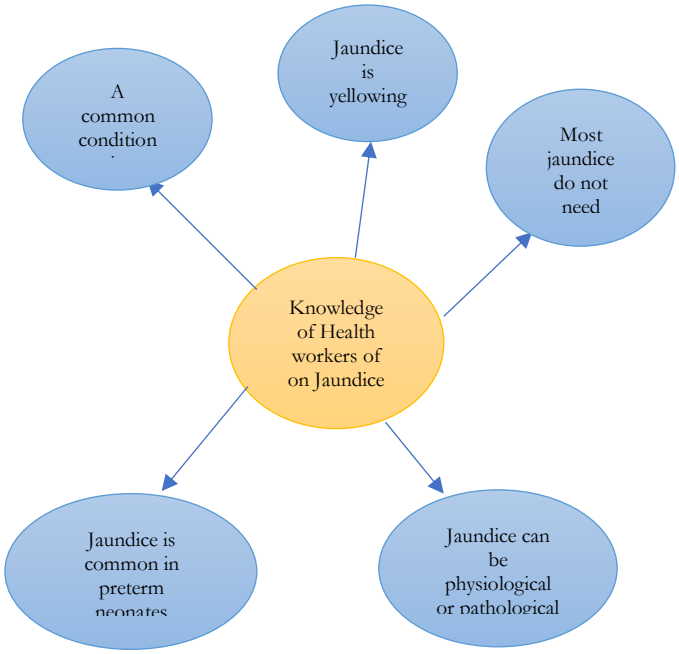

Figure 1: Knowledge of Health Workers on Jaundice

To explore challenges in the management of jaundice among preterm and high-risk full-term neonates.

The study's objective was to explore the challenges encountered in the management of jaundice among preterm and full-term neonates in the selected health facilities. The participants of the study pointed out that the management of jaundice depends on the severity of the jaundice or the bilirubin level and the gestational age of the baby; however, it was stated that challenges do not differ in terms of gestational ages, and they reported that they experienced the same challenges in managing jaundice among neonates. Below are some of the challenges to the management of jaundice among the health workers caring for both preterm and full-term neonates in selected health facilities in Ondo State:

Impatient Nature of Mothers

The study revealed healthcare workers' belief that the effective management of neonatal jaundice, especially among neonates, is based on the impatient behaviour of some mothers and caregivers. They also revealed that early interruption of phototherapy, refusal to complete treatment, and early discharge against medical advice can reduce treatment effectiveness and prolong or worsen jaundice in neonates. A 56-year-old female consultant

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reported that mothers sometimes disrupt treatment by removing babies from phototherapy for breastfeeding or other caregiving practices, thereby reducing therapeutic light exposure crucial for lowering bilirubin levels. She said, "*Mothers take the babies off photo therapy to breastfeed, or do some other procedures, reduce the exposure to that light, which is supposed to reduce the jaundice".* Another 29-year-old male registrar revealed that some caregivers are unwilling to wait until bilirubin levels fall to the recommended threshold before discharge. He was also of the opinion that economic concerns, such as the cost of repeated bilirubin tests, and the risk of anaemia from frequent sampling in preterm babies, make families more likely to seek early discharge, sometimes against medical advice. He said, "*Okay. Well, some of the challenges I have encountered include some patients are not willing to stay until they, yes, the caregivers are not willing to stay till we get the baseline values, which is less than 8 for many preterm, and then less than 10 or less than 12. So, we have patients who requested discharge even while the bilirubin was still higher than the threshold we have for discharge, and they still had to be discharged against medical advice. Some complained of the cost of having to repeat or access serum bilirubin every day or every 48 hours. However, those are and then the fact that repeated sampling of a preterm will also cause anaemia. Those are the challenges we've had".* Similarly, a 47-year-old male consultant highlighted the difficulty in keeping some mothers compliant with the full duration of phototherapy. He said, "*We have a lot of challenges. One of those challenges we have is the ability to be able to make those preterm stay under photo, because you see some, some others, they will say, I want to breastfeed my child. I want to do Kangaroo Mother Care for my child. So, they might not allow them to stay for the period they are supposed to stay. Some babies will need some other treatment. For example, a baby that needs, maybe to what's the name now, to do investigation, yes, to do investigation. Maybe you want to do a babygram, so we have to take that from phototherapy. So those are the challenges".*

Lack of Constant Electricity

Another major challenge raised by healthcare providers in tertiary facilities is the lack of a stable and constant electricity supply, which significantly hinders both the diagnosis and management of neonatal jaundice. Participants revealed that diagnostic processes such as serum bilirubin testing are sometimes affected by power outages One of the participants mentioned, "*Well, in diagnosing again, we know we have the serum bilirubinometer by the side lab, which sometimes can be affected by electricity, and also the delay in getting the results from the main lab due to turnaround time. For now, no light" (29-year-old male registrar, tertiary).* Similarly, a 45-year-old female paediatrician also reported, "*Now, in the management of jaundice, some of the challenges are power supply. Sometimes you need phototherapy to be on for a minimum of six hours, and you don't get a power supply for up to one hour. So, it's a big challenge" (45-year-old female paediatrician, tertiary).* In addition, another 37-year-old male paediatrician revealed the link between the poor power supply to broader economic challenges. He said, "*Currently, with the high cost of electricity, phototherapy uses electricity. Do you understand? The machine has a high cost of electricity, a high cost of running the Hospital, and the rest it has also affected management. In short, the general outcome of goods and services in the country, the economic recession that is currently going on, but it all stems".* From the diagnostic side, a participant explained that both testing and treatment are delayed by the lack of stable electricity supply. He said, "*Now, once some of those babies are presented in the hospital and they are diagnosed of having jaundice. For us to have a definitive diagnosis, we need to take blood samples and send them to the lab. Challenges that we have at times include the electricity problem of electricity. In the laboratory where the test is supposed to be carried out, there will not be lights for them to run the test; as a result of that, there may be a delay in bringing out the results, which will affect the management of jaundice. At times, for the treatment now, we talk about phototherapy, it's light, it's electricity that will need to run the photo light. If there is no light in the hospital, especially, there is an increase in the price of fuel now, there will be a problem in the management". (47-year-old male Consultant, tertiary)*

Late presentation of Jaundice by parents

Another challenge identified by health workers in the management of neonatal jaundice is the late presentation of affected infants by their caregivers, which greatly limits timely intervention and increases the likelihood of severe complications such as brain damage, seizures, or long-term disabilities. A participant mentioned that many parents either ignore the early warning signs or intentionally delay seeking medical attention said, "*Yes, one, one, common one is a late presentation. So, you see, parents, they notice that the baby has yellow discolouration on the eyes or the skin, but they don't present on time. Keep the baby for one reason or the other. Maybe because they want to do naming for some, they might not know for some other person, because of their knowledge and ignorance, they will start up on the herbal preparation or some funny treatment practices. And so, at the point where they are presenting, they may be presenting late, and this might affect the outcome of other things" (37-year-old male paediatrician, tertiary).* Likewise, another participant emphasized this point and said "*Yes, the challenges are more*

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of a long-term complications because when they present late and they've already developed acute bilirubin encephalopathy or are already manifesting kernicterus, it shows there's already a brain damage in them and in such instance, it becomes problematic, to now have to tell them that we have to do a long term management because such patients might present with cerebral palsy, hearing defect or blindness or sensorial deafness or cortical blindness and such patients will need long term management and we can see the depression that will happen to the parents when you have only one case of cerebral palsy in the family. That's just the major problem that I have with the management: late presentation". (42-year-old male consultant, tertiary).

Religious Beliefs

Religious belief was one of the factors revealed by healthcare workers as a significant barrier to the effective management of neonatal jaundice. Participants emphasized how deep-rooted faith-based practices and ideologies often lead to resistance towards medical advice, refusal of lifesaving procedures like blood transfusion, and reliance on religious rituals or traditional remedies. A participant revealed that some parents reject an exchange blood transfusion due to religious convictions, even when their baby's condition is severe. She said, "*Apart from that, the ones that have severe jaundice that may require an exchange blood transfusion, religious beliefs may also prevent us from having, from rendering that type of treatment. Some people believe that, some people decline blood transfusion, and all that" (56-year-old female consultant, tertiary).* Similarly, a 48-year-old male consultant revealed the influence of traditional and religious settings. He said "*A lot of people believe in local religious, if, if we can't get them to the hospital for antenatal care, we can strengthen the places they go, maybe community health workers should go there to give them a talk, so that they will be aware of what neonatal jaundice is, what are the causes and things they need to do to prevent it, even while they are still pregnant. Then some use some traditional practices, like the use of certain things on the clothes of the babies, dusting powder, and all those things need to be discouraged".* In addition, a 42-year-old male consultant shared how religious affirmations and resistance to negative health information hinder the effectiveness of medical counselling. He opined that many caregivers respond to warnings with faith-based rejections, like saying I reject it in Jesus' name, preferring prayers or spiritual remedies like anointing oil, which ultimately delay proper treatment. These delays often result in advanced complications such as kernicterus or bilirubin encephalopathy.

Cost of Treatment

Healthcare workers also revealed that the financial burden of neonatal jaundice treatment is another major challenge affecting timely access to care and health outcomes. They viewed that poverty and out-of-pocket healthcare costs often prevent families from seeking or completing proper treatment, leading to complications.

A 56-year-old female consultant revealed that many families cannot afford hospital admission or treatment, she stated "Poverty *is a major problem because some of the parents of the babies that we want to admit and treat for jaundice may not have the money to pay for admission, and by the time some of them will be coming back later, most of those babies will come with severe complications".* Another 54-year-old female Deputy Director of Nursing (DDNS) revealed her concerns about the lack of essential medical supplies and the inability of families and hospitals to afford standard treatment tools like neonatal exchange blood transfusion trays. She said "*Let's see, you know, we are now in a modern technology era, now that they have all every access to the, what do they call it, we have ehm neonatal care pack for bilirubin exchange blood transfusion tray, but here, we don't have such, before, they do have; but with this economic what will I call it, with the common economy melt down in the country and those things cannot be imported into the country, and then for the people to be able to, that they can get those things, it's nor everybody that can afford it. Now, if at all, it is readily available in Nigeria, they can't afford the neonatal exchange blood transfusion tray because everything you need for the cannulation, for the transfusion, is very embedded in the pack. But now we make use of improvision for catheterization, and then had it been that we have tray, we have cannula, everything is well packed and sterile, so these days, we are just improvising except, if at all we are expecting government to provide those things, for now, in Nigeria, it's very, very rare, unlike before, and then it would have been better if you have those things readily available for effective running of the delivery and the care of the clients in the hospital"*

Another participant revealed that out-of-pocket payment remains the primary method of healthcare financing in the country, which poses a barrier. He stated, "*Ehm, there are so many challenges. One of the common challenges we face starts with even finances, sometimes for the parents, because in this part of the world, it is out-of-pocket payments that people do. So, if you have parents who come with babies and don't have money, challenges can even come from it; it's a social challenge. And then, of course, in some parts of the world, it's a social welfare thing; they don't need to pay a dime. And so that brings us to removing that challenge if we assume that*

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everybody doesn't have to pay. So, paying is one challenge" (56-year-old male Consultant, tertiary)

Culture of the people

Healthcare workers also revealed that sociocultural beliefs and traditional practices are another significant barrier that affects the effective management of neonatal jaundice. They thought that many caregivers are influenced by extended family members or longstanding myths, which often delay their health-seeking behaviour and sometimes lead to discontinued treatment prematurely, favouring traditional remedies such as sunlight exposure or herbal preparations. The statement "*The challenge we have is for them to accept the counsel. And in our environment here, the impact of extended family cannot be overemphasized. So even when the woman has agreed to stay, a grandmother or an uncle or a brother somewhere will come and say no, that this is not the first time we are seeing jaundice in our family, and we put them under the sun and everything is okay, so they may just come and discharge against medical advice" (56-year-old female consultant, tertiary)* made by a participant revealed that the influence of extended family members who often override the mother's decision to continue hospital treatment when jaundice is diagnosed. Similarly, a 47-year-old male consultant said that beliefs and fables often affect caregivers' adoption of medical treatments. He mentioned, "*Yes, sometimes, some others might, they might have some old women's belief, old women's belief, old fables that, ah, no, there's nothing wrong with the child. With jaundice, all you just need to do is to put a pawpaw leaf inside water and feed the child with it. So sometimes you might have difficulty convincing them to stay. You know, in the hospital for jaundice because of what they have already been told, what they've already believed, so you might have difficulty putting them to stay under phototherapy".* This is in the same vein as what was said by some other participants "*Then, I don't want to say cultural belief, the traditional practices of people in our environment, that when the baby has jaundice, they will put under sunlight, they will not seek help on time". (48-year-old male consultant, tertiary).* Similarly, a 50-year-old female Deputy Director of Nursing (DDNS) also opined, "*We have challenges because some of them believe that before we could get the neonates admitted, some parents will just come and they will tell us they want to go home and manage them locally. I've heard of cases where neonates are being managed with pawpaw water. Some of them believe that you will just put them in the morning sunlight and bring them in. So, we have to convince them, talk to them, educate them, counsel them before they will allow us to admit the neonates, especially when their mother-in-law or their mothers are staying with them, but with good counselling, we still manage them very well". (50-year-old female DDNS, tertiary).*

Lack of Resources

Healthcare workers also revealed that the shortage of essential equipment and diagnostic tools, such as bili-blankets, phototherapy units, bilirubinometers, and reliable electricity, remains a significant challenge in the management of neonatal jaundice. These often lead to treatment delays and increased risk of complications for affected neonates. A participant revealed that the lack of bili blankets remains a limiting factor affecting the management of neonatal jaundice. She reported *"But like I mentioned earlier, we do not have a bili blanket. However, by the time we combine the bili bed and an overhead phototherapy unit, we'll get results close to, if not at, hour with the use of a bili blanket, and diagnostic resources we also have. So, we do have problems with resources". (56-year-old female consultant, tertiary).* Reflecting on past experiences, a 47-year-old male consultant recalled a period of acute equipment shortage, and his experiences was narrated thus: "*Yeah, just like I said earlier, before we got to, to where we are in the centre by using phototherapy unit, there was a time that we were not having enough phototherapy unit that we have to be moving, moving phototherapy unit, for one baby to another, and in the process of doing that, of doing that so baby will be left, you know without phototherapy that needed it. So, what we just discovered then that time, we discovered baby's jaundice will just be going up, um, the rate of doing exchange blood transfusion at that time was very high, unlike now that we have a lot of phototherapy units that we can always use for our babies".* Similarly, a 51-year-old female Deputy Director of Nursing (DDNS) revealed that only a facility in Ondo State has the capacity to manage jaundice effectively, as primary health centres often lack adequate phototherapy equipment and stable electricity supply. She said, "*Yes, the health centres or health care facilities that can manage this thing we are talking about appropriately are scarce. What I know within Ondo State, we can manage in FMC, Owo, the primary health care cannot manage it; instead in primary health centres, when they bring these babies to them, they may advice to come to, they can't do EBT that's number one, if they can do, if they can use phototherapy, there may be no regular light for them to continue managing it, but in FMC, we have neonatal section where we have constant light to do both phototherapy and EBT because we have standard doctors, qualified consultants".*

The issue of resource allocation was also raised by a participant who said, "*Because the incidence is high and then, there's a lot of jaundice among them and we have limited phototherapy, it now becomes how do we use the limited resources, which in these cases, the phototherapy machine for the unlimited*

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case, which is the increase bilirubin, hyperbilirubinemia, jaundice. That is just the major issues there. (42-year-old male Consultant, tertiary).

Also, health care workers revealed that the lack of affordable diagnostic tools, especially transcutaneous bilirubinometers, which allow non-invasive point-of-care testing, is another challenge. A participant who talked regarding this reported, "*Well, we do have challenges, and one of our challenges is having the point of care with the bilirubinometers; they are quite high-sided. Another challenge is the transcutaneous bilirubinometer. Ideally, every unit that manages jaundice should have transcutaneous bilirubinometer, they are just machines that you just need to put on the babies chin, and they will all be able to do the estimate, even though it's not the true value, each units should have that, we don't have to be taking blood samples always but we are left with taking blood samples to the labs and sometimes we need to take so much samples to be able to make a diagnosis, so, having point of care bilirubinometers will go a long way in the management, but like I said earlier, they are expensive".(47-year-old male Consultant, tertiary)*

Lack of Awareness of Mothers

Healthcare workers also identified poor maternal awareness as a significant contributor to the delayed recognition and treatment of neonatal jaundice. Many caregivers were unaware of risk factors like ABO incompatibility or rhesus isoimmunization, and often lacked a proper understanding of jaundice symptoms, resulting in delayed care-seeking behaviour. A 48-year-old male consultant revealed that missed opportunities for early identification and prevention during antenatal care due to poor maternal awareness of jaundice risk factors are another significant factor that influences neonatal jaundice. He said, "*I think I will look at the challenges even before coming to the hospital, before antenatal care, could be a challenge, because most mothers, even before they are born, are supposed to have known who is at risk of ABO incompatibility or rhesus isoimmunization, such that the care that should have been given during antenatal care is missed. So, that also leads to an increased incidence of neonatal jaundice because some could have been present even while the mother was pregnant".*

Also, a 47-year-old male consultant revealed that the widespread myths and lack of basic knowledge on jaundice among non-medical individuals, often delays hospital presentation until the babies are already severely jaundiced. He said "*Yes. So, there are many challenges, especially, yes, there are many challenges that are involved when we talk about good diagnosis and eventual management of babies with neonatal jaundice. Now in terms of diagnosis, looking at our area, so many people are not aware, they don't even understand what neonatal jaundice is all about. There are so many myths surrounding jaundice in our environment, particularly among people who are not in the medical field. So many people think that when a baby is jaundiced, some people will think the baby is fine now, more beautiful, they will not think of it, and before you know it, the baby is severely jaundiced. So many mothers are not even able to identify it".* In addition, another 57-year-old female Deputy Director of Nursing (DDNS) revealed how caregivers may not appreciate the importance of clinical procedures, she said "*And also, the mothers at time, they can be posing problems because they don't know the importance of what we are doing for their child, some of them may be agitated, I just put to bed, I'm supposed to be at home resting, you asked me to stay here and I don't have time to rest well, I do walk around, I'm asked to come and be expressing, I'm supposed to carry my baby and be able to suck directly on my breast. So, we use to encourage them and let them know what it is expected to do and at times, I think I've talked about the i/v line, at times to get, to set their line can also be a problem because some of these tiny creatures, all these preterm are very very small, the hands are small and to get their line, it takes a lot of experiences and expertise. God is helping us".*

Finally, a 56-year-old male consultant who believes that sociocultural obligations interfere with the jaundice management because caregivers usually do not want to agree with a prolonged hospital stay said, "*Okay, yes, there may be challenges you expect to counsel, maybe not because you don't have the time to counsel, but sometimes the parents may not even understand what you say. For example, now, you have a patient that has neonatal jaundice that you feel this patient has to be on bed and then you have relations who will tell you, ah no, go and put under the sun, go and put, use pawpaw and then some, if you don't counsel, you have to, it has to take you more time to convince them that the best option is putting under this lamp. Are they going to be in the hospital till the seventh day? That's the seventh day, when the baby has to be named, most parents don't want to be around in the hospital. And so counselling to let them see your point and the plan that you have for them, rather than the old ways of doing things, is also a challenge."* revealing that healthcare workers had to dedicate additional time to persuade families to accept evidence-based care.

Scarcity of Blood Donors

Another critical challenge identified by health care workers in the management of severe neonatal jaundice is the scarcity of compatible blood donors, which hinders timely exchange blood transfusions, a life-saving intervention for jaundiced infants. A 47-year-old male consultant revealed the multifaceted barriers that lead to delays in obtaining blood for exchange transfusion. He reported "*Then, in exchange for blood transfusion, which is the*

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main modality of management, at times there may not be blood in the lab, some of the parents may not want to donate blood, and some of them who want to donate may not be compatible, so it may take time before you get blood for exchange transfusion".

Table 2: Summary of challenges in the management of jaundice among neonates.

THEMES	Frequency of response
The impatient nature of mothers	+++
Lack of Constant Electricity	+++++++++
Late presentation of Jaundice by parents	++++
Religious Beliefs	+++
Cost of Treatment	+++
Culture of the people	++++++
Lack of Resources	++++++
Lack of Awareness of Mothers	++++++
Scarcity of Blood Donors	+

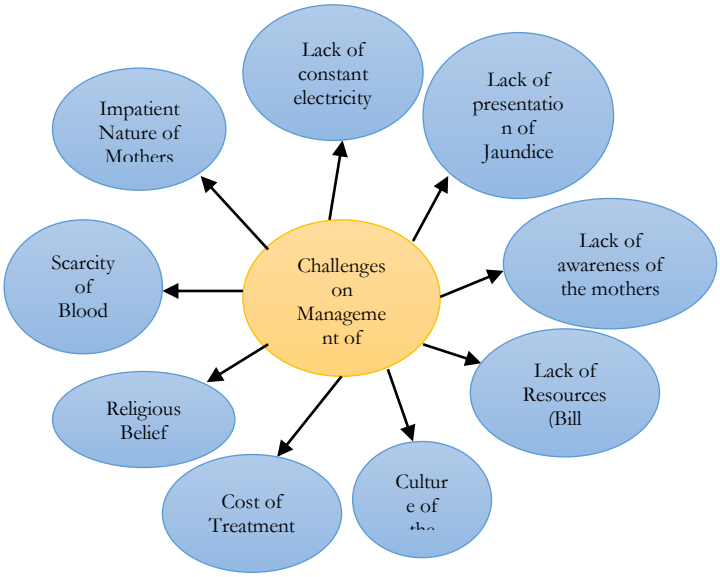

Figure 3: Challenges on Management of Jaundice

DISCUSSION

This research explored the challenges encountered in the management of neonatal jaundice among health workers in selected health facilities in Ondo State.The results of this study showed the diverse opinions of health workers on what the knowledge of jaundice is and the challenges they faced in managing it.The sociodemographic profile of participants shows that the majority were mainly consultants with FWACP and senior nurses with 5–14 years of experience reflecting a highly skilled workforce positioned to provide specialist insights into neonatal jaundice management. This aligns with studies in Nigeria, which highlight that neonatal care in tertiary hospitals is often led by experienced specialists who encounter complex cases, especially late referrals with severe complications.[20,21] The predominance of males reflects few females getting to managerial level which is consistent with gender patterns in specialist medicine in Nigeria,[22] while the Yoruba-Christian majority mirrors the demographic composition of Ondo State. The concentration of participants in tertiary facilities, although enhancing the depth of expert perspectives, means that barriers faced at primary and secondary levels may be underrepresented, echoing findings from other Nigerian studies that emphasize disparities in neonatal jaundice management across levels of care.[23,24]

The study, in an effort to understand the barriers to effective management of jaundice among health workers, explored, first, the knowledge of jaundice among the health workers. This is to have a grasp of what these participants know about the subject matter before subjecting them to deeper conversations. From the exploration, the study identified diverse opinions of the health workers on their knowledge of jaundice. The findings of this study highlight that healthcare workers perceived neonatal jaundice as a frequent occurrence among newborns, particularly in preterm infants. This observation is consistent with biomedical evidence, as immature hepatic function and higher red blood cell turnover in preterm neonates predispose them to bilirubin accumulation.[25]Participants' recognition of jaundice through visible yellowing of the eyes and skin underscores their reliance on clinical observation rather than advanced diagnostic tools, which is a common practice in resource-limited settings. A similar pattern was reported inOgunlesi & Olanrewaju (2015), where community health workers primarily depended on visual inspection to detect jaundice, often leading to delayed recognition of severe cases.[26] The fact that healthcare workers in this study correctly identified preterm babies as being more vulnerable also reflects a good level of clinical knowledge; however, the persistence of severe outcomes in Nigeria suggests that such knowledge is not always translated into effective practice, often due to late presentation by parents, lack of equipment, or systemic delays in treatment.[20,27]Furthermore, the participants' understanding of the distinction between physiological

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and pathological jaundice further demonstrates their diagnostic awareness, as they acknowledged that while many cases are mild and self-resolving, others can progress to dangerous complications. This aligns with findings by Satrom et al. (2023), who showed that while most Nigerian health workers were aware of the benign nature of physiological jaundice, there was a tendency to underestimate the severity of pathological cases.[28] Such underestimation may explain why delayed intervention remains a problem in sub-Saharan Africa, where severe hyperbilirubinemia continues to contribute significantly to neonatal morbidity and long-term neurological impairment.[29] Unlike studies in high-income countries, where effective screening tools like transcutaneous bilirubinometers support early detection,[30,31] Nigerian facilities still depend heavily on clinical observation.[7] This gap underscores why, despite healthcare workers' knowledge, outcomes remain poor, pointing to the structural and systemic limitations within the health system rather than ignorance among providers. Thus, while the results of this study reveal commendable awareness among participants, the broader picture reflects the interplay of knowledge with infrastructural, socioeconomic, and systemic barriers that undermine neonatal outcomes.

Notably, findings of this study revealed that one of the major barriers to effective management of neonatal jaundice was the impatient behavior of mothers and caregivers, particularly their tendency to interrupt phototherapy or discharge neonates against medical advice. This aligns with previous Nigerian studies, which show that poor adherence to prescribed treatment remains a major contributor to neonatal morbidity.[32,33] Such behavior often stems from a lack of understanding of the severity of jaundice, as many mothers perceive the condition as mild or transient, while others fear prolonged hospitalization due to financial implications or family pressures. Similar findings were reported in Ghana, where mothers discontinued phototherapy due to a preference for home-based traditional remedies, thereby undermining the effectiveness of biomedical interventions.[1] These attitudes highlight the intersection of maternal impatience with deeper issues of awareness, cost, and sociocultural influences. Similarly, structural barriers were also emphasized, particularly the lack of constant electricity, which disrupted both diagnosis and treatment. Participants reported that serum bilirubin testing and continuous phototherapy were often interrupted by power outages, a problem consistent with the infrastructural weaknesses of Nigeria's health system. Messersmith et al., (2022), in their study, stated how erratic electricity supply compromises neonatal intensive care, leaving infants vulnerable to preventable complications.[34] The problem is compounded by the shortage of essential resources, including phototherapy units, bilirubinometers, and exchange transfusion kits. Several Nigerian studies corroborate this challenge, stressing that inadequate neonatal equipment in tertiary facilities contributes to high rates of severe hyperbilirubinemia and kernicterus.[21,28]Moreover, the scarcity of blood donors presents another layer of difficulty, particularly for exchange transfusions, which are lifesaving in severe cases. Similar donor shortages have been documented in studies across sub-Saharan Africa, where cultural reservations, fear of blood donation, and lack of donor mobilization programs contribute to treatment delays.[35]Most healthcare workers in this study observed that neonates were often brought in only after severe complications had set in, limiting the effectiveness of available interventions. This echoes findings from Ogunlesi & Olanrewaju (2015), where delayed care-seeking was attributed to poor maternal awareness and reliance on home remedies.[26]Relatedly, participants highlighted the role of low maternal awareness as a fundamental problem, with many mothers unable to recognize early signs of jaundice or understand risk factors such as ABO incompatibility and Rhesus isoimmunization. This lack of awareness perpetuates harmful delays in accessing care, and similar findings have been documented in Uganda and Kenya, where poor caregiver knowledge significantly contributed to late referrals and adverse neonatal outcomes.[1,36,37]Sociocultural and religious factors further compound the problem. Emphasis was placed on cultural practices, such as reliance on sunlight exposure, herbal preparations, and the influence of extended family, which often delayed or disrupted biomedical treatment. Such beliefs are widespread in Nigeria, as demonstrated in the work of Audu et al., (2016), who reported that mothers often resort to home-based remedies before presenting at hospitals, and in many cases, the situation has worsened before presentation.[38] In addition, religious beliefs were noted as barriers, with some caregivers resisting exchange transfusion on faith-based grounds, preferring prayers or spiritual interventions over medical care. This finding is consistent with earlier Nigerian research that linked maternal religiosity to healthcare refusal in pediatric

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emergencies.[39] Finally, the cost of treatment emerged as a critical challenge, as poverty and out-of-pocket expenses discouraged families from seeking or completing care. This financial burden is well-documented in Nigeria, where the lack of neonatal health insurance results in catastrophic expenditure for many households.[10]

Strength of the Study

A major strength of this study lies in its qualitative design, which provided rich, in-depth insights into the multifaceted barriers faced by healthcare workers in the management of neonatal jaundice in Ondo State. Unlike quantitative surveys that often focus on prevalence or outcomes, this approach allowed participants to articulate their lived experiences, perceptions, and contextual challenges, thereby uncovering systemic, sociocultural, and infrastructural issues that are often underreported in routine hospital data. The inclusion of diverse cadres of health professionals, particularly consultants and senior nurses with extensive experience, enhanced the credibility and depth of the findings. Additionally, the study is situated in tertiary facilities, which are referral centers for severe neonatal jaundice, thereby ensuring that the perspectives captured are from frontline experts regularly managing complicated cases. By grounding the findings in both local realities and global literature, this study contributes valuable evidence that bridges the gap between clinical knowledge and health system limitations, offering practical implications for policy, training, and resource allocation in Nigeria and other low-resource settings.

Limitations of the Study

A limitation of this study is its focus on healthcare workers in tertiary facilities only, which may limit the generalizability of the findings to primary and secondary healthcare settings where neonatal jaundice is also commonly encountered but managed under different constraints. The perspectives of mothers and caregivers, who are central to treatment adherence and health-seeking behavior, were not captured, thereby providing only one side of the care experience. Additionally, the relatively small sample size, inherent in qualitative research, restricts the breadth of views represented, although the depth of responses compensates for this. Social desirability bias may also have influenced participants' narratives, as healthcare workers might underreport personal or systemic shortcomings.

CONCLUSION

This study concludes that neonatal jaundice remains a prevalent condition in Nigeria, with preterm infants being particularly vulnerable due to physiological immaturity and multiple maternal and perinatal risk factors. While healthcare workers demonstrated adequate knowledge of its causes, classification, and management, significant barriers such as maternal impatience, cultural and religious beliefs, late presentation, financial constraints, scarcity of resources, and infrastructural challenges like unstable electricity and inadequate diagnostic equipment impede optimal care. To address these gaps, it is recommended that health policies prioritize the strengthening of neonatal care through investment in essential diagnostic and therapeutic equipment, provision of stable electricity in healthcare facilities, and expansion of health insurance coverage to reduce out-of-pocket costs. In parallel, community-based health education campaigns targeting mothers, families, and religious leaders should be scaled up to improve awareness, promote timely health-seeking behavior, and foster adherence to prescribed treatments. Such integrated efforts, bridging both healthcare system strengthening and sociocultural engagement, are essential to reducing the burden, complications, and mortality associated with neonatal jaundice in resource-limited settings.

Declarations

Conflict of Interest Declaration: The authors declare that there are no financial or personal relationships that could have influenced the conduct or findings of this study.

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