



Assessing the Knowledge Gap in Paediatric Emergency Management among Primary Healthcare Workers in Zaria, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: <https://doi.org/10.56557/jomahr/2024/v9i28889>

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://prh.ikpress.org/review-history/12423>

Original Research Article

Received: 01/08/2024

Accepted: 03/10/2024

Published: 09/10/2024

ABSTRACT

Paediatric emergencies remain a significant cause of mortality in Nigeria, particularly in rural areas where primary healthcare centres (PHCs) often serve as the sole source of medical care. This study aimed to assess the knowledge gap among healthcare workers in PHCs in Zaria regarding the management of common paediatric emergencies.

A cross-sectional descriptive study was conducted among 139 randomly selected healthcare workers in Sabon Gari and Zaria Local Government Areas. A pre-tested questionnaire was used to collect data, which was analysed using SPSS version 21.

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Cite as: P. O., Suberu, Obohjemu K. O., and Soyobi V. Y. 2024. "Assessing the Knowledge Gap in Paediatric Emergency Management Among Primary Healthcare Workers in Zaria, Nigeria". *Journal of Medicine and Health Research* 9 (2):20-32. <https://doi.org/10.56557/jomahr/2024/v9i28889>.

Results revealed a generally low level of knowledge among healthcare workers regarding both the causes and treatment of common paediatric emergencies. Only a small percentage of respondents demonstrated adequate knowledge in these areas. A statistically significant association was found between academic qualifications and knowledge levels.

These findings underscore the urgent need for targeted interventions to improve the skills and knowledge of healthcare workers in PHCs. Collaborations between academic institutions and local health departments can play a crucial role in organising regular training programs to address these deficiencies and enhance the quality of care provided to children in need.

Keywords: *Paediatric emergencies; primary healthcare; healthcare workers; continuous professional development; health outcomes; rural health; healthcare disparities; healthcare access.*

1. INTRODUCTION

Paediatric emergencies continue to be a significant cause of morbidity and mortality worldwide, particularly in developing countries where healthcare systems often struggle to provide timely and effective care. Despite advancements in global health, children in low- and middle-income countries (LMICs) remain disproportionately affected by acute conditions, which can rapidly escalate to life-threatening emergencies if not managed promptly and appropriately [1,2]. Primary healthcare centres (PHCs) are frequently the first point of contact for paediatric emergencies, underscoring the critical need for healthcare workers in these settings to possess adequate knowledge and skills to manage such cases effectively [3–5].

The burden of paediatric emergencies in developing countries is well-documented, with respiratory tract infections, diarrhoeal diseases, infectious diseases, severe malaria, and severe acute malnutrition being among the most common conditions requiring emergency care [2,6]. A study conducted in Eastern Sudan identified these conditions as the leading causes of paediatric emergencies, reflecting similar trends observed across Sub-Saharan Africa [7]. In Nigeria, febrile convulsions, severe malaria, acute pneumonia, diarrhoeal diseases, and sickle cell anaemia crises have been reported as the most common causes of paediatric emergency admissions, further highlighting the significant healthcare burden these conditions pose [1,8].

Undernutrition remains a critical underlying factor that exacerbates the severity of paediatric emergencies and contributes significantly to child mortality [9]. Malnourished children are more vulnerable to infections and are at higher risk of dying from conditions such as diarrhoea, pneumonia, and malaria. The World Health

Organization (WHO) and the United Nations Children's Fund (UNICEF) have consistently reported that undernutrition is a major contributor to the global burden of paediatric mortality, particularly in LMICs where access to adequate nutrition and healthcare is limited [10,11]. Despite global efforts, including initiatives such as the Millennium Development Goals (MDGs) and the subsequent Sustainable Development Goals (SDGs), significant disparities in child health outcomes persist, particularly in rural and underserved areas.

Nigeria, the most populous country in Africa, continues to face high rates of child mortality, with preventable and treatable conditions accounting for a significant proportion of deaths among children under five [12]. The pathway to mortality from these conditions often include presentation as paediatric emergency cases to various cadre of health institutions, including primary care centres. Despite various initiatives aimed at improving healthcare access and quality, many children in Nigeria do not survive to their fifth birthday. This situation is particularly dire in rural areas, where PHCs often represent the only available healthcare services, and where healthcare workers frequently face challenges related to inadequate training, limited resources, and poor infrastructure [13–15].

Assessing the knowledge and competence of healthcare workers in PHCs is crucial for understanding the factors contributing to high child mortality rates in Nigeria. Numerous studies have highlighted deficiencies in the training, knowledge, and skills of healthcare workers in managing paediatric emergencies, which are further compounded by the lack of necessary infrastructure, equipment, and human resources [13–15]. These challenges significantly hinder the ability of healthcare workers to provide effective and timely care to children in need, often resulting in preventable deaths.

This study aims to evaluate the knowledge and skills of healthcare workers in PHCs in Zaria, Nigeria, specifically regarding the management of common paediatric emergencies. By identifying knowledge gaps and skill deficiencies, this research can provide critical insights that inform targeted interventions to improve the quality of paediatric emergency care in these settings. Addressing these gaps is essential for reducing child mortality and improving health outcomes for children in Nigeria and other similar contexts.

2. METHODOLOGY

2.1 Background of the Study Area

Zaria, located in Kaduna State, Nigeria, is a historically significant urban centre with a population of approximately 698,348 according to the 2006 census [16]. The area is characterised by a diverse ethnic composition, with Hausa, Fulani, Yoruba, Igbo, and other groups represented. The primary economic activities in Zaria include agriculture and livestock rearing.

The city has a network of 55 primary healthcare centres (PHCs) distributed across 24 wards. These facilities serve as the first point of contact for healthcare services in the community. In addition to PHCs, Zaria also has private clinics, hospitals, and traditional medical practitioners. Ahmadu Bello University Teaching Hospital serves as the main tertiary referral centre for the region.

2.2 Study Design

A cross-sectional descriptive study design was employed for this research.

2.3 Study Population

The study population consisted of healthcare workers involved in providing services at PHCs in Zaria, Kaduna State.

2.4 Inclusion Criteria

Primary healthcare workers who were actively involved in patient management at the selected PHCs and had at least six months of work experience were included in the study.

2.5 Exclusion Criteria

Healthcare workers who were on leave during the data collection period or not directly involved

in patient management, such as cleaners, were excluded.

2.6 Sample Size Determination

A sample size of 146 healthcare workers was calculated using a formula with a 95% confidence level and a 5% margin of error. A 10% attrition rate was considered, resulting in a total sample size of 159.

2.7 Sampling Technique

A multi-stage sampling method was used to select respondents. First, 15 wards were randomly selected from Zaria and Sabon Gari LGAs. Then, one PHC from each selected ward was chosen randomly. Finally, healthcare workers were selected proportionately from each PHC based on their number.

2.8 Study Instrument

A structured self-administered questionnaire was developed, adapted from previous studies, and pretested among medical students. The questionnaire consisted of four sections: socio-demographic data, work experience, knowledge of causes of common paediatric emergencies, knowledge of treatment of common paediatric emergencies, and skills in diagnosing and treating common paediatric emergencies. The paediatric emergencies assessed are as follows: severe malaria, acute diarrhoeal diseases, severe pneumonia, congestive heart failure, acute bacterial meningitis and severe acute malnutrition.

2.9 Data Collection

Data were collected in December 2016 by researchers visiting selected PHCs to administer questionnaires and provide clarifications.

2.10 Data Management

Collected questionnaires were checked for completeness, cleaned, coded, and entered into SPSS version 21 for data analysis.

2.11 Data Analysis

Data were analysed using SPSS version 21. Descriptive statistics, including frequencies and percentages, were used to summarise socio-demographic and work experience data. Chi-square tests were employed to assess associations between variables.

2.12 Scoring System

A scoring system was developed to assess knowledge and skills in paediatric emergency management. Each correct response was awarded points, and scores were categorised into very poor, poor, good, and excellent levels.

2.13 Limitations of the Study

The study was limited by its cross-sectional design, which provides a snapshot of knowledge and skills at a single point in time (December 2016). Caution should be exercised in interpreting the findings in the present context, as patterns may have changed since then. Factors such as changes in healthcare policies, training programs, and resource availability may have influenced the knowledge and skills of healthcare workers in the intervening years. Additionally, the assessment of knowledge was based on self-reported data rather than direct observation of clinical performance. This may introduce some bias into the findings, as healthcare workers may overestimate their abilities or underreport their limitations.

3. RESULTS

A total of 146 questionnaires were administered, 139 questionnaires were filled and returned giving a response rate of 95%. The results were analysed and presented in tables and charts, according to the study objectives.

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.

The Table 2 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.

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 wrongly selected *Plasmodium*

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

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

Table 1. 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 | | |
| Primary | 2 | 1.4 |
| Secondary | 15 | 10.8 |
| Tertiary | 122 | 87.8 |
| Qualification | | |
| Nurse/midwife | 41 | 29.5 |
| CHO | 10 | 7.2 |
| SCHEW | 25 | 18.0 |
| JCHEW | 20 | 14.4 |
| EHO | 15 | 10.8 |
| Medical Lab Technician | 11 | 7.9 |
| Others | 17 | 12.2 |

Table 2. Knowledge of causes of common paediatric emergencies

| 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 3 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.

The Fig. 3 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 [17].

Table 3. Knowledge of treatment of common paediatric emergencies

| Knowledge | Frequency (n=135) | Percent (%) |
|---------------------|-------------------|-------------|
| Very poor knowledge | 63 | 46.7 |
| Poor knowledge | 46 | 34.1 |
| Good knowledge | 22 | 16.3 |
| Excellent knowledge | 4 | 3.0 |

The Fig. 4 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.

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 respondents admitted ignorance.

Frequency

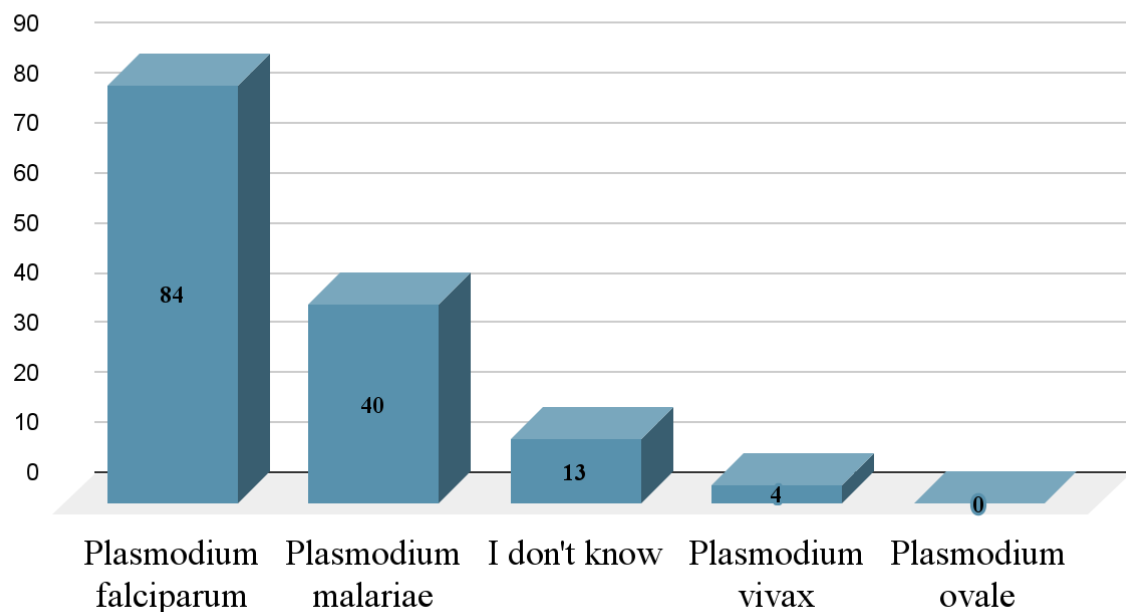


Fig. 1. Knowledge of the causative organism of severe malaria

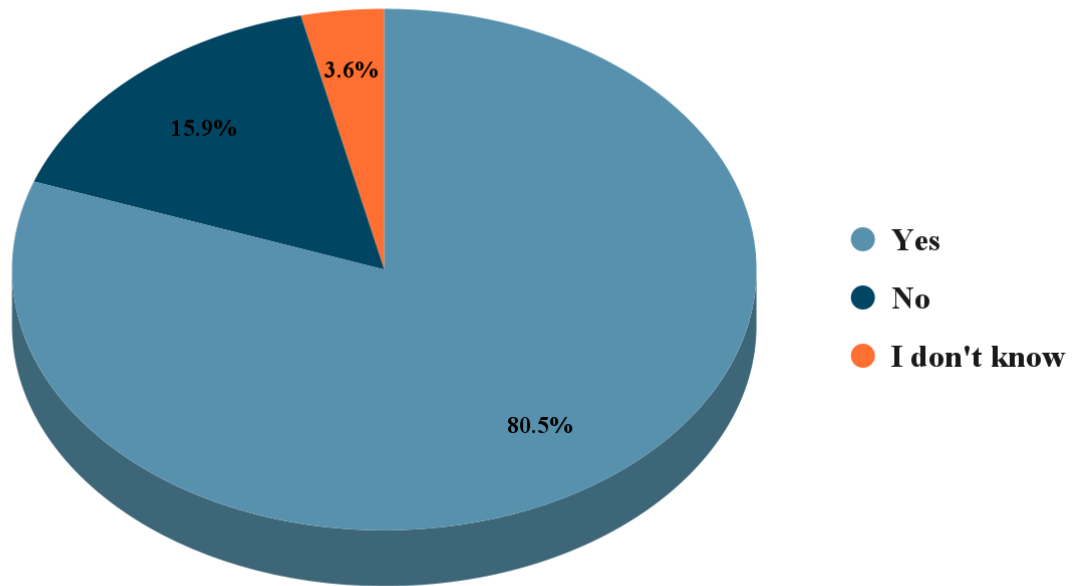


Fig. 2. Knowledge of the protective role of exclusive breastfeeding in preventing diarrhoea in children

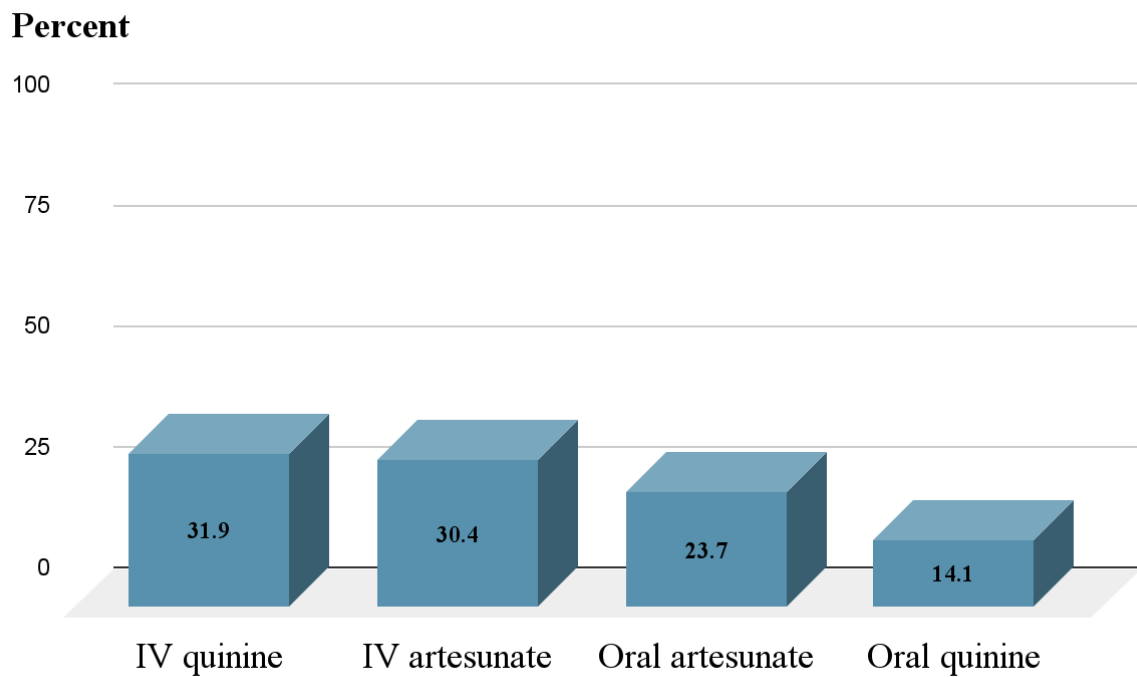


Fig. 3. Knowledge of the first line drug for the initial treatment of severe malaria in children

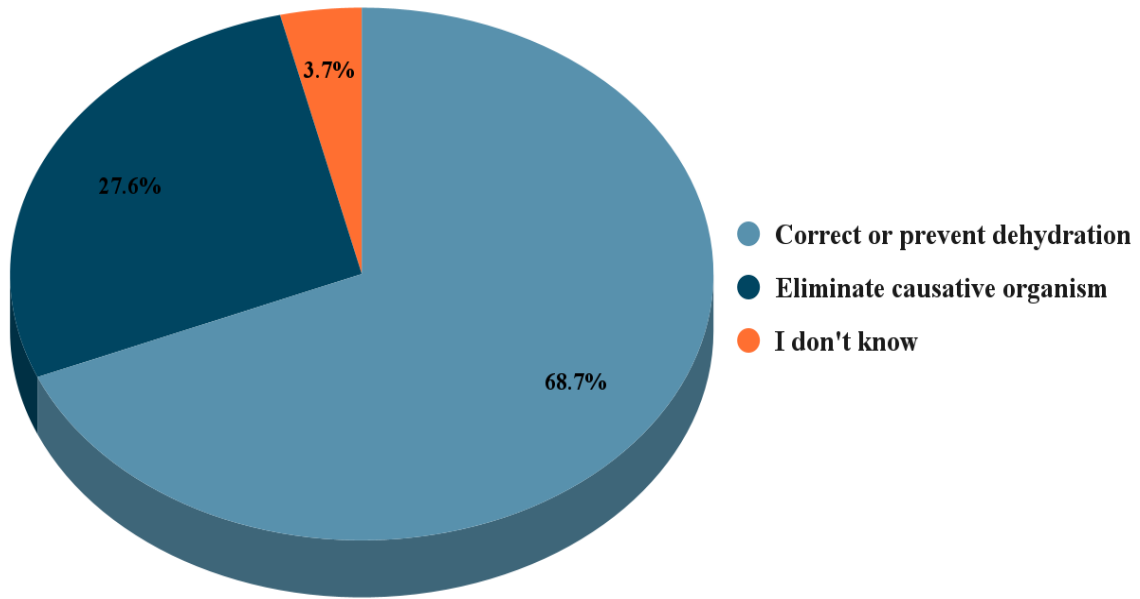


Fig. 4. Knowledge of the most important treatment objective in managing acute diarrhoeal disease

Percent

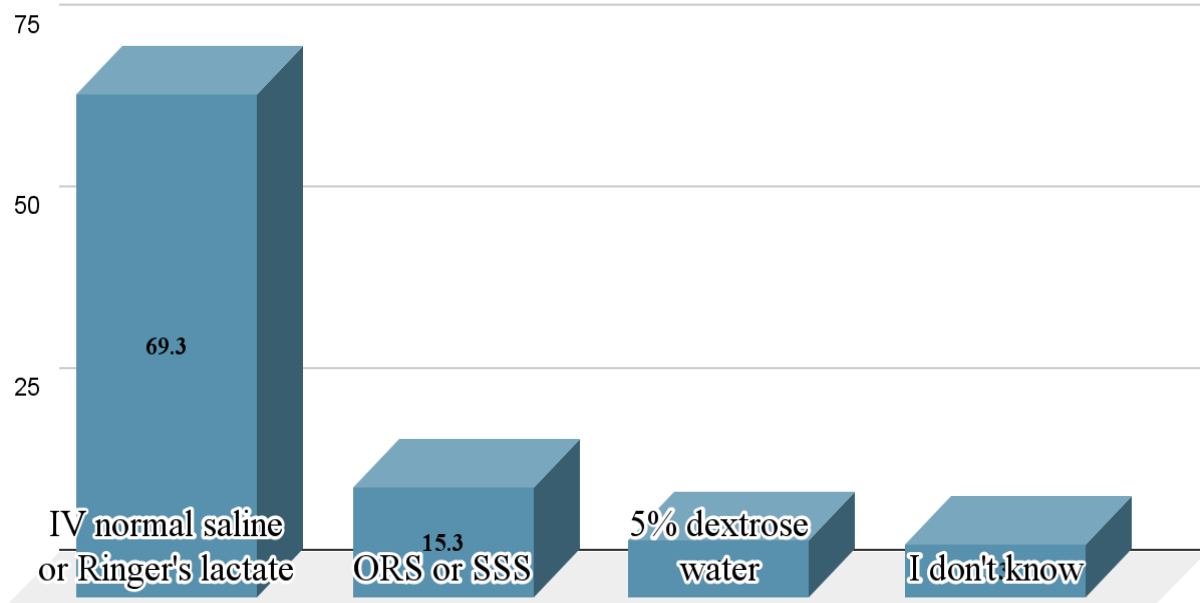


Fig. 5. Knowledge of the fluid of choice in managing severe dehydration

Table 4. 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 4 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.

When asked whether it was advisable to treat 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 5. 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 |

The Table 6 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 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.

This Table 7 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 6. 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 |

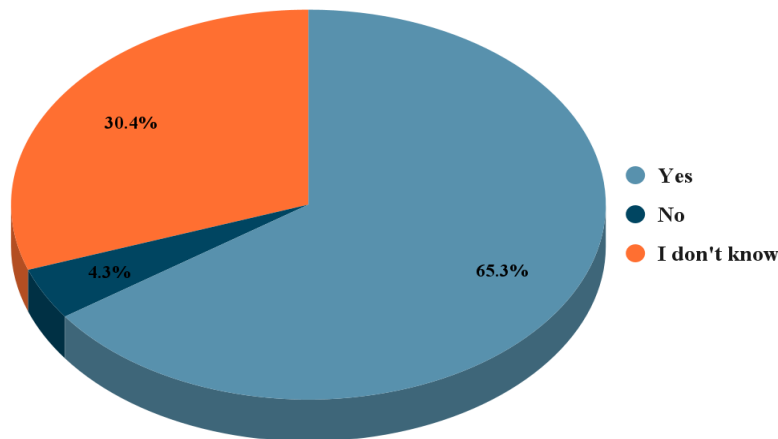


Fig. 6. Knowledge of the role of ready-to-use therapeutic foods in managing a child with protein energy malnutrition

Table 7. 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 |

The Fig. 6 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.

This Table 8 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.

Table 8. 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 |

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.

Percentage

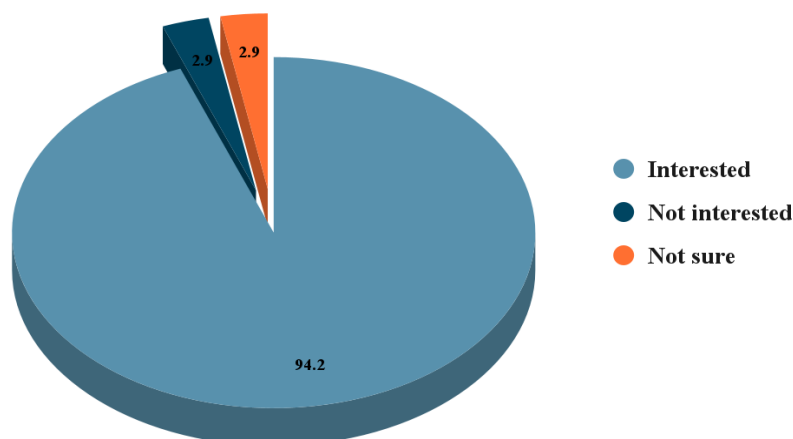


Fig. 7. PHC workers who will like to attend a training to improve their knowledge of the management of common paediatric emergencies

4. DISCUSSION

This study assessed the knowledge of primary healthcare (PHC) workers in Zaria regarding the management of common paediatric emergencies. Understanding the knowledge levels of PHC workers is crucial because their ability to recognize and manage paediatric emergencies directly impacts child health outcomes, particularly in low-resource settings where they are often the first point of contact for sick children.

4.1 Knowledge of Paediatric Emergencies

The overall knowledge regarding the causes of common paediatric emergencies was generally low among respondents, with nearly half demonstrating very poor knowledge. This finding is consistent with other studies in similar settings, such as a study conducted in Jigawa state, Nigeria, which also found that healthcare workers had limited knowledge regarding the causes and management of paediatric conditions like diarrhoea and malaria [18]. Previous studies have also identified similar knowledge gaps among healthcare providers in developing countries [19]. Such knowledge gaps can contribute to delays in diagnosis and treatment, which are critical in managing paediatric emergencies.

4.2 Knowledge of Severe Malaria

The finding that 60.4% of respondents correctly identified *Plasmodium falciparum* as the causative organism of severe malaria aligns with the expected knowledge level in a malaria-endemic region like Zaria. However, this still leaves a significant proportion of healthcare workers who are unclear about the cause, which is concerning. A similar study in Western Uganda reported even lower levels of correct knowledge, with only 24% correctly identifying malaria parasites, highlighting a widespread knowledge gap in malaria-endemic regions across Sub-Saharan Africa [20]. The disparity in knowledge across different regions underscores the need for targeted educational interventions to improve understanding of malaria pathogenesis among PHC workers.

4.3 Diarrhoea Management Knowledge

The knowledge of diarrhoea prevention was relatively high, with 80.4% of respondents correctly identifying exclusive breastfeeding as a preventive measure. However, this contrasts with the findings from Jigawa, where only 55.8% of

healthcare workers attributed diarrhoea to contamination, poor hygiene, and inadequate breastfeeding practices [18]. This difference may be attributed to regional variations in training and public health education. Nevertheless, the need for comprehensive educational programs on the prevention and management of paediatric diarrhoea remains critical, as diarrhoea is a leading cause of morbidity and mortality in children under five years of age [21].

4.4 Knowledge of Treatment Modalities

The knowledge of appropriate treatment for paediatric emergencies was also found to be inadequate. Many healthcare workers were unable to correctly identify appropriate medications and dosages for conditions like severe malaria, acute diarrhoea, and pneumonia. For instance, only 30.4% of respondents correctly identified IV artesunate as the first-line drug for severe malaria. These findings are consistent with previous research highlighting the need for improved training in paediatric emergency management [22]. However, these findings contrast sharply with the knowledge levels reported in a study from Jos, Nigeria, where over half of the respondents could correctly manage severe malaria [23]. The lack of knowledge about the correct dosage of artesunate further exacerbates the risk of poor outcomes in children with severe malaria. This knowledge gap could be due to insufficient continuing medical education (CME) opportunities or inadequate access to updated treatment guidelines in the region.

4.5 Recognition of Dehydration and ORS Composition

Despite the importance of early recognition and treatment of dehydration in children with acute diarrhoea, only 20.1% of respondents knew the correct composition of low-osmolarity ORS. This is slightly better than the finding from Jigawa, where the correct composition was known by only 5.4% of health workers [18]. The poor knowledge regarding the preparation and use of ORS is particularly concerning given its critical role in preventing mortality from dehydration.

4.6 Paediatric Emergency Knowledge Gaps

The poor knowledge of conditions like meningococcal disease, where only 18.7% of respondents correctly diagnosed it based on

clinical features, is indicative of a significant gap in the understanding of less common but severe paediatric conditions. Moreover, the high percentage of respondents who admitted ignorance of the diagnosis highlights the need for enhanced training and educational interventions focusing on the recognition and management of paediatric emergencies.

4.7 Interest in Further Training

It is noteworthy that almost all respondents expressed interest in attending further training to improve their knowledge of paediatric emergencies. This finding suggests a positive attitude among PHC workers towards continuous professional development, which could be leveraged to improve knowledge and ultimately patient outcomes. There was a significant relationship between academic qualification and knowledge of both the causes and treatment of paediatric emergencies, reinforcing the importance of formal education and ongoing training in improving healthcare delivery.

4.8 Implications for Practice and Policy

The findings of this study highlight the urgent need for targeted interventions to address the knowledge gaps and skill deficiencies among primary healthcare workers in Zaria. These interventions should include:

- **Strengthening pre-service education:** Ensuring that healthcare workers receive adequate training in paediatric emergency management during their initial education.
- **Providing in-service training:** Implementing regular training programs to update healthcare workers on the latest guidelines and best practices in paediatric emergency care.
- **Improving access to continuing medical education:** Facilitating opportunities for healthcare workers to participate in continuing medical education programs to enhance their knowledge and skills.
- **Developing and disseminating clinical guidelines:** Providing clear and evidence-based guidelines for the management of common paediatric emergencies.
- **Strengthening healthcare infrastructure:** Ensuring that PHCs have the necessary equipment, supplies,

and human resources to effectively manage paediatric emergencies.

4.9 Recommendation for Future Research

This study used a single-point cross-sectional design to assess the respondents knowledge gap in paediatric emergency management. While this provides crucial baseline data for the Zaria community, the findings are limited by the scope and generalizability of the design. As such, future research should adopt a multi-regional, prospective interventional study design across different regions of Nigeria. This approach would involve implementing targeted training interventions, followed by repeated assessments to measure changes in knowledge and practice over time. A multi-regional design will provide more comprehensive data, reflecting the variability in healthcare knowledge and practices across diverse settings.

5. CONCLUSION

The findings from this study highlight substantial knowledge gaps among PHC workers in Zaria regarding the management of common paediatric emergencies. These gaps could contribute to delayed or inappropriate treatment, leading to poorer health outcomes for children. Addressing these knowledge gaps through targeted training programs, regular updates on treatment guidelines, and improved access to educational resources is essential to enhance the quality of paediatric care at the primary healthcare level.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

CONSENT AND ETHICAL APPROVAL

Ethical approval for this study was obtained from the Department of Community Medicine at Ahmadu Bello University, Zaria. Additionally, permission was secured from the directors of Primary Health Care in both Sabon Gari and Zaria Local Government Areas, as well as from the in-charges of all participating primary healthcare facilities. Informed written consent was obtained from all respondents prior to their participation.

ACKNOWLEDGEMENT

The authors would like to thank the management and technical staff of PENKUP Research Institute, Birmingham, United Kingdom, for their invaluable contributions. Their expertise in manuscript writing and editing, adhering to Good Publication Practice (GPP3) guidelines, was instrumental in the successful completion of this work.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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