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Research Article

KNOWLEDGE AND SKILLS IN MANAGEMENT OF COMMON PAEDIATRIC EMERGENCIES AMONG HEALTH WORKERS IN PRIMARY HEALTH CARE CENTRES IN ZARIA

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Suberu Omeiza Peter
MPH, Cardiorespiratory Unit, Leeds Teaching Hospitals NHS Trust, Leeds, United Kingdom

Obohwemu Oberhiri Kennedy
PhD, Department of Health, Wellbeing & Social Care, Global Banking School/Oxford Brookes University, Birmingham, United Kingdom;
PENKUP Research Institute, Birmingham, United Kingdom

Soyobi Yewande Victoria
MBBS, Oni Memorial Children Hospital, Ibadan, Nigeria; Riverside Nursing Home, Aberdeen, United Kingdom

Adesida-Ehebha Tolulope
MSPH, Sunderland Royal Hospital, South Tyneside and Sunderland NHS Foundation Trust, Sunderland, United Kingdom

Ndioho Ibiangake Friday
PhD, Department of Health Professions, Manchester Metropolitan University, Manchester, United Kingdom

Abdelkader Nourhan
MSC, Department of Health, Wellbeing & Social Care, Global Banking School/Oxford Brookes University, Birmingham, United Kingdom

Corresponding Author: Obohwemu Kennedy Oberhiri, PhD

ABSTRACT

Every day, Nigeria witnesses the loss of approximately 2,300 children under the age of five, primarily due to preventable and treatable conditions such as pneumonia, malaria, and diarrhoea. These high mortality

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rates are disproportionately higher in rural areas compared to urban regions, where primary health care (PHC) centres often represent the only accessible medical services. Given that PHC centres serve as the first point of contact with the healthcare system for most Nigerians, it is imperative to assess the capabilities of health workers in these facilities, particularly in the management of paediatric emergencies. This study aimed to evaluate the knowledge and skills of health workers in PHC centres in Zaria concerning the management of common paediatric emergencies. A cross-sectional descriptive study was conducted among 139 health workers in PHC centres, randomly selected through a multi-stage sampling technique from both Sabon Gari and Zaria Local Government Areas. Data collection was performed using a pre-tested, semi-structured, self-administered questionnaire. The collected data were analysed using SPSS version 21, with the chi-square test applied to assess associations, and results presented in tables and charts.

The findings revealed a generally low level of knowledge and skills in managing common paediatric emergencies among the health workers surveyed. Specifically, 66 (48.5%) of the respondents exhibited very poor knowledge of the causes of common paediatric emergencies, 32 (23.5%) had poor knowledge, 34 (25.0%) demonstrated good knowledge, and only 4 (2.9%) had excellent knowledge. In terms of treatment knowledge, 46.7% of respondents had very poor knowledge, 34.1% had poor knowledge, 16.3% had good knowledge, and only 3.0% had excellent knowledge. Diagnostic skills were similarly deficient, with 41 (37.3%) of respondents displaying very poor skills, 39 (35.5%) poor skills, 26 (23.6%) good skills, and only 4 (3.6%) exhibiting excellent skills. Additionally, 24.8% of respondents had very poor skills in the treatment of paediatric emergencies, 42.3% had poor skills, and 32.8% had good skills, with none achieving excellent skills. A statistically significant relationship was observed between academic qualification and knowledge of causes ($p=0.004$) and treatment ($p=0.000$), as well as between academic qualification and diagnostic skills ($p=0.006$).

The pervasive low level of knowledge and skills among PHC health workers is alarming, particularly given Nigeria's already dire childhood mortality statistics. These findings underscore the urgent need for a strategic partnership between the Department of Paediatrics at Ahmadu Bello University Teaching Hospital and the Department of Primary Health Care in Zaria and Sabon Gari Local Governments. Such collaborations could facilitate quarterly training sessions and workshops aimed at enhancing the management of paediatric emergencies in these critical frontline health centers.

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KEYWORDS

Paediatric emergencies, Nigeria, Primary healthcare, Healthcare workers, Emergency management skills, Child mortality.

INTRODUCTION

A medical emergency is an acute injury or illness that poses an immediate risk to a person's life or long-term health if not treated promptly. These emergencies become paediatric emergencies when they occur in children under 18 years of age, representing a critical area of concern in global health due to their potential to cause significant morbidity and mortality, especially in children under five years. Paediatric emergencies, such as respiratory infections, diarrheal diseases, malaria, and acute malnutrition, are among the leading causes of death in children in low- and middle-income countries (LMICs) (Oguonu et al., 2018; Elhassan et al., 2021). The pattern of these emergencies tends to be consistent across regions with similar socio-demographic characteristics, highlighting the importance of targeted interventions to improve outcomes in these settings.

For instance, a study in Khartoum, Sudan, identified respiratory tract infections (33%), diarrheal disorders (29.9%), infectious diseases (8.3%), severe malaria (5.5%), and severe acute malnutrition (3.5%) as the most common paediatric emergencies (Elhassan et al., 2021). Similarly, in a five-year review of paediatric admissions at the Children's Emergency Room of the University of Nigeria Teaching Hospital (UNTH) in Enugu, the most frequent emergencies included febrile convulsions (21.5%), severe malaria with anemic heart failure (18.4%), acute pneumonia (16.1%), and diarrheal diseases (12.3%) (Oguonu et al., 2018). These findings underscore the pervasive nature of paediatric emergencies and the need for well-equipped and trained healthcare providers to manage these conditions effectively.

The urgency of addressing paediatric emergencies aligns with global health initiatives,

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such as Millennium Development Goal 4 (MDG 4), which aimed to reduce under-five mortality by two-thirds between 1990 and 2015. Although significant progress was made, with a global reduction in under-five mortality by over 50%, many countries, including Nigeria, continue to struggle with high rates of child mortality (United Nations, 2015). In 2013, an estimated 6.3 million children under the age of five died globally, with a significant proportion of these deaths occurring in Sub-Saharan Africa due to preventable causes such as pneumonia, malaria, and diarrhea (UNICEF, 2015). In Nigeria, the situation remains dire, with the under-five mortality rate ranking among the highest globally. Despite a reduction in the mortality rate from 157 per 1,000 live births in 2008 to 128 per 1,000 live births in 2013, the rate is still alarmingly high, meaning one in every eight Nigerian children does not survive to their fifth birthday (National Population Commission, 2014).

The burden of under-five mortality is disproportionately higher in rural areas, where access to healthcare is limited, and primary health care (PHC) centers often serve as the only point of contact with the healthcare system. These PHC centers, particularly in rural communities, frequently lack the necessary manpower and adequate facilities to manage common paediatric emergencies effectively. The effectiveness of healthcare delivery at the primary level is crucial, given that PHC centers are the first point of contact for most Nigerians. However, there is a scarcity of studies evaluating the knowledge and skills of health workers in these centers, particularly in managing paediatric emergencies (WHO, 2018).

The healthcare delivery system in Nigeria operates at three levels: primary, secondary, and tertiary. Tertiary healthcare is provided by teaching hospitals and federal medical centers, which are managed by the Federal Government. Secondary healthcare, involving general hospitals, is the responsibility of State Governments. Primary healthcare, which has the widest coverage, particularly in rural areas, is managed by Local Governments. Primary healthcare was established to provide essential health services to communities, as outlined in the Alma Ata Declaration of 1978. It aims to improve health outcomes at the grassroots level through the diagnosis and treatment of common diseases, health education, disease prevention, and referrals (Federal Ministry of Health, 2018).

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Despite being the cornerstone of Nigeria's healthcare system, PHC centers are often inadequately staffed and poorly equipped. For instance, a study conducted in Lagos State revealed significant deficiencies in the infrastructure and human resources of PHC facilities (Fatusi & Jimoh, 2018). Most of the facilities lacked essential services such as water and power supply, adequate sanitary facilities, and basic medical equipment. Additionally, the study found a critical shortage of healthcare workers, with none of the existing staff having received in-service training in the previous two years. More recent studies corroborate these findings (Suberu et al., 2024a; Suberu et al., 2024b; Suberu et al., 2024c). Such deficiencies highlight the pressing need to assess and improve the competence of health workers in PHC centers, particularly in managing paediatric emergencies.

Given the high burden of paediatric emergencies and the critical role of PHC centers in providing frontline care, this study aims to assess the knowledge and skills of health workers in managing common paediatric emergencies in PHC centers in Zaria. The study will cover all categories of health workers found in selected PHC centers, including pharmacy technicians, community health extension workers (CHEWs), nurses, midwives, community health officers (CHOs), and medical officers.

The specific research questions guiding this study are:

1. How knowledgeable are the health workers in PHC centers in Zaria about the causes of common paediatric emergencies?

2. How well do these health workers understand the treatment protocols for common paediatric emergencies?

3. What is the level of skill among these health workers in diagnosing and treating common paediatric emergencies?

The primary aim of this research is to evaluate the knowledge and skills of health workers in PHC centers in Zaria in managing common paediatric emergencies. The objectives are:

1. To determine the level of knowledge regarding the causes of common paediatric emergencies among health workers in PHC centers in Zaria.

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2. To assess the level of knowledge about the treatment of common paediatric emergencies among these health workers.

3. To evaluate the skill levels of health workers in diagnosing common paediatric emergencies.

4. To assess the competence of health workers in treating common paediatric emergencies.

METHODOLOGY

Study Setting

Zaria, a key city in Kaduna State, Nigeria, is known for its diverse population and significant urban-rural split. The city hosts 55 primary healthcare centers (PHCs) that serve a population of approximately 698,348 people (National Population Commission [NPC] & ICF International, 2014). These centers are strategically located across various wards to ensure that essential health services are accessible to residents, particularly in the underserved rural areas. The selected PHCs for this study represent the broader healthcare infrastructure of Zaria, providing a comprehensive evaluation of paediatric emergency management skills among healthcare workers across both urban and rural settings.

Study Design

This study utilized a cross-sectional descriptive design to evaluate the paediatric emergency management skills of healthcare workers in Zaria's PHCs. This design was selected for its ability to offer a detailed snapshot of the current skill levels at a specific point in time, facilitating the identification of prevalent competencies and gaps (Abodunrin et al., 2018). Cross-sectional studies are particularly effective in public health research for informing policy and intervention strategies due to their capacity to assess multiple variables concurrently (Chinawa et al., 2020).

Study Participants

The study focused on healthcare workers who were actively involved in patient care within the selected PHCs. This included pharmacy technicians, junior and senior community health extension workers (J-CHEWs and S-CHEWs), nurses, midwives, community health officers (CHOs), and medical officers (doctors). To ensure that participants had sufficient exposure to

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paediatric emergencies, only those with at least six months of experience in their current role were included (Akinyemi et al., 2017). This criterion aligns with standard practices in similar studies to ensure that respondents are familiar with emergency scenarios (Okoli & Oli, 2015).

Exclusion Criteria

Healthcare workers who were on leave, either temporarily or permanently, during the data collection period were excluded from the study. Additionally, those not directly involved in patient care, such as administrative staff and non-clinical support personnel, were excluded. This exclusion criterion was implemented to focus the study on individuals actively managing paediatric emergencies, thereby enhancing the relevance and accuracy of the findings (Okoli & Oli, 2015).

Sample Size

The sample size was calculated using a formula designed for estimating proportions in cross-sectional studies, aiming for a 95% confidence level and a 5% margin of error. An initial sample size of 132 was determined based on the population of 55 PHCs, assuming a 50% proportion for maximum variability (Fagbamigbe et al., 2020). To accommodate a potential 10% non-response rate and attrition, the sample size was increased to 146 healthcare workers. This adjustment ensures sufficient statistical power to detect significant differences and associations, thus enhancing the study's reliability (World Bank, 2010).

Sampling

A multi-stage sampling technique was employed to select study participants, ensuring that the sample was representative of both Sabon Gari and Zaria Local Government Areas. In the first stage, 15 wards were randomly chosen from these two areas to ensure proportional representation. In the second stage, one PHC was randomly selected from each chosen ward, leading to the inclusion of 15 PHCs in the study. Finally, within each selected PHC, healthcare workers were chosen proportionately based on their numbers, using simple random sampling to minimize selection bias (Uzochukwu & Onwujekwe, 2004). This approach enhances the generalizability of the study findings across different PHCs in Zaria.

Data Collection Instrument

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Data were collected using a structured, pre-tested, semi-structured self-administered questionnaire. The questionnaire included sections on demographic information (age, gender, education level, and years of experience), work experience, and specific skills related to paediatric emergency management. The skills assessment focused on practical scenarios and self-rated competence levels, exclusively evaluating skills rather than knowledge or training (Abodunrin et al., 2018). The questionnaire was developed based on validated instruments from previous studies to ensure reliability and validity (Chinawa et al., 2020). It was pilot-tested on a small sample of healthcare workers not included in the final study to refine the questions and improve clarity.

Data Collection

Data collection occurred over three months, during which researchers visited the selected PHCs to administer the questionnaires. Healthcare workers were approached individually to complete the self-administered questionnaires in a private setting, ensuring confidentiality and reducing potential response bias. Researchers were present on-site to provide clarifications and assist with any difficulties in understanding the questionnaire, thereby improving the completeness and accuracy of the collected data (Akinyemi et al., 2017). Participation was voluntary, and respondents were assured that their responses would be used solely for research purposes.

Data Management and Analysis

After collection, the questionnaires were reviewed for completeness and consistency. Data were then coded and entered into SPSS version 21 for analysis. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize the demographic characteristics and skill levels of the participants. Inferential statistics, specifically chi-square tests, were employed to assess associations between categorical variables, such as academic qualification and skill levels in paediatric emergency management. A p-value of less than 0.05 was considered statistically significant, enabling the identification of factors significantly associated with varying skill levels (Okoli & Oli, 2015).

Scoring System

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A scoring system was implemented to evaluate the skills of healthcare workers in managing paediatric emergencies. Responses were categorized into four levels: very poor, poor, good, and excellent. This categorization was based on predefined criteria, with cut-off points determined from the distribution of scores in the pilot study. The scoring system allowed for an objective assessment of skill levels, facilitating the identification of areas requiring improvement and informing targeted interventions (Abodunrin et al., 2018).

Knowledge score for causes of common paediatric emergencies

Fifteen questions were used to assess the health workers' knowledge of the causes of common paediatric emergencies. Five of these questions were single response questions while 10 were multiple response questions. Each correct response was scored 2 points, and each incorrect response was scored 0. The overall maximum obtainable score for knowledge of causes of paediatric emergencies was 102 and the minimum was 0.

Knowledge score for treatment of common paediatric emergencies

Fourteen questions were used to assess the health workers' knowledge of the treatment of common paediatric emergencies. Seven of these questions were single response questions while 7 were multiple response questions. Each correct response was scored 2 points, and each incorrect response was scored 0. The overall maximum obtainable score for knowledge of treatment of paediatric emergencies was 70 and the minimum was 0.

Skill score in diagnosing and treating common paediatric emergencies

Twenty-one questions were used to assess the health workers' skill in diagnosing and treating common paediatric emergencies. Thirteen of these questions were single response questions while 8 were multiple response questions. Each correct response was scored 2 points, and each incorrect response was scored 0. The overall maximum obtainable score for skill in diagnosing and treating common paediatric emergencies was 96 and the minimum was 0.

Table 1: Grading of knowledge and skill scores

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Knowledge/Skill level	Range of scores (%)
Very poor	0-29.9
Poor	30-49.9
Good	50-74.9
Excellent	>75

Ethical Considerations

Ethical approval for this study was obtained from the Department of Community Medicine at Ahmadu Bello University, Zaria. Additionally, permissions were granted by the Directors of Primary Health Care in both Sabon Gari and Zaria Local Government Areas, as well as by the heads of all participating PHCs. Informed written consent was obtained from all participants, ensuring they were fully informed about the study's purpose, procedures, and their rights, including the right to withdraw at any time without any consequences (National Population Commission & ICF International, 2014). Confidentiality was maintained by anonymizing responses and securely storing data in accordance with ethical research standards (Federal Ministry of Health, 2010).

Study Limitations

This study's cross-sectional design captures the skills of healthcare workers as of December 2016, meaning that the findings may not reflect changes that have occurred due to shifts in healthcare policies, training initiatives, or resource availability since then. Additionally, the reliance on self-reported data for skill assessment introduces the possibility of response bias, as healthcare workers may overestimate their abilities or underreport limitations. To mitigate this, practical scenario-based questions were included to complement self-assessments, enhancing the reliability of the skill evaluation (World Health Organization, 2014). Future studies could employ longitudinal designs and objective skill assessments to provide a more comprehensive understanding of skill development over time.

Results

A total of 146 questionnaires were administered, 139 questionnairres were filled and returned giving a response rate of 95%. The results were

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analysed and presented in tables and charts, according to the study objectives.

Table 2: Socio-demographic characteristics of respondents

Variable	Frequency (n=139)	Percent (%)
Age (years)		
<26	46	33.1
26-35	49	35.3
36-45	35	25.2
>45	9	6.5
Sex		
Male	23	16.5
Female	116	83.5
Marital status		
Married	96	69.1
Single	41	29.5
Divorced	1	0.7
Widowed	1	0.7
Tribe		
Hausa	116	83.5
Yoruba	5	3.6
Igbo	4	2.9
Others	14	10.1
Religion		
Christianity	18	12.9
Islam	119	85.6
Others	2	1.4
Education status	2	
Primary	15	1.4
Secondary	122	10.8
Tertiary		87.8
Qualification	41	
Nurse/midwife	10	29.5

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CHO	25	7.2
SCHEW	20	18.0
JCHEW	15	14.4
EHO	11	10.8
Medical Lab Technician	17	7.9
Others		12.2

Most (35.3%) of the respondents were within the age group 26-35 years with a mean age of 30.9±8.8 standard deviation. Majority (83.5%) of them were females, 69.1% of them were married, 83.5% of were Hausa, majority (85.6%) of them were Muslims, most of them (87.8%) have had tertiary education, and 29.5% of them were nurses/midwives.

Table 3: Work experience of respondents

Variable	Frequency (n=139)	Percent
Below 3 years	55	39.6
3-5 years	31	22.3
Greater than 5 years	53	38.1

Fifty-five (39.6%) of the respondents had a health care working experience of less than 3 years, 31 (22.3%) had experience of between 3-5 years while 53 (38.1%) of respondents have been health workers for more than 5 years.

Table 4: PHC workers who have had some form of medical training in the last two years of practice

Medical training	Frequency (n=139)	Percent (%)
Had	91	65.5

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Not had	48	34.5

Majority (65.5%) of the respondents have had some form of medical training within the last two years preceding this study.

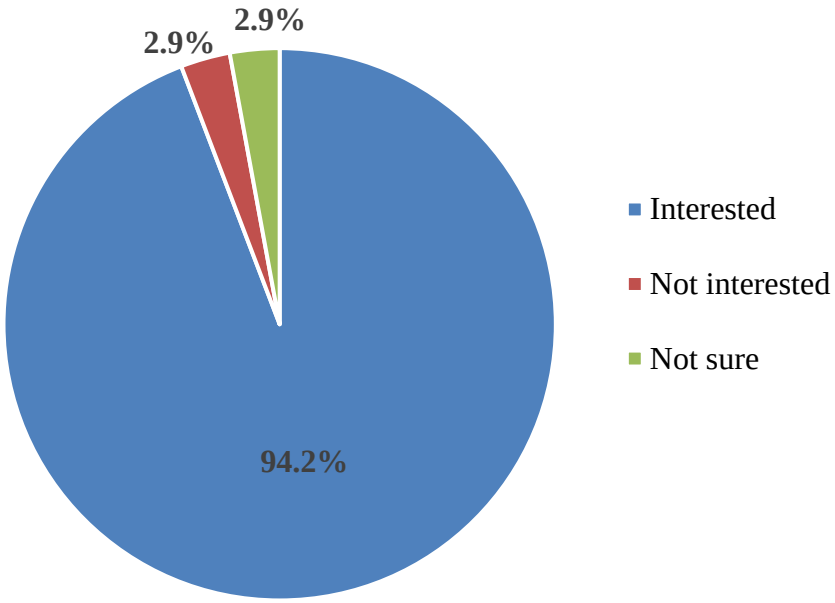

Figure 1: PHC workers who would like to attend a training to improve their knowledge of the management of common paediatric emergencies

When asked whether they would like to attend further training to improve their knowledge of the management of common paediatric emergencies if given the opportunity, almost all (94.2%) the respondents indicated interest.

Table 5: Knowledge of causes of common paediatric emergencies

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Knowledge	Frequency (n=136)	Percent (%)
Very poor knowledge	66	48.5
Poor knowledge	32	23.5
Good knowledge	34	25.0
Excellent knowledge	4	2.9

The table shows the aggregated knowledge scores (in percentage) of the causes of common paediatric emergencies. Sixty-six (48.5%) of the respondents had very poor knowledge of the causes of common paediatric emergencies, 32 (23.5%) of the respondents had poor knowledge, 34 (25.0%) had good knowledge, and only 4 (2.9%) of the respondents had excellent knowledge.

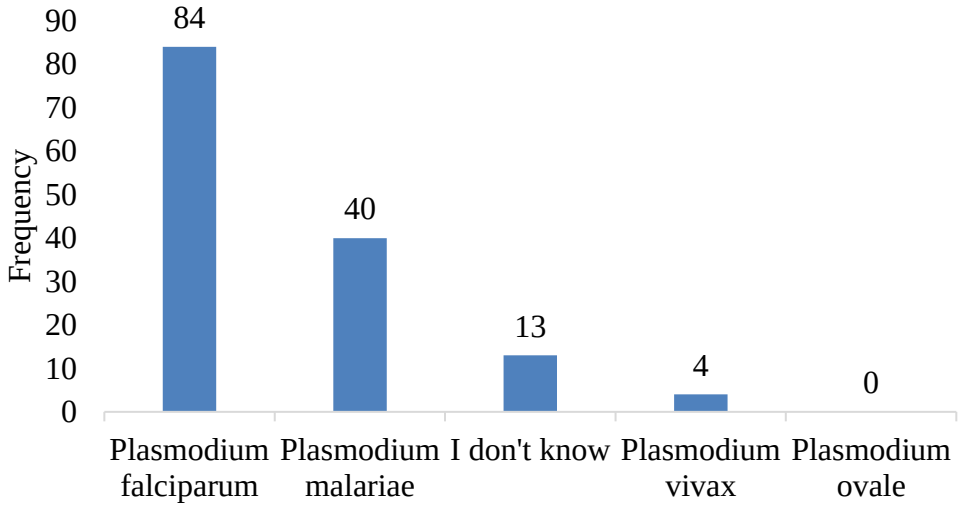

Figure 2: Knowledge of the causative organism of severe malaria

When asked about the causative organism of severe malaria, 84 out of the 139 respondents correctly identified Plasmodium falciparum as the causative organism of severe malaria; 40 and 4 respondents

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wrongly selected Plasmodium malariae and Plasmodium vivax respectively; while 13 health workers admitted ignorance of the causative organism of severe malaria.

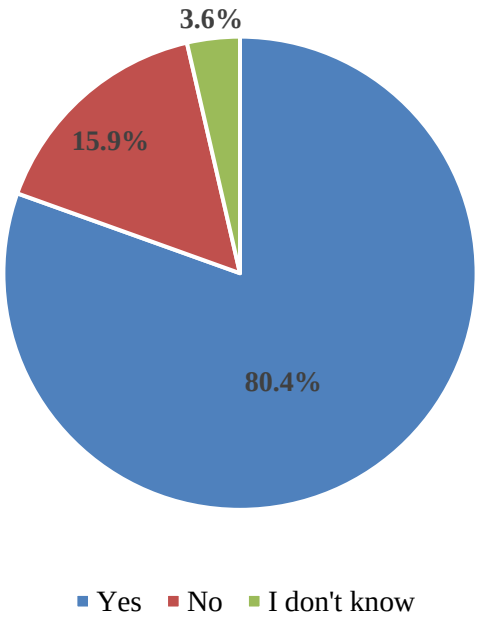

Figure 3: Knowledge of the protective role of exclusive breastfeeding in preventing diarrhoea in children

When asked whether diarrhoea in children can be prevented by exclusive breastfeeding, 80.4% responded "Yes", 15.9% responded "No", while 3.6% of responded did not know if exclusive breastfeeding had any protective effect against diarrhoea.

Table 6: Knowledge of treatment of common paediatric emergencies

Knowledge	Frequency (n=135)	Percent (%)
Very poor knowledge	63	46.7
Poor knowledge	46	34.1

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Good knowledge	22	16.3
Excellent knowledge	4	3.0

The table shows the aggregated knowledge scores (in percentage) of the treatment of common paediatric emergencies. Sixty-three (46.7%) of the respondents had very poor knowledge of the treatment of common paediatric emergencies; 46 (34.1%) had poor knowledge; 22 (16.3%) of the respondents had good knowledge, while only 4 (3.0%) of the respondents had excellent knowledge.

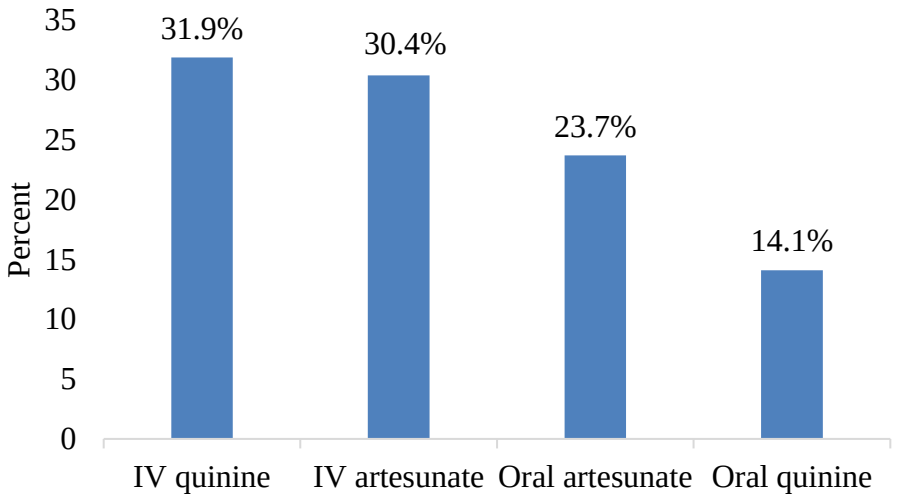

Figure 4: Knowledge of the first line drug for the initial treatment of severe malaria in children

The figure shows the choice of the health workers when asked what the first line drug for the initial treatment of severe malaria is. Thirty-one-point nine percent selected IV quinine as the first line drug for the initial treatment of severe malaria; 30.4% selected IV artesunate; 23.7% chose oral quinine, while 14.1% of the respondents chose oral quinine. WHO 2015 severe malaria treatment guideline recommends IV artesunate.

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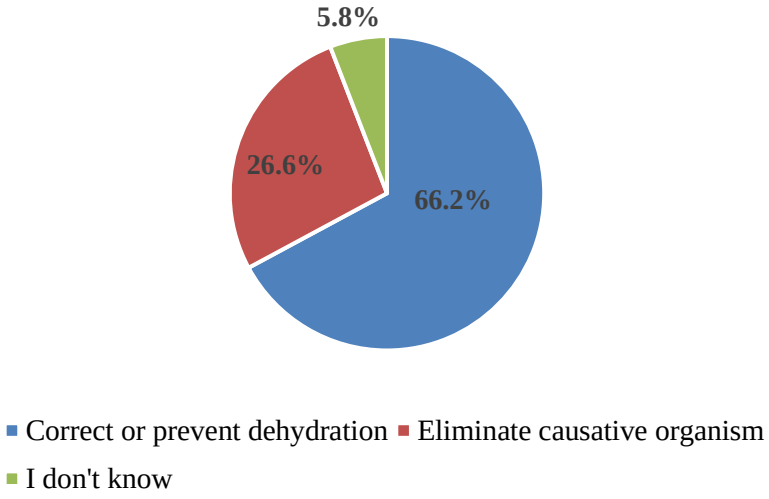

Figure 5: Knowledge of the most important treatment objective in managing acute diarrhoeal disease

The figure shows the response of the health workers when asked what the most important treatment objective was in managing acute diarrhoeal diseases. Majority of the respondents (66.2%) knew that correcting or preventing dehydration is the most important treatment objective when managing acute diarrhoeal disease.

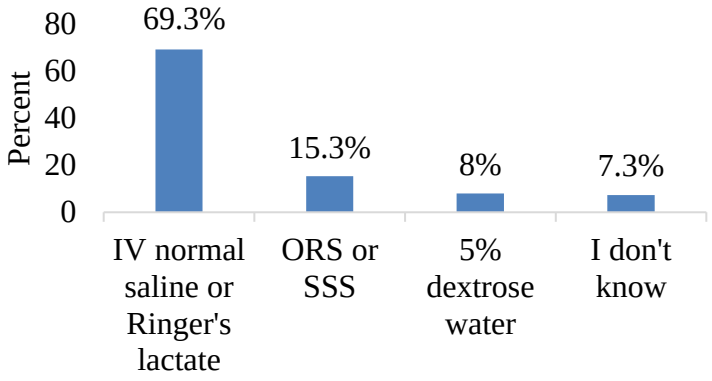

Figure 6: Knowledge of the fluid of choice in managing severe dehydration

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When asked about the fluid of choice in managing a child with severe dehydration, most of the respondents (69.3%) correctly identified IV normal saline or Ringer's lactate as the fluid of choice in managing severe dehydration; 15.3% wrongly selected ORS or SSS; 8% wrongly selected 5% dextrose water, and 7.3% of the respondent's admitted ignorance.

Table 7: Knowledge of the role of oral zinc tablet in the management of dehydration

Response	Frequency (n=139)	Percent (%)
Yes	111	79.9
No	24	17.3
I don't know	4	2.9

The table shows the response of the health workers when asked whether oral zinc tablet has any role in the management of a child with dehydration. A significant majority of the respondents (79.9%) recognized that oral zinc tablet has a role in the management of a child with dehydration. Twenty-four respondents (17.3%) wrongly selected "No", and 4 respondents (2.9%) did not know whether it has any role.

Table 8: Knowledge of the treatment of acute bacterial meningitis

Response	Frequency (n=139)	Percent (%)
Yes	73	52.5
No	38	27.3
I don't know	28	20.1

When asked whether it was advisable to treat for severe malaria concurrently with acute bacterial meningitis, most of the respondents (52.5%) selected "Yes", 38 (27.3%) selected "No", while 28 (20.1%) respondents admitted ignorance of this.

Table 9: Skills in diagnosing common paediatric emergencies

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Skill	Frequency (n=110)	Percent (%)
Very poor skills	41	37.3
Poor skills	39	35.5
Good skills	26	23.6
Excellent skills	4	3.6

The table shows the aggregated skill scores of the respondents in diagnosing common paediatric emergencies. Forty-one (37.3%) of the respondents had very poor skills in the diagnosis of common paediatric emergencies; 39 (35.5%) had poor skills; 26 (23.6%) had good skills, and only 4 (3.6%) of the respondents had excellent skills.

Table 10: Skills in diagnosing severe dehydration

Diagnosis	Frequency (n=139)	Percent (%)
Acute diarrhoeal disease with mild dehydration	18	12.9
Acute diarrhoeal disease with moderate dehydration	8	5.8
Acute diarrhoeal disease with severe dehydration	95	68.3
I don't know	18	12.9

The table shows the diagnosis made by the health workers when given the case scenario of a 1-year-old girl who presented with a history of several bouts of diarrhoea and vomiting with the following features of severe dehydration: cold clammy extremities, lethargy, inability to suck, sunken eyes and anterior fontanelle, barely palpable pulse, and loss of skin turgor. Majority (68.3%) of the respondents made an accurate diagnosis of acute diarrhoeal disease with severe dehydration; 18 (12.9%) of the respondents

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wrongly chose acute diarrhoeal disease with mild dehydration; 8 (5.8%) of the respondents wrongly chose acute diarrhoeal disease with moderate dehydration; while 18 (12.9%) of the respondents admitted that they are unable to make a diagnosis.

Table 11: Skills in diagnosing severe protein energy malnutrition 1

	Response	Frequency (n=138)	Percent (%)
Kwashiorkor is diagnosed if the child has oedema, and his/her weight is between 60-80% of expected for his age	Yes	53	38.4
	No	85	61.6
Marasmus is diagnosed if patient's weight is <60% of expected for his age and he/she has no pedal oedema	Yes	39	28.3
	No	99	71.7

This table shows the response given by the health workers when asked whether the above statements were correct. Majority of the respondents did not know the correct definition of kwashiorkor (61.6%) and marasmus (71.7%).

Table 12: Skills in diagnosing severe protein energy malnutrition 2

	Response	Frequency (n=138)	Percent (%)
Which of the following formulae will you use to calculate the expected weight (in kg) for a 16-month-old child?	weight = $\frac{n+9}{2}$	37	26.8
	weight = 2n + 8	26	18.8
	I don't know	75	54.3

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This table shows the response of the health workers when asked which of the given formulae they will use to calculated expected weight (in kg) for a 16-month-old child. Only 26 (18.8%) of the respondents know the correct formulae for calculating the expected weight for a 16-month-old child, 101 (73.2%) did not know out of which 75 (54.3%) admitted this ignorance.

Table 13: Skills in diagnosing congestive heart failure in children

Skill	Frequency (n=138)	Percent (%)
Swollen liver, fast breathing, and fast heartbeat	41	29.7
Difficulty in breathing, cough and body weakness	63	45.7
Fast breathing, headache and fever	6	4.3
I don't know	28	20.3

The table above shows the response of the health workers when asked about the cardinal signs of heart failure in children. Only 41 (29.7%) of the respondents knew the cardinal signs of heart failure in children. Sixty-three (45.7%) wrongly chose a triad of difficulty in breathing, cough and body weakness; 6 (4.3%) wrongly chose a triad of Fast breathing, headache and fever; while 28 (20.3%) of the respondents admitted ignorance of the cardinal signs of heart failure in children.

Table 14: Skills in diagnosing acute bacterial meningitis 1

Response	Frequency (n=139)	Percent (%)
Complicated measles	37	26.6
Meningococcemia	26	18.7

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Chicken pox	16	11.5
Scabies	10	7.2
I don't know	50	36.0

When given the case scenario of a girl presenting acutely with fever, headache, convulsions, loss of consciousness, body rashes and severe hypotension but no diarrhoea, only 26 respondents (18.7%) made an accurate diagnosis of meningococcaemia, while a large group of the respondents (36.0%) admitted ignorance of the right diagnosis.

Table 15: Skills in diagnosing acute bacterial meningitis 2

Investigations	Response	Frequency (n=139)	Percent (%)
CSF MCS	Yes	25	18.8
	No	114	82.0
CSF analysis	Yes	37	26.6
	No	102	73.4

When given the same case scenario as in Table 4.13 above, most of the respondents did not know that CSF MCS (82.0%) and CSF analysis (73.4%) have important roles in the diagnosis of acute bacterial meningitis.

Table 16: Skills in treating common paediatric emergencies

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Skill	Frequency (n=137)	Percent (%)
Very poor skills	34	24.8
Poor skills	58	42.3
Good skills	45	32.8
Excellent skills	0	0.0

The table shows the aggregated skill scores of the respondents in treating common paediatric emergencies. A large group (24.8%) of the respondents had very poor skills in the treatment of common paediatric emergencies; 58 (42.3%) had poor skills; while 45 (32.8%) of the respondents had good skills. None of the respondents have excellent skills in the management of common paediatric emergencies.

Table 17: Knowledge of the correct dosage schedule of artesunate for severe malaria

Response	Frequency (n=139)	Percent (%)
IV artesunate 2.4mg/kg at 0, 12 and 24 hours; then once daily for 7days	25	18.0
IV artesunate 1.4mg/kg at 0, 12 and 24 hours; then once daily for 7days	19	13.7
IV artesunate 3.6mg/kg at 0, 12 and 24 hours; then once daily for 4days	27	19.4
IV artesunate 2.4mg/kg at 0, 12 and 36 hours; then once daily for 4days	16	11.5
I don't know	52	37.4

The table shows the choices of the respondents when asked about the dosage schedule of artesunate in the management of severe malaria. Fifty-two respondents (37.4%) admitted ignorance of the correct dosage

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schedule while only 25 (18.0%) knew the correct dosage schedule. A total of 114 (82.0%) respondents did not know the correct dosage schedule of artesunate in the management of severe malaria.

Table 18: Knowledge of the composition of low osmolarity ORS

Response	Frequency (n=139)	Percent (%)
Glucose 111mmol/L, Sodium 90mmol/L, Chloride 80mmol/L, Potassium 20mmol/L, Citrate 10mmol/L	27	19.4
Glucose 75mmol/L, Sodium 75mmol/L, Chloride 65mmol/L, Potassium 20mmol/L, Citrate 10mmol/L	28	20.1
Glucose 60mmol/L, Sodium 60mmol/L, Chloride 65mmol/L, Potassium 20mmol/L, Citrate 10mmol/L	26	18.7
I don't know	58	41.7

This table represents the choices of the respondents when asked about the composition of low osmolarity ORS. Most of the respondents did not know the correct composition of Low ORS, 58 (41.7%) admitted this ignorance, while only 28 (20.1%) knew the correct composition.

Table 19: Skills in preparing salt sugar solution (SSS)

Skill	Frequency (n=139)	Percent (%)
Dissolve 1 level teaspoon of salt and 10 level teaspoons of sugar (or 5 cubes of sugar) in 2 full soft drink bottles of water	89	64.0
Dissolve 1 level teaspoon of salt and 10 level teaspoons of		

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sugar (or 5 cubes of sugar) in 1 full soft drink bottle of water	27	19.4
Dissolve ½ level teaspoon of salt and 8 level teaspoons of sugar in 2 full soft drink bottles of water	7	5.0
I don't know	16	11.5

When asked how they will advise mothers to prepare salt sugar solution at home, only 7 (5.0%) of the respondents knew the new method of constituting SSS.

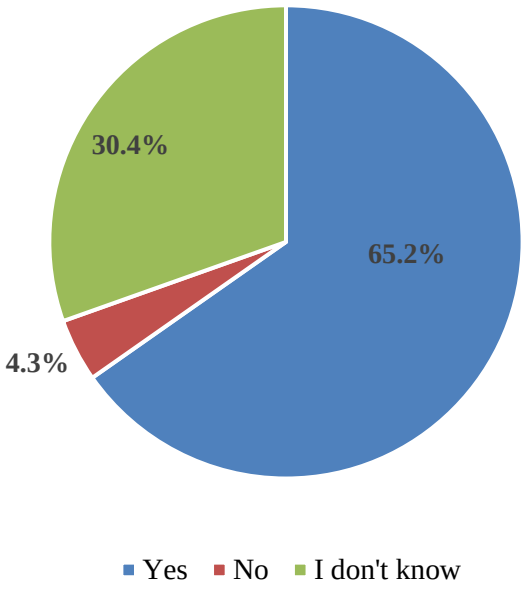

Figure 7: Knowledge of the role of ready-to-use therapeutic foods in managing a child with protein energy malnutrition

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The figure shows the response of the health workers when asked whether ready-to-use therapeutic foods (RUTF) have any role in the management of a child with PEM. Ninety respondents (65.2%) knew that ready-to-use therapeutic foods (RUTF) have a role to play in managing severe protein energy malnutrition. Four-point-three percent responded "No", while 30.4% admitted ignorance of this.

Table 20: Knowledge of the best place of treatment of severe protein energy malnutrition

Response	Frequency (n=138)	Percent (%)
Tertiary health centres	103	74.6
PHC Centres	17	12.3
I don't know	17	12.3
Home	1	0.7
Chemist's shop	0	0.0
Traditional healers	0	0.0

This table shows the response of the health workers when asked about the best place of treatment of severe protein energy malnutrition. Most of the respondents (74.6%) correctly identified tertiary health centres as the best for managing severe protein energy malnutrition. Seventeen (12.3%) chose PHC centres. Another 17 (12.3%) "did not know" the right answer. One (0.7%) respondent chose home while none of the respondents chose chemist's shop or traditional healers.

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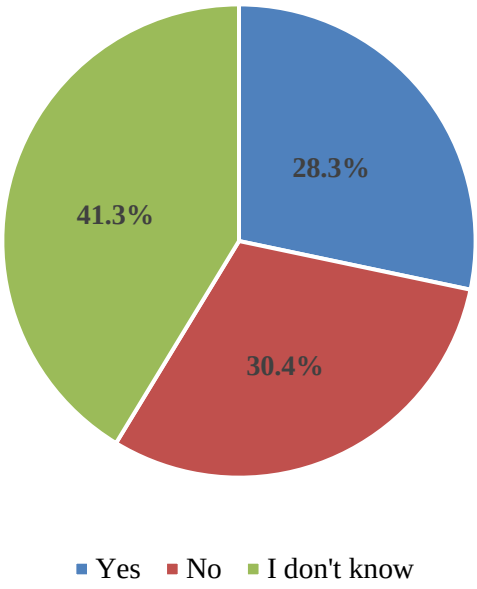

Figure 8: Skills in the treatment of congestive heart failure

When asked whether they will administer digoxin to a child with anaemic heart failure, 39 respondents (28.3%) incorrectly said "Yes", 42 of them (30.4%) correctly responded "No", while 57 of them (41.3%) admitted ignorance of the right response. Note that digoxin is contra-indicated in treating congestive heart failure from severe anaemia.

Table 21: Skills in treating acute bacterial meningitis

Response	Frequency (n=139)	Percent (%)
Give antibiotics	65	46.8
Give antiviral drugs	10	7.2
Give IV fluid therapy	34	24.5
I don't know	30	21.5

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The table shows the responses of the health workers when given the same case scenario as in Table 4.13 above and asked what treatment they will initiate first. Only 34 (24.5%) respondents recognized the importance of giving IV fluid therapy first in a girl with severe hypotension. Sixty-five (46.8%) of the respondents chose to antibiotics, 10 (7.2%) chose to give antiviral drugs while 30 (21.5%) admitted ignorance of what to do.

Table 22: Determinants of knowledge of causes and treatment of common paediatric emergencies among the health workers

Variable	Frequency (n=139)	Percent (%)	Knowledge of causes	Knowledge of treatment
Age (years)				
<26	46	33.1		
26-35	49	35.3	X^2=10.065	X^2=7.438
36-45	35	25.2	P=0.345	P=0.592
>45	9	6.5		
Sex				
Male	23	16.5	X^2=2.463	X^2=0.628
Female	116	83.5	P=0.482	P=0.890
Marital status				
Married	96	69.1		
Single	41	29.5	X^2=7.577	X^2=5.285
Divorced	1	0.7	P=0.577	P=0.809
Widowed	1	0.7		
Education status				
Primary	2	1.4	X^2=4.296	X^2=5.454
Secondary	15	10.8	P=0.637	P=0.487
Tertiary	122	87.8		
Qualification				
Nurse/midwife	41	29.5		
CHO	10	7.2	X^2=33.496	X^2=57.259
SCHEW	25	18.0	P=0.004	P=0.000

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JCHEW	20	14.4
EHO	15	10.8
Medical Lab Technician	11	7.9
Others	17	12.2

There was a statistically significant relationship between academic qualification and knowledge of causes (0.004) and treatment (0.000) of common paediatric emergencies among the health workers.

Table 23: Determinants of skills in diagnosis and treatment of common paediatric emergencies among the health workers

Variable	Frequency (n=139)	Percent (%)	Skills in diagnosis	Skills in treatment
Age (years)				
<26	46	33.1		
26-35	49	35.3	X^2=14.842	X^2=13.359
36-45	35	25.2	P=0.095	P=0.038
>45	9	6.5		
Sex				
Male	23	16.5	X^2=6.682	X^2=2.993
Female	116	83.5	P=0.083	P=0.224
Marital status				
Married	96	69.1		
Single	41	29.5	X^2=4.820	X^2=9.590
Divorced	1	0.7	P=0.567	P=0.143
Widowed	1	0.7		
Education status				
Primary	2	1.4	X^2=4.482	X^2=2.245
Secondary	15	10.8	P=0.612	P=0.691

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Tertiary	122	87.8		
Qualification				
Nurse/midwife	41	29.5		
CHO	10	7.2	X^2=32.097	X^2=16.891
SCHEW	25	18.0	P=0.006	P=0.077
JCHEW	20	14.4		
EHO	15	10.8		
Medical Lab Technician	11	7.9		
Others	17	12.2		

There was a statistically significant relationship between age of respondents and skills in the treatment (0.038) of common paediatric emergencies among the health workers, as well as between academic qualification and skills in the diagnosis (0.006) of common paediatric emergencies.

Table 24: Relationship between working experience and knowledge of causes and treatment of common paediatric emergencies among the health workers

Variable	Frequency (n=139)	Percent (%)	Knowledge of causes	Knowledge of treatment
Below 3 years	55	39.6	X^2=11.016 P=0.880	X^2=7.250 P=0.298
3-5 years	31	22.3		
Greater than 5 years	53	38.1		

There was no statistically significant relationship between years of working experience and knowledge of causes and treatment of common paediatric emergencies among the health workers.

Table 25: Relationship between working experience and skills in diagnosis and treatment of common paediatric emergencies among the health workers

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Variable	Frequency (n=139)	Percent (%)	Skills in diagnosis	Skills in treatment
Below 3 years	55	39.6	X^2=6.103 P=0.412	X^2=4.472 P=0.346
3-5 years	31	22.3		
Greater than 5 years	53	38.1		

There was no statistically significant relationship between years of working experience and skills in diagnosis and treatment of common paediatric emergencies among the health workers.

DISCUSSION

This study was conducted among primary healthcare (PHC) workers in Zaria to evaluate their knowledge and skills in managing common paediatric emergencies. As a descriptive cross-sectional study, it provides a critical insight into the preparedness of PHC workers in dealing with life-threatening conditions in children, which is vital for reducing child mortality, particularly in resource-limited settings.

The findings indicate that a majority (60.4%) of the respondents correctly identified Plasmodium falciparum as the causative organism of severe malaria. This contrasts with a study in Western Uganda where a significant proportion of respondents (76%) incorrectly attributed the cause of malaria to the female Anopheles mosquito rather than the malaria parasite itself (Rutebemberwa et al., 2013). The discrepancy highlights a regional variation in the understanding of malaria transmission, potentially influenced by differences in training, availability of educational resources, and public health messaging.

The overall knowledge scores among the respondents in this study revealed concerning gaps: 48.5% demonstrated very poor knowledge of the causes of common paediatric emergencies, 23.5% had poor knowledge, 25.0% had good

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knowledge, and only 2.9% had excellent knowledge. This finding underscores the urgent need for targeted educational interventions to improve the competency of PHC workers in Zaria. Comparable studies have shown that inadequate knowledge among healthcare providers is a significant barrier to effective paediatric emergency care in low-income countries (Graham et al., 2016; World Health Organization, 2018).

In terms of preventive knowledge, 80.4% of respondents knew that exclusive breastfeeding could prevent diarrhoea in children. This contrasts with a study conducted in Jigawa State, Nigeria, where only 55.8% of respondents recognized poor hygiene practices and suboptimal breastfeeding as contributing factors to diarrhoea (Abdu et al., 2013). The difference in knowledge levels may reflect regional disparities in health education and awareness programs.

Regarding the treatment of paediatric emergencies, the study found that 46.7% of respondents had very poor knowledge, 34.1% had poor knowledge, 16.3% had good knowledge, and only 3.0% demonstrated excellent knowledge. This is starkly different from findings in a tertiary care children's hospital in the United States, where 93.5% of residents achieved high scores on the standardized Paediatric Advanced Life Support (PALS) test (Auerbach et al., 2014). The disparity is likely due to differences in the educational background, training opportunities, and healthcare infrastructure between the two countries, emphasizing the need for contextualized training programs that address the specific challenges faced by PHC workers in Nigeria.

The study also revealed significant gaps in knowledge about the management of severe malaria. Only 30.4% of the health workers correctly identified intravenous (IV) artesunate as the first-line drug for the initial treatment of severe malaria, while 31.9% selected IV quinine, and a concerning 23.7% opted for oral quinine. This contrasts sharply with findings from Western Uganda, where 73% of respondents identified parental quinine as the drug of choice for complicated malaria (Rutebemberwa et al., 2013). Furthermore, only 18.0% of respondents in this study knew the correct dosage schedule for artesunate, with a significant majority (82.0%) admitting ignorance of the correct dosage. This is concerning, given that correct dosing is critical to

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the effective treatment of severe malaria and preventing drug resistance (World Health Organization, 2015).

Regarding the use of oral zinc tablets in managing dehydration, 79.9% of respondents recognized its importance, which contrasts with findings from Jigawa, where only about 20% would include zinc as adjunct therapy (Abdu et al., 2013). This discrepancy might be attributed to the differing levels of exposure to updated treatment guidelines or variations in local healthcare practices.

The overall skill scores in diagnosing common paediatric emergencies were similarly concerning: 37.3% of respondents had very poor diagnostic skills, 35.5% had poor skills, 23.6% had good skills, and only 3.6% demonstrated excellent skills. When presented with a case scenario indicative of severe dehydration, only 68.3% of the respondents made an accurate diagnosis. This is in contrast with a study in Jigawa where 40.3% of respondents could not accurately classify dehydration (Abdu et al., 2013). Furthermore, only 18.8% of respondents knew the correct formula for calculating the expected weight for a 16-month-old child, and a mere 29.7% were aware of the cardinal signs of heart failure in children. Such gaps in diagnostic knowledge are particularly troubling in resource-limited settings where misdiagnoses can lead to fatal outcomes (Graham et al., 2016).

The study also revealed inadequate knowledge and skills in managing severe protein-energy malnutrition (PEM). Although 65.2% of respondents were aware that Ready-to-Use Therapeutic Foods (RUTF) play a role in treating severe PEM, only 74.6% correctly identified tertiary health centres as the most appropriate setting for managing these cases, with 12.3% mistakenly believing that PHC centres were suitable. This highlights the need for clearer guidelines and training on the referral process and the management of severe malnutrition (WHO, 2013).

The overwhelming interest in further training, expressed by 94.2% of respondents, reflects a recognition of these knowledge gaps and a desire to improve their competence in managing paediatric emergencies. This finding aligns with global trends emphasizing the importance of continuous professional development to

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maintain high standards of healthcare delivery (World Health Organization, 2018).

There was a statistically significant relationship between academic qualification and knowledge of the causes ($p = 0.004$) and treatment ($p = 0.000$) of common paediatric emergencies. Additionally, the relationship between academic qualification and diagnostic skills ($p = 0.006$) further supports the notion that higher educational attainment is associated with better clinical performance. These findings are consistent with other studies that have shown that higher levels of education among healthcare providers correlate with improved patient outcomes (Lassi et al., 2016; Suberu, Obohwemu & Soyobi, 2024).

Recommendations

To address the identified gaps in knowledge and skills, the following recommendations are proposed:

1. The Department of Primary Health Care in both Zaria and Sabon Gari Local Governments should collaborate with the Department of Paediatrics at Ahmadu Bello University Teaching Hospital to organize quarterly training sessions and workshops focused on the management of common paediatric emergencies. These sessions should cover both theoretical knowledge and practical skills, using case-based learning to enhance retention and application in clinical settings.

2. The Kaduna State Government should consider employing medical doctors to supervise the activities of other health workers in as many PHC centers as possible. This supervisory role is crucial for ensuring that best practices are followed and that complex cases are appropriately managed or referred.

3. Senior PHC workers, particularly those with higher qualifications and more experience, should take an active role in mentoring and guiding younger or less experienced staff when managing paediatric emergencies. This peer-learning approach can be an effective way to disseminate knowledge and improve the overall competency of the healthcare team.

Conclusion

The study's findings reveal a generally low level of knowledge and skill in managing common paediatric emergencies among PHC workers in Zaria. Nearly half of the respondents had very

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poor knowledge of the causes and treatment of paediatric emergencies, and a significant proportion lacked the necessary skills to diagnose and manage these conditions effectively. These gaps are alarming, considering the critical role PHC centers play in providing frontline care in Nigeria's healthcare system.

The results underscore the urgent need for targeted training programs to enhance the knowledge and skills of PHC workers, particularly in diagnosing and managing life-threatening paediatric conditions. The statistically significant relationships between academic qualifications and clinical competencies further highlight the importance of formal education and continuous professional development in improving healthcare delivery.

Given the overwhelming interest in further training among the respondents, there is a clear opportunity to implement training programs that can significantly improve the management of paediatric emergencies in PHC settings. Strengthening the capacity of PHC workers is essential to achieving better health outcomes for children and reducing under-five mortality rates in Nigeria.

Conflicts of interest

The author reports no conflicts of interests.

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