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Original Research Article

Variation in Phototherapy Treatment in Some Selected Hospitals in Ghana

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ABSTRACT

Background: Neonatal jaundice (NNJ), one of the major diseases among neonates, could lead to Kernicterus (brain damage) if not treated well and early. The most significant treatment modality in the management of NNJ is phototherapy (PT). Providing PT by using clinical standards can enhance its effectiveness and safety and minimize PT-related complications. However, research shows that PT has not always been utilized in healthcare settings with low resources, and there is an incomplete understanding of NNJ and the use of PT for its management among trained community health workers (CHWs) and local communities. **Objectives:** The study aims to provide a basis for standardizing the use of PT to improve practice in Ghana. This was achieved by visiting selected hospitals in Ghana to acquire information on the use of PT and assessing the approach by which PT is administered by health professionals. **Methods:** The research utilized a descriptive cross-sectional design. Data were gathered using a Likert scale structured questionnaire. In addition, the Chi-square test of independence was used to establish the correlation between sociodemographic characteristics and health care workers' perspectives on PT treatment. Data analysis was performed using SPSS, and a p -value of 0.05 or less indicates a significant relationship. **Results:** The study revealed that over half of the participants had a good attitude toward clinical presentation, emphasizing the importance of always testing for bilirubin levels before administering PT treatment. The majority of respondents also demonstrated a good understanding of the importance of calibrating and maintaining PT devices. Lastly, most participants had good knowledge of standard protocols and held a positive attitude toward PT treatment. **Conclusions:** NNJ is prevalent, and PT has become the gold standard method for treating both full-term and preterm infants affected by it. Therefore, we recommend that other health care facilities assess the effectiveness of their PT devices and follow standard procedures to enhance the efficacy of this treatment.

Keywords—*Neonatal jaundice, Hyperbilirubinemia, Health care professionals, American Academy of Pediatrics.*

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INTRODUCTION

Neonatal jaundice (NNJ), also known as hyperbilirubinemia (HB), is a prevalent condition that affects at least 60% of term and preterm neonates worldwide, including those born between 35 and 38 weeks of pregnancy.¹ Severe HB is expected to impact at least 481,000 newborns worldwide each year. More than 63,000 of these babies survive with moderate to severe long-term disabilities², such as hearing loss, choreoathetoid cerebral palsy, developmental delay, and other neurological problems. The greatest burden of severe HB is commonly reported in low- to middle-income countries than in developed countries because of the large disparity in health care access and resources^{3,4}, with only 31.6/100,000 live births with HB reported in high-income countries.^{5,6} As there has been concern about a possible re-emergence of bilirubin encephalopathy in the United States and other parts of the world, severe HB has been gaining recognition among the world's leaders in health policy research as an important clinical and public health issue that requires further attention in these resource-constrained settings.⁷

Understanding NNJ is critical for developing a strong and safe rationale for the use of phototherapy (PT). PT was first used to treat neonatal HB in the late 1950s and was mostly used to avoid exchange transfusions.⁸ Its use has gradually become more widely suggested for the prevention of "acute bilirubin encephalopathy", a reversible symptom of bilirubin toxicity, and "kernicterus", a chronic and permanent clinical sequela of bilirubin toxicity.⁹ The American Academy of Pediatrics (AAP) has published a clinical practice guideline on the "Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation", which will hopefully provide greater uniformity and consistency in the application of PT in this newborn population.

The AAP recommends a clinical pathway that uses suitable nomograms to guide the use of PT and/or exchange transfusion for the management of a newborn infant who has been diagnosed with jaundice.¹⁰

The most effective treatment for HB is light, which has a wavelength range of 430 to 490 nm with a peak at 460 ± 10 nm.¹¹ The fundamental laws of photobiology and photochemistry determine the efficacy of PT. The interaction

of blue light with bilirubin creates a therapeutically effective photochemical shift, which allows for a decline in the levels of bilirubin in the neonate. PT causes bilirubin to undergo fast oxidative reactions and intermolecular rearrangements, resulting in mutant bilirubin isomers, which are more polar and thus excretable without conjugation in bile and urine.¹² Despite this knowledge, pediatricians still occasionally use heliotherapy or PT with visible light in homeopathic quantities.¹³

PT devices with intensive irradiance are quite expensive in Ghana.¹⁴ Since intense PT equipment is so much more expensive, most clinical services have no choice but to purchase the far less expensive, but inferior, traditional devices, which lack appropriate irradiance if they have any resources at all.¹⁵ As a result, most neonatal clinical facilities are unable to treat severe HB in a timely and effective manner to avoid serious consequences.

A survey is undertaken in this study to assess variations in PT treatment in terms of clinical presentation, calibration of equipment, procedure for treatment, and knowledge assessment of caregivers among selected health facilities in Ghana.

METHODS

Study Setting and Period

The investigation was carried out in 15 medical facilities that treat NNJ with PT equipment. Six regions of the nation—Ashanti, Central, Eastern, Greater Accra, Volta, and Western—were home to these specific facilities. Health care facilities in Ghana that provide comprehensive neonatal care across emergency, outpatient, and inpatient settings were selected. Between May and June 2023, a prospective cohort study was conducted at these facilities, enrolling two key stakeholder groups: Caregivers and health care professionals (HCPs).

Study Design and Population

A cross-sectional study with an institutional focus was carried out. A cross-sectional study design was suitable because it allowed information to be gathered on participant characteristics at the time of the study, together with data on the outcome and any associations between

participant characteristics and the desired outcome. Nurses, midwives, doctors, and engineers/technicians who worked in neonatal intensive care units at various chosen facilities during the study periods were the study's target demographics. The study excluded staff who declined or did not want to participate.

Sampling Technique and Sample Size

Purposive sampling was utilized in this investigation. This technique allows units to be chosen because they share specific attributes or characteristics that will allow the researcher to gain a better understanding of the topic under investigation. It was important to select HCPs who belong to units involved in the use of PT. This is to obtain precise and correct information in order to satisfy study objectives. The sample size was 82 HCPs from 15 selected facilities who volunteered to participate in the study.

Outcome Measures

In this survey, participants' attitudes were assessed by the extent of agreement or disagreement with corresponding statements under each section. Response was rated as strongly agreeing, agreeing, neutral, disagreeing, and strongly disagreeing on a five-point Likert scale. The "strongly agree" responses received a score of 5, "agree" responses received 4, "neutral" a score of 3, "disagree" a score of 2, and "strongly disagree" a score of 1. An inverted score was made for statements whose correct response was disagreement (the strongly disagree score becomes 5 and the strongly agree score becomes 1).

Attitude toward clinical presentation was assessed using seven statements. The maximum possible attitude score was 35. The median attitude score was calculated for each respondent, on the basis of which their attitude was categorized as positive or negative. Attitude toward calibration of equipment was assessed using three statements. The maximum possible attitude score was 15. The median attitude score was calculated for each respondent, on the basis of which their attitude was categorized as positive or negative. Attitude toward the procedure for treatment was assessed using six statements. The maximum possible attitude score was 30. The median attitude score was calculated for each respondent, on the basis of which their attitude was categorized as positive or negative.

General knowledge on PT was assessed using four statements. The maximum possible attitude score was 20. The median attitude score was calculated for each respondent, on the basis of which their attitude was categorized as good or poor.

Data Collection

The data collection tool is a structured questionnaire using a Likert scale measurement. The questionnaire was administered as an online survey. The questionnaire had five main sections, with each section having a set number of items. The main sections included the following variables: demographic data, assessment of attitude toward clinical presentation, calibration of equipment, procedure for treatment, and general knowledge assessment. A reminder was provided to nonrespondents twice a month. If the survey was not received by the last week of the second month, the participant was considered a nonrespondent.

Statistical Methods

After data collection, the data were edited, coded, transcribed, and then cleaned. Data was grouped in measures such as ordinal, nominal, and scalar.

The data were then coded by attaching numerical value to every qualitative data. Before any statistical analysis was done, a pretest statistical measure called a normality test was conducted to validate the authenticity of the numerical data collated. Statistical Package for Social Science (SPSS) was used to analyze data using both inferential and descriptive statistics. Inferential statistics performed included chi-square test of independence to evaluate relationship between two categorical variables.

Limitation

Relatively low sample size can be attributed to the fact that even though there are many health facilities in these regions, few of them offered PT treatment on account of the nonavailability of PT devices. In addition, most neonatal units have limited staff (HCPs).

RESULTS

Demographic Characteristics

In the current study, an online questionnaire was distributed through a focal person from the selected facilities. In total, 82 responses were received to proceed with analysis. The majority of respondents were nurses, reaching 66 (80.5%), 7 (8.5%) were midwives, 4 (4.9%) were nursing students, 3 (3.7%) were engineers/technicians, and 2 (2.4%) were medical doctors. Almost half of the respondents were from the Ashanti region, about 39 (47.6%), and 16 (19.5%) were from Greater Accra (Table 1).

TABLE 1. Sociodemographic characteristics of respondents.

Variables	Category	Frequency (%)
Sex	Male	18 (22.0)
	Female	64 (78.0)
Region	Ashanti	39 (47.6)
	Central	8 (9.8)
	Eastern	12 (14.6)
	Greater Accra	16 (19.5)
	Volta	6 (7.3)
	Western	1 (1.2)
	Age (Years)	18–24
	25–34	63 (76.8)
	35–44	6 (7.3)
Position	Student	4 (4.9)
	Nurse	66 (80.5)
	Midwife	7 (8.5)
	Engineer/Technician	3 (3.7)
	Medical Doctor	2 (2.4)

Attitude of HCPs Toward Clinical Presentation

Regarding attitudes of HCPs toward clinical presentation, the majority (70.7%) of respondents agreed that it is always necessary to test for bilirubin levels before administering PT, while a few (26.8%) admitted that PT is administered simply because the baby’s skin appears yellowish, and with a neutral (2.4%) response. Overall, more than half of respondents (53.7%) had a positive attitude toward clinical presentation, while 46.3% had a negative attitude (Table 2).

TABLE 2. Attitude of health care professionals toward clinical presentation.

Items	Responses				
	Strongly Disagree, N (%)	Disagree, N (%)	Neutral, N (%)	Agree, N (%)	Strongly Agree, N (%)
It is not always necessary to test for bilirubin levels before administering phototherapy.	30 (36.6%)	28 (34.1%)	2 (2.5%)	11 (13.4%)	11 (13.4%)
I administer phototherapy simply because the baby’s skin appears yellowish.	2 (2.4%)	16 (19.5%)	4 (4.9%)	39 (47.6%)	21 (25.6%)
I am familiar with some bilirubin testing methods.	2 (2.4%)	2 (2.4%)	17(20.7%)	48 (58.5%)	13 (15.9%)
It is necessary to check the bilirubin level after some time of exposure to phototherapy light .	0 (0%)	0 (0%)	2 (2.4%)	24 (29.3%)	56 (68.3%)
The level of bilirubin is determined using a laboratory method.	0 (0%)	3 (3.7%)	3 (3.7%)	42 (51.2%)	34 (41.5%)
A point-of-care (POC) device, such as the Bilistick, is used to determine bilirubin levels in real time.	0 (0%)	3 (3.7%)	16 (19.5%)	50 (61.0%)	13 (15.9%)
It is important to check the total serum bilirubin level before discharge.	0 (0%)	1 (1.2%)	1 (1.2%)	17 (20.7%)	63 (76.8%)
Overall Level of Attitude					
Positive	44 (53.7%)				
Negative	38 (46.3%)				

Attitude of Health Professionals Toward Calibration of Equipment

Regarding attitudes of HCPs toward maintenance of equipment, overall, the majority (72.0%) of respondents had a positive attitude, while a few (28.0%) had a negative attitude (Table 3).

TABLE 3. Attitude of health care professionals toward maintenance of equipment.

Items	Responses				
	Strongly Disagree, N (%)	Disagree, N (%)	Neutral, N (%)	Agree, N (%)	Strongly Agree, N (%)
It is critical that the equipment be standardized on a regular basis.	0 (0%)	0 (0%)	6 (7.3%)	22 (26.8%)	54 (65.9%)
The clinical engineer is in charge of maintenance and repair.	0 (0%)	0 (0%)	3 (3.7%)	22 (26.8%)	57 (69.5%)
For treatment, I used irradiance-based protocols.	0 (0%)	3 (3.7%)	20 (24.4%)	31 (37.8%)	28 (34.1%)
Overall Level of Attitude					
Positive	59 (72.0%)				
Negative	23 (28.0%)				

Attitude of Health Professionals Toward Treatment Procedures

Regarding attitudes of HCPs toward treatment procedures, overall, the majority (62.2%) of respondents had a positive attitude, while a few (37.8%) had a negative attitude (Table 4).

TABLE 4. Attitude of health professionals toward treatment procedures.

Items	Responses				
	Strongly Disagree, N (%)	Disagree, N (%)	Neutral, N (%)	Agree, N (%)	Strongly Agree, N (%)
Before treatment, I consider the baby's exposed body surface area (BSA).	0 (0%)	0 (0%)	2 (2.4%)	25 (30.5%)	55 (67.1%)
I document treatment duration.	1 (1.2%)	3 (3.7%)	11 (13.4%)	39 (47.6%)	28 (34.1%)
Before treatment, I cover the baby's eyes.	1 (1.2%)	5 (6.1%)	3 (3.7%)	9 (11.0%)	64 (78.0%)
I consider the irradiance level before treatment.	0 (0%)	3 (3.7%)	9 (11.0%)	33 (40.2%)	37 (45.1%)
Phototherapy is admitted while the preterm baby is in the infant incubator.	0 (0%)	3 (3.7%)	5 (6.1%)	46 (56.1%)	28 (34.1%)
Between the baby and the phototherapy source, there is a standard measurement.	0 (0%)	4 (4.9%)	10 (12.2%)	45 (54.9%)	23 (28.0%)
Overall Level of Attitude					
Positive	51 (62.2%)				
Negative	31 (37.8%)				

HCPs' Knowledge Assessment of PT

Regarding HCPs' knowledge assessment of PT, overall, the majority (64.6%) of respondents had a good knowledge, while a few (35.4%) had a poor knowledge (Table 5).

TABLE 5. Health care professionals' knowledge assessment of phototherapy.

Items	Responses				
	Strongly Disagree, N (%)	Disagree, N (%)	Neutral, N (%)	Agree, N (%)	Strongly Agree, N (%)
I am aware of some standard treatment operation protocols.	0 (0%)	0 (0%)	3 (3.7%)	23 (28.0%)	56 (68.3%)
We have a standard protocol in my facility.	0 (0%)	2 (2.4%)	2 (2.4%)	19 (23.2%)	59 (72.0%)
After purchasing phototherapy equipment, users must be trained.	0 (0%)	0 (0%)	0 (0%)	13 (15.9%)	69 (84.1%)
We have another form of treatment procedure for neonatal jaundice.	1 (1.2%)	5 (6.1%)	41 (50.0%)	18 (22.0%)	17 (20.7%)
Overall Level of Knowledge					
Good	53 (64.6%)				
Poor	29 (35.4%)				

Association Between Demographic Features and Key Indicators

The chi-square test of independence was conducted to determine the significant relationship between any two categorical variables or parameters, or attributes of interest. The null hypothesis (H_0) of this study states that there is no significant relationship between sociodemographic factors and attitudes and knowledge about PT treatment, while the alternate hypothesis (H_a) also states that there is a relationship between the paired categorical variables, as shown in Table 6.

Apart from the region of respondents, the remaining demographic features did not show any significant relationship with clinical presentation ($p > 0.05$). There was a statistically significant relationship between region and clinical presentation ($\chi^2 = 16.141, p = 0.006$). Positive attitude toward clinical presentation was seen to be the highest in respondents who work in facilities located in the Ashanti region.

TABLE 6. Association between sociodemographic features and attitude of health professionals toward clinical presentation.

	Attitude		Total (N = 82)	Chi-square (χ^2)	p-value
	Negative (%)	Positive (%)			
Sex					
Male	8 (44.4%)	10 (55.6%)	18	0.033	0.855
Female	30 (46.9%)	34 (53.1%)	64		
Region					
Ashanti	11(28.2%)	28 (71.8%)	39	16.141	0.006
Central	5 (62.5%)	3 (37.5%)	8		
Eastern	8 (66.7%)	4 (33.3%)	12		
Greater Accra	7 (43.8%)	9 (56.2%)	16		
Volta	6 (100.0%)	0 (0.0%)	6		
Western	1 (100.0%)	0 (0.0%)	1		
Age (yrs.)					
18–24	8 (61.5%)	5 (38.5%)	13	1.547	0.461
25–34	27 (42.9%)	36 (57.1%)	63		
35–44	3 (50.0%)	3 (50.0%)	6		
Position					
Student	3 (75.0%)	1 (25.0%)	4	1.591	0.810
Nurse	30 (45.5%)	36 (54.5%)	66		
Midwife	3 (42.9%)	4 (57.1%)	7		
Engineer/Technician	1 (33.3%)	2 (66.7%)	3		
Medical Doctor	1 (50.0%)	1 (50.0%)	2		

TABLE 7. Association between sociodemographic features and attitude of health professionals toward maintenance of equipment.

	Attitude		Total (N = 82)	Chi-square (χ^2)	p-value
	Negative (%)	Positive (%)			
Sex					
Male	2 (11.1%)	16 (88.9%)	18	3.278	0.070
Female	21 (32.8%)	43 (67.2%)	64		
Region					
Ashanti	4 (10.2%)	35 (89.8%)	39	14.352	0.014
Central	5 (62.5%)	3 (37.5%)	8		
Eastern	5 (41.7%)	7 (58.3%)	12		
Greater Accra	7 (43.8%)	9 (56.2%)	16		
Volta	2 (33.3%)	4 (66.7%)	6		
Western	0 (0.0%)	1 (100.0%)	1		
Age (yrs)					
18–24	5 (38.5%)	8 (61.5%)	13	1.001	0.606
25–34	16 (25.4%)	47 (74.6%)	63		
35–44	2 (33.3%)	4 (66.7%)	6		
Position					

	Attitude		Total (N = 82)	Chi-square (χ^2)	p-value
	Negative (%)	Positive (%)			
Student	4 (100.0%)	0 (0.0%)	4	13.069	0.011
Nurse	14 (21.2%)	52 (78.8%)	66		
Midwife	3 (42.9%)	4 (57.1%)	7		
Engineer/Technician	1 (33.3%)	2 (66.7%)	3		
Medical Doctor	1 (50.0%)	1 (50.0%)	2		

Demographic features like the region and position of respondents showed a statistically significant relationship with attitude toward maintenance of equipment ($p < 0.05$). Positive attitude toward maintenance of equipment was seen to be higher in respondents who work in facilities located in the Ashanti and western regions when compared to those in the other regions. Also, a positive attitude toward maintenance of equipment was determined to be the highest among nurses as compared to the other professionals (Table 8).

TABLE 8. Association between sociodemographic features and attitude of health professionals toward treatment procedures.

	Attitude		Total (N = 82)	Chi-square (χ^2)	p-value
	Negative (%)	Positive (%)			
Sex					
Male	4 (22.2%)	14 (77.8%)	18	2.382	0.123
Female	27 (42.2%)	37 (57.8%)	64		
Region					
Ashanti	12 (30.8%)	27 (69.2%)	39	2.631	0.757
Central	4 (50.0%)	4 (50.0%)	8		
Eastern	5 (41.7%)	7 (58.2%)	12		
Greater Accra	7 (43.8%)	9 (56.2%)	16		
Volta	3 (50.0%)	3 (50.0%)	6		
Western	0 (0.0%)	1 (100.0%)	1		
Age (yrs.)					
18–24	7 (53.8%)	6 (46.2%)	13	5.072	0.079
25–34	24 (38.1%)	39 (61.9%)	63		
35–44	0 (0.0%)	6 (100.0%)	6		
Position					
Student	4 (100.0%)	0 (0.0%)	4	8.852	0.065
Nurse	21 (31.8%)	45 (68.2%)	66		
Midwife	3 (42.9%)	4 (57.1%)	7		
Engineer/Technician	2 (66.7%)	1 (33.3%)	3		
Medical Doctor	1 (50.0%)	1 (50.0%)	2		

There was no statistically significant association between demographic features and attitude toward treatment procedures ($p > 0.05$).

TABLE 9. Association between sociodemographic features and knowledge assessment of phototherapy.

	Knowledge		Total (N = 82)	Chi-square (χ^2)	p-value
	Poor (%)	Good (%)			
Sex					
Male	2 (11.1%)	16 (88.9%)	18	5.935	0.015
Female	27 (42.2%)	37 (57.8%)	64		
Region					
Ashanti	5 (12.8%)	34 (87.2%)	39	23.284	0.000
Central	7 (87.5%)	1 (12.5%)	8		
Eastern	5 (41.7%)	7 (58.2%)	12		
Greater Accra	9 (56.3%)	7 (43.7%)	16		
Volta	2 (33.3%)	4 (67.7%)	6		
Western	1 (100.0%)	0 (0.0%)	1		
Age (yrs.)					
18–24	7 (53.8%)	6 (46.2%)	13	3.252	0.197
25–34	19 (30.2%)	44 (69.8%)	63		
35–44	3 (50.0%)	3 (50.0%)	6		
Position					
Student	4 (100.0%)	0 (0.0%)	4	17.231	0.002
Nurse	18 (27.3%)	48 (72.7%)	66		
Midwife	4 (57.1%)	3 (42.9%)	7		
Engineer/Technician	3 (100.0%)	0 (0.0%)	3		
Medical Doctor	0 (0.0%)	2 (100.0%)	2		

As shown in Table 9, the demographic features, sex, region, and position of respondents showed a statistically significant association with knowledge on PT ($p < 0.05$). Good knowledge about PT was seen to be higher in males compared to females. In addition, good knowledge about PT was seen to be higher among respondents who work in facilities located in the Ashanti region, as compared to those in the other regions. Also, good knowledge about PT was seen to be higher in nurses and medical doctors when compared to other professionals.

DISCUSSION

The discussion summarizes and interprets the key findings of the study in relation to the research objectives: to examine how clinical presentation guides neonatal

jaundice (NNJ) treatment decisions, assess the calibration processes of phototherapy equipment, analyze the procedures involved in NNJ treatment, and evaluate the knowledge applied by health professionals in managing NNJ.

Attitude of HCPs Toward Clinical Presentation

The overall positive attitude of respondents (53.7%) toward clinical presentation suggests that the majority of the HCPs are aware of the principles of clinical assessment of treating NNJ using PT. Notwithstanding, 46.3% of the respondents who exhibited a negative attitude toward clinical presentations point out the presence of varying levels of knowledge and experience among HCPs regarding the assessment of NNJ prior to treatment. Significantly, the study findings revealed a noticeable number of respondents' (70.7%) test bilirubin levels before administering PT, indicating that HCPs understand the importance of appropriate diagnostic procedures prior to treating NNJ. This aligns with the established clinical guidelines, which advocate for a thorough assessment of bilirubin levels before commencing treatment.¹⁶ However, 26.8% of the findings indicate that respondents administered PT based on only the visual assessment of the level of bilirubin. Reliance on only visual assessment might not only result in insufficient or inappropriate treatment but also ineffective treatment of NNJ. Emerging concerns about the risks of unnecessary PT highlight the need for strict bilirubin checks or testing before starting treatment and monitoring (4–6 hour intervals during therapy to prevent overuse, following the recommendations of the 2022 AAP guidelines).

Attitude of Health Professionals Toward the Maintenance of Equipment

Generally, the study indicates a predominantly positive attitude among HCPs toward the maintenance of equipment, with 72% of respondents favorably validating this perspective. This affirms the importance of appropriately maintaining equipment for safe and effective delivery of PT.⁸ Table 3 highlights several key parameters related to the attitude of HCPs toward maintenance. Notably, the majority of the respondents (65.9%) agreed that it is crucial to regularly maintain equipment, which aligns with existing literature that emphasizes the necessity of

regular maintenance to uphold the quality of health care services and improve PT.¹⁷ Besides, the majority of the respondents (69.5%) also agreed that clinical engineers are responsible for maintaining equipment. This suggests that there is adequate collaboration between the health-care givers and the specialized professionals to ensure the safety and functionality of the equipment. Interestingly, the responses on the use of irradiance-based protocols for treatment varied. Although a substantial number of the respondents (37.8%) agreed with the statement, 24.4% remained neutral, while 3.7% disagreed. This result indicates differing levels of knowledge and familiarity with irradiance protocols among HCPs.

Attitude of HCPs Toward Treatment Procedures

The overall positive attitude (62.2%) toward treatment procedures among the respondents is encouraging, suggesting a high level of knowledge on treatment procedures. However, 37.8% of respondents expressing a negative attitude indicate the underlying concerns in knowledge about treatment procedures that need to be addressed. A significant majority of the respondents (67.1%) consider the baby's exposed body surface area (BSA) before treatment, which reflects the understanding of the basic principles of PT, where the surface area exposed to light directly correlates with treatment outcomes, which is crucial for optimizing effective treatment and minimizing potential risks. This emphasizes the importance of health-care givers to be well-versed in the physiological aspects of treating NNJ, ensuring that treatments are tailored to the individual needs of each infant. Moreover, a notable 78.0% of the respondents practiced covering the baby's eyes before administering treatment. This aligns with the established recommendation of protecting the eyes from potentially harmful light exposure during PT.¹⁸ In addition, the findings also reveal a similar level of agreement among respondents on the statements; consideration of specific treatment duration and irradiance levels with 47.6% and 45.1% responses, respectively. Even though the majority of the respondents demonstrated awareness of these factors, a noticeable proportion of respondents who disagreed and took a neutral stance suggests that this is an area that requires potential improvement in practice. Notably, a substantial portion of the respondents

(56.1%) treat infants while they are in incubators, which is a common practice in neonatal care. This approach not only provides a controlled environment for the infant but also facilitates the administration of treatments without compromising the infant's safety or stability. However, 54.9% of the respondents agreed that there is a standard measurement between the baby and the PT source. This indicates a recognition of the need for standardized protocols in NNJ treatment delivery, which affirms the existing literature on achieving effective treatment of NNJ by improving upon standardization.⁴

HCPs' Knowledge Assessment of PT

Generally, 64.4% of the respondents had good knowledge of PT, while 35.4% who had poor knowledge cannot be overlooked. This finding indicates that there is a need for HCPs to be well-informed about the knowledge regarding PT and its clinical applications. The results reveal that a notable 68.3% of respondents agreed with the statement regarding the awareness of standard treatment operation protocols. While 72.0% of respondents agreed that their facility has a standard protocol for PT, the small percentage (2.4%) who disagreed or remained neutral raises questions about the consistency and uniformity of practices across different health care facilities. This suggests that some facilities do not adopt the universal or standardized protocols, resulting in variations in treatment approaches, thereby potentially affecting the quality of treatment provided. The study findings also reveal that a substantial 84.1% of HCPs agreed on the necessity of training for users of PT devices. This indicates a strong acknowledgment of the critical role that adequate training plays in ensuring an effective and safe use of PT devices.¹⁹ Without proper training, there's a risk of misuse, potentially leading to inadequate treatment or harm to neonates. Moreover, the responses about alternative treatment options for NNJ revealed a divided opinion. While half of the respondents (50.0%) were neutral, only 20.7% agreed that their facility utilizes different treatment methods. This uncertainty suggests a possible lack of knowledge or awareness regarding alternative therapies that could be beneficial in certain cases. It indicates the need for HCPs to stay informed about all treatment options for NNJ to provide optimal care.

CONCLUSION

This study aimed to identify the variations in treatment procedures using PT by assessing the approach in the treatment administered by HCPs, focusing on the use of clinical presentation in the treatment of NNJ, the calibration process of the PT equipment, the procedure involved in the treatment of NNJ, and the knowledge used by health professionals in the treatment of NNJ. Generally, the majority of the HCPs had good knowledge of the treatment of NNJ and also demonstrated a positive attitude toward clinical presentation, maintenance process of the PT equipment, and procedures involved in the treatment of NNJ. However, the low sample size can be attributed to the fact that most of the neonatal units in the selected facilities have limited staff. On the other hand, further research can focus more on exploring how adequately educating HCPs on clinical presentation, maintenance process of the PT equipment, and standardized treatment procedures can improve the overall positive attitude toward these factors necessary for the effective treatment of NNJ.

AUTHOR CONTRIBUTIONS

Conceptualization, D.E.A., S.S.B. and A.M.; Methodology, V.W.E.; Formal Analysis, D.A. and S.D.P.; Investigation, D.E.A. and S.D.P.; Data Curation, D.E.A. and I.A.; Writing–Original Draft Preparation, D.E.A. and S.S.B.; Writing–Review & Editing, D.E.A.; Supervision, A.M.

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DATA AVAILABILITY STATEMENT

Raw institutional data are not publicly available due to hospital confidentiality agreements. Anonymized summary data may be made available upon reasonable request and subject to ethics committee approval.

CONFLICTS OF INTEREST

The author declares no conflicts of interest, including no affiliations with phototherapy equipment manufacturers.

ETHICS APPROVAL

Ethical approval was obtained from the Institutional Review Board and the ethics committees of all participating hospitals. Institutional consent was secured from each facility prior to data collection.

CONSENT FOR PUBLICATION

Written consent for publication was obtained from all participating healthcare facilities. Hospital-specific findings are presented anonymously.

FURTHER DISCLOSURE

This study forms part of a doctoral thesis at the University of Ghana. It aims to inform policy and support the standardization of phototherapy practices across healthcare facilities in Ghana.

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