

## ORIGINAL RESEARCH OPEN ACCESS

# Assessing Preparedness for Nutritional Emergencies in Rural and Urban Healthcare Facilities: A Hospital-Based Cross-Sectional Study

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## ABSTRACT

**Background and Aims:** Effective management of nutritional emergencies requires healthcare professionals to be knowledgeable and prepared. Nutritional emergencies, characterized by chronic undernutrition and recurrent illness, lead to high stunting rates and increase the risk of rapid death in children under five by up to nine times. Nutritional emergencies, combined with limited access to healthcare and clean water, contribute to disease outbreaks like acute watery diarrhea and cholera. This study is crucial for evaluating Ghana's preparedness for nutritional emergencies and the need for an effective national response and trained emergency medical personnel. The study aimed to evaluate the preparedness for nutritional emergencies in selected rural and urban healthcare facilities in Ghana.

**Methods:** A cross-sectional study was conducted with 11 purposefully selected nutritionists and dietitians from Bono Regional Hospital (urban) and St. Peter's Hospital (rural). Data were collected using a semistructured questionnaire and analyzed using SPSS (v22) for quantitative data, while NVivo software managed qualitative data. The chi-square test evaluated differences in preparedness levels between urban and rural facilities. The study assessed participants' knowledge of nutritional emergencies, preparedness for response, and preparedness differences between rural and urban healthcare facilities.

**Results:** The study found that urban facilities were better prepared with common enteral feeds, as indicated by significant differences in stock levels ( $\chi^2 = 7.775$ ,  $p = 0.018$ ). Conversely, rural facilities showed a higher likelihood of having adequate ready-to-use therapeutic foods (RUTFs), which was unexpected and requires further investigation ( $\chi^2 = 10.431$ ,  $p = 0.001$ ). The location of a facility significantly influenced the presence of a menu plan ( $\chi^2 = 10.431$ ,  $p = 0.018$ ) for patients with nutritional emergencies, with urban facilities reporting 100% of these plans.

**Conclusion:** Allocating resources for rural healthcare facilities, enhancing training programs, and forming partnerships between healthcare facilities, local communities, and academic institutions are crucial for managing nutritional emergencies effectively.

## 1 | Introduction

The nutritional crisis in Ghana is a significant public health issue, marked by elevated malnutrition rates and inequities in

healthcare access. According to recent data, approximately 18% of children under five in Ghana experience stunting, 12% are classified as underweight, and 6% suffer from wasting [1–3]. These high rates of malnutrition contribute to around 45% of

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## Summary

### • Key findings

- The research identified significant differences in preparedness for nutritional emergencies between urban and rural healthcare facilities. Urban facilities reported a 100% implementation of menu plans for patients, whereas rural facilities had none ( $\chi^2 = 10.431$ ,  $p = 0.018$ ).
- Although knowledge of nutritional emergencies was generally high among healthcare professionals in both settings, rural facilities faced substantial challenges related to resource constraints, including limited access to essential supplies and fewer opportunities for specialized training. Urban facilities exhibited higher preparedness levels regarding usual enteral feeds, whereas rural facilities were more likely to maintain adequate stocks of RUTFs ( $\chi^2 = 10.431$ ,  $p = 0.001$ ), revealing an unexpected trend that requires further exploration.
- We also identified key factors that influence facility readiness, including training of health workers, availability of resources, and infrastructure, which can inform policy and programmatic interventions.

### • Contributions

- Our research contributes to the understanding of emergency preparedness in nutritional care by highlighting the critical role of facility location in determining readiness levels, thus informing future policies aimed at improving healthcare responses in both urban and rural settings.
- The findings emphasize the need for targeted training and resource allocation in rural healthcare facilities to enhance their capacity to handle nutritional emergencies effectively, which could lead to improved health outcomes in vulnerable populations.
- Our research also opens avenues for further investigation into the reasons behind the preparedness discrepancies between urban and rural facilities and explores strategies to enhance emergency nutrition care across various contexts.

deaths in children under five [4]. In Ghana, malnutrition is a significant public health concern, affecting a substantial portion of the population, particularly children. Complex emergencies frequently present with acute malnutrition (wasting and nutritional edema) and micronutrient deficiency illnesses [5]. This has not only immediate health implications but also long-term consequences on cognitive development, physical growth, and overall well-being. The disparities in access to healthcare services between rural and urban areas further exacerbate the challenges faced in addressing nutritional emergencies effectively.

In Ghana, health service delivery operates across three levels: primary, secondary, and tertiary. Although tertiary care is provided by four teaching hospitals in the Northern, Ashanti, Central, and Greater Accra regions, primary and secondary care facilities operate at the sub-district, district, and regional levels. The public sector employs 81.5% of Ghana's 52,258 health workforce, with ratios of one doctor per 15,259 people and one

nurse per 1251 people [6]. Rural health facilities typically face challenges of limited resources and inadequate equipment, affecting their emergency preparedness capabilities [7]. Although urban populations generally have better access to healthcare services, the urban poor often face difficult choices between under resourced public facilities or expensive private care. Self-medication and over-the-counter medication purchases are common health-seeking behaviors in low-income urban areas [8].

The critical role of effective emergency response systems in managing nutritional emergencies has been underscored in prior research [9, 10]. However, there remains a notable gap in the current understanding of the disparities in preparedness between urban and rural healthcare facilities in Ghana. Existing studies have primarily focused on specific factors such as health worker training or resource availability, rather than directly comparing preparedness levels between urban and rural settings [11]. Although a number of studies have addressed factors such as health worker training and resource availability, no study has directly compared the level of preparedness of rural and urban health facilities to respond to nutrition emergencies in Ghana. To address this gap and provide a more comprehensive analysis of this topic, it is imperative to conduct research that directly assesses and compares the preparedness of healthcare facilities in rural and urban areas in managing nutritional health emergencies and reducing health disparities in Ghana. The primary purpose of this study was to assess the level of preparedness of rural and urban health facilities in responding to nutrition emergencies, focusing on infrastructure, resources and menu planning, to provide practical recommendations for improving health responses to nutrition crises. Given the high rates of malnutrition that cause child mortality in Ghana, it is important to understand the extent to which health facilities, both in rural and urban areas, are prepared to respond to life-saving nutritional emergencies. The study was conducted in two specific hospitals: Bono Regional Hospital in Sunyani and St. Peter's Hospital in the Amansie Central district, Jacobu. This allowed for a direct comparison of preparedness levels between rural and urban settings. The findings are expected to provide insights into the current state of nutritional emergency preparedness, identify barriers to effective response, and suggest recommendations for enhancing preparedness in both rural and urban healthcare facilities in Ghana. This will ultimately inform policy and practice aimed at improving healthcare responses to nutritional crises.

## 2 | Methods

### 2.1 | Study Design, Study Site, and Study Population

The study was a cross-sectional descriptive study carried out at the nutrition and diet therapy units of the Bono Regional Hospital, Sunyani (urban healthcare), and St Peter's Hospital, Jacobu (rural healthcare). This research was undertaken in April 2023. A cross-sectional design was chosen because it allows for a broad picture of health facility readiness at a given point in time, although it does not provide insight into changes over time.

## 2.2 | Sample Size and Sampling

The study population consisted of a total of 11 nutritionists/dietitians currently employed at these hospitals who were purposefully selected. Although the small sample size limits generalizability, the purposive sampling approach is justifiable given the exploratory nature of this study. The small sample size of 11 individuals, selected through purposive sampling, was intentionally chosen to gather in-depth insights from healthcare professionals with direct experience in managing nutritional emergencies in both rural and urban settings. The motive behind purposive sampling was to get people whose characteristics reflect the topic under study, in this case, such as healthcare administrators, doctors, nurses, and other stakeholders who can speak into emergency response. This method ensures that only those who are experienced regarding the challenges and preparedness of healthcare facilities can offer detailed perspectives on the subject. Further supporting the sample size is data saturation, which occurs when no new themes or insights surface after the 11th participant, suggesting that this number was adequate to gather the crucial data required for the investigation. Because of time and resource constraints, only 11 participants were chosen. Nonetheless, the findings can be applied to similar settings and can guide future research. To address this limitation and strengthen the research design, future research could consider expanding the sample size to include a more diverse and representative range of participants from a larger number of healthcare facilities in both rural and urban areas.

## 2.3 | Inclusion and Exclusion Criteria

The study included nutritionists and dietitians currently working in the Nutrition and Diet Therapy Units of Bono Regional Hospital and St. Peter's Hospital, who consented to participate. The exclusion criteria encompassed national service personnel, interns, and previous staff of the units. The inclusion criteria focused on currently employed nutritionists and dietitians within the Nutrition and Diet Therapy Units of the participating hospitals to ensure participants possessed direct, up-to-date experience relevant to the study's focus on current preparedness for nutritional emergencies. National service personnel and interns were excluded because their experience and responsibilities within the units may be limited and less representative of the established practices and decision-making processes relevant to the research question. Similarly, previous staff (individuals who had left the department for about a month or more before the study) were excluded to ensure the data reflected the current state of preparedness within the units and to avoid potential recall bias related to past practices. These exclusions aimed to enhance the reliability and validity of the data by focusing on the most relevant and experienced personnel currently working within the units.

## 2.4 | Data Collection

Before the start of the study, approval for the study's ethical practices was sought from the institutional review board (IRB),

Kwame Nkrumah University of Science and Technology, the Ethical Review Committee of the Bono Regional Hospital, and St. Peter's Hospital. The IRB, Kwame Nkrumah University of Science and Technology (CHRPE/AP/200/23) approved the study, as well as the Ethical Review Committees of the Bono Regional Hospital and St Peter's Hospital, for the use of their facilities for the study. After receiving approval, the researcher went to the facility to get acquainted with the participants and briefly collaborated with the staff before data collection commenced. Every participant was asked for their informed consent after being informed that they could leave the study at any moment without facing any repercussions. Participants received precise, unambiguous information about the study in addition to being provided with pseudonyms and identification numbers.

The primary instrument for data collection was a semi-structured interview guide designed to facilitate in-depth discussions while allowing flexibility for follow-up questions. This approach enabled the researcher to explore participants' experiences and insights regarding nutritional emergency preparedness in detail.

Semi-structured interviews are a data collection method that pairs predetermined survey questions with interviewer-initiated open-ended, ad hoc and follow-up probes. These probes give the respondent the opportunity to provide more detailed information based on their initial answer [12]. Semi-structured interviews are just one research method for collecting data from this group of subject matter experts. They are both structured and flexible because semi-structured interviews include a set number of survey questions that will be asked of all respondents while also incorporating opportunities for more detailed inquiry into topics that arise during researcher-respondent discussions. The survey questions can be open-ended, whereby response categories are not offered and data are taken directly from the respondent. Or, the questions may be closed-ended with predetermined categories provided to participants who select a response option. The detailed inquiry portion of the semi-structured interview takes advantage of what Lune and Berg describe as "a monologue on the research topic" [13]. This means that the interviewee has the chance to express their thoughts on the topic, and the conversation is allowed to flow and evolve beyond the existing structured survey question format. Semi-structured interviews are well suited for introductory data collection and analysis of a given topic. When researchers do not have substantial scholarly knowledge of a subject, they often begin by talking with people and agency representatives to assemble enough data to help them begin to understand an area or topic of interest.

Interviews were audio-recorded to ensure an accurate capture of participants' responses, which enhanced the reliability of the data collected. This method allowed for a thorough analysis of the content shared during the interviews. The data collected from the interviews were categorized based on the assessment of knowledge, preparedness of facilities to handle nutritional emergencies, and identification of challenges faced in implementing effective nutritional emergency preparedness strategies. The measurement results were derived from the

thematic analysis of the interview transcripts. This analysis involved identifying recurring themes and patterns related to the participants' knowledge, perceptions and experiences. The findings were then organized according to the established categories, providing a comprehensive overview of the current state of nutritional emergency preparedness in the studied facilities. The semistructured interview guide used in this study underwent validity and reliability testing through conducting pilot testing with the national service personnel and interns and expert review to ensure that it effectively measured the intended constructs.

The validity of the semi-structured interview guide was assessed through content validity, ensuring that the questions included in the instrument effectively captured the intended constructs and aspects related to nutritional emergency preparedness in healthcare facilities. The content validity was established by reviewing the instrument with experts in the field of nutrition and emergency preparedness to confirm that the questions were relevant, comprehensive, and aligned with the research objectives. The reliability of the interview guide was evaluated to ensure consistency and stability in the data collected. This involved conducting pilot testing with a subset of the target population (national service personnel and interns) to assess the clarity, relevance, and appropriateness of the questions. Feedback from the pilot testing phase was used to refine and finalize the interview guide for the main data collection process. The validity and reliability testing of the semistructured instrument were conducted with a subset of participants who had similar characteristics to the main study population. This sample group helped determine the clarity and effectiveness of the interview guide in eliciting relevant responses and insights related to nutritional emergency preparedness.

The concept of saturation was taken into account while determining the study's level of rigor. It is used to assess when a study's data are sufficient to create a solid and reliable understanding of the topic under study. Because it indicates the veracity of the data, saturation is a crucial idea that is frequently taken into consideration when evaluating the quality of qualitative research [14]. It is typically understood to mean that additional data gathering and/or analysis is not necessary given the data that have already been collected or processed [15]. For this study, saturation was specifically defined as the point at which the incoming data points created little to no new meaningful information in relation to the study's objectives. This was decided by comparing each new piece of information to what has already been gathered. At the time where no fresh themes are generated or fresh data are obtained, the interviews were discontinued.

## 2.5 | Statistical Analysis

Two independent coders listened to the verbatim transcripts of the recorded interviews numerous times to make sure they fully comprehended what was stated. The data were next examined through the use of thematic analysis according to the methodology of Clarke and Braun. There are six steps in this method [16].

The researchers searched the data for related and intriguing concepts, ideas, and words before coding them. The researchers used an inductive approach to coding, giving us the freedom to create new codes as necessary to address any newly discovered themes as the data was processed. After each interview, the researchers fully listened to the audio and jotted down our initial impressions, including the overall content of the interview, any gaps or potential future research topics, and any important words or phrases that the participants repeatedly used. To create the initial codes, keywords or phrases from the participant's narratives that characterize the occurrence of interest were chosen. Codes with comparable contents were categorized or given descriptive descriptions to make sense. To find recurring trends in the data, the categories or codes were examined and sorted. The researcher was on the lookout for idea saturation and recurring patterns of comparable and disparate meanings.

The qualitative data from the interviews were transcribed verbatim, and an initial round of open coding was conducted to segment the data into meaningful units. Each segment was assigned a code that represented a specific concept or idea related to nutritional emergency preparedness. Following the initial coding phase, codes were grouped based on similarities and relationships to form broader themes. This process involved a constant comparative method, where data segments were compared and contrasted to identify recurring patterns and connections. The thematic analysis was supported by NVivo, a qualitative analysis software that was used to manage and organize the data effectively. The software facilitated the coding process, data retrieval, and theme development, enhancing the rigor and efficiency of the analysis. Examples of themes that emerged from the data analysis included "Training and Education Needs" which highlighted the importance of ongoing training for healthcare staff on nutritional emergency protocols, "Resource Constraints" which identified challenges related to the availability of essential resources in both urban and rural facilities, and "Interdisciplinary Collaboration" which emphasized the significance of collaboration between nutritionists, dietitians, and other healthcare professionals in managing nutritional emergencies effectively. "The findings from the thematic analysis were analyzed by comparing results between urban and rural facilities and linking them to emergency management theory and existing literature on health facility preparedness in responding to malnutrition."

## 3 | Results

### 3.1 | Sociodemographic Characteristics

The study results indicate that the majority of the respondents (81.8%) were from the Bono Region and currently practicing at the Bono Regional Hospital, with 54.5% of them being female and aged 30 years and below. Additionally, it was found that 72.7% of the respondents held a bachelor's degree, with 63.6% being nutrition officers, and the mean duration of work as a nutritionist/dietitian was  $4.36 \text{ years} \pm 3.70$ . Furthermore, 81.8% of the respondents reported having 10 or fewer nutritional emergencies per month, and all respondents had received training on nutritional emergencies, with 27.3% receiving their training in 2022, as shown in Table 1.

**TABLE 1** | Sociodemographic characteristics.

Variable	Frequency ( <i>n</i> )	Percentage (%)	Total (%)
Region			
Ashanti	2	18.2	
Bono	9	81.8	100
District			
Amansie Central	2	18.2	100
Sunyani Municipal	9	81.2	
Hospital			100
Bono Regional Hospital	9	81.8	
St. Peter's Hospital	2	18.2	100
Gender			
Male	5	45.5	
Female	6	54.5	100
Age (years)	Mean = 31.0 ( $\pm$ 4.49)		
$\leq 30$	6	54.5	
$\geq 31$	5	45.5	100
Highest education			
Diploma	2	18.2	
BSc	8	72.7	
MPH	1	9.1	100
Rank			
Nutrition officer	7	63.6	
Senior nutrition officer	1	9.1	
Principal nutrition officer	2	18.2	
Senior dietitian	1	9.1	100
Duration of work as a nutritionist/dietitian	Mean = 4.36 ( $\pm$ 3.70)		
$\leq 5$	8	72.7	
$\geq 6$	3	27.3	100
Duration of work as nutritionist/dietitian in the nutrition and diet therapy unit	Mean = 3.09 ( $\pm$ 3.11)		
$\leq 5$	9	81.8	
$\geq 6$	2	18.2	100
Average nutritional emergencies in the unit/facility per month	Mean = 8.82 ( $\pm$ 6.08)		
$\leq 10$	9	81.8	
$\geq 11$	2	18.2	100
Have you obtained training in nutritional emergencies?			
Yes	11	100.0	100
Which year did you receive the training?			
2010	2	18.2	
2015	1	9.1	
2018	2	18.2	
2019	1	9.1	
2021	2	18.2	
2022	3	27.3	100

(Continues)



TABLE 1 | (Continued)

Variable	Frequency (n)	Percentage (%)	Total (%)
How many continuous professional developments have you taken in a year?	Mean = 9.36 ( $\pm$ 7.606)		
≤ 10	7	63.6	
≥ 11	4	21.6	100
How many of the CPDs covered nutritional emergencies in the year?	Mean = 1.91 ( $\pm$ 1.58)		
1	7	63.6	
2	2	18.2	
5	2	18.2	100

TABLE 2 | Level of knowledge of nutritionists/dietitians.

Variable	Not at all n (%)	A little bit n (%)	Somewhat n (%)	Quite a bit n (%)	Very much n (%)
Heard about nutritional emergencies	0 (0)	0 (0)	0 (0)	0 (0)	11 (100.0)
Know the importance of nutrition during emergencies	0 (0)	0 (0)	0 (0)	0 (0)	11 (100.0)
Classify nutritional emergencies	0 (0)	0 (0)	1 (9.1)	1 (9.1)	9 (81.8)
Can identify data to determine dietary requirements in a nutritional emergency	0 (0)	0 (0)	1 (9.1)	1 (9.1)	9 (81.8)
Can manage nutritional emergency cases	0 (0)	0 (0)	1 (9.1)	1 (9.1)	9 (81.8)
Metric	Minimum	Maximum	Average	Standard deviation	Interpretation
Knowledge	4.60	5.00	4.96	0.12	High average knowledge, consistent across respondents

### 3.2 | Level of Knowledge of Nutritionists/Dietitians

Table 2 presents the results on the level of knowledge of the respondents in the study, showing that all respondents (100.0%) were highly aware of nutritional emergencies and the importance of nutrition during emergencies. A majority of the respondents (81.8%) reported being able to classify nutritional emergencies, knowing the necessary data to determine dietary requirements, and having the knowledge to manage nutritional emergency cases.

### 3.3 | Level of Preparedness of Nutritionists/Dietitians

Table 3 provides a summary of the respondents' preparedness for nutritional emergencies. The findings reveal that 81.8% of the respondents strongly agreed that there is an existing plan to notify nutrition/dietetic staff during nutritional emergencies, and a similar percentage (81.8%) strongly agreed that there is a menu plan for patients with nutritional emergencies. However, the majority of respondents (72.7%) indicated a moderate level of agreement that there is an adequate stock level for usual enteral nutritional feeds in case of nutritional emergencies, and 81.8% strongly disagreed that there is an adequate stock level of ready-to-use therapeutic foods (RUTFs) in child nutritional emergency cases.

### 3.4 | Comparison of the Level of Preparedness of Rural and Urban Healthcare Facilities in Nutrition Emergency Situations

Table 4 shows that respondents from the urban hospital exhibited a higher level of awareness regarding the existence of a menu plan for patients with nutritional emergencies compared to respondents from the rural hospital, and this association was statistically significant. Similarly, respondents from the urban hospital displayed somewhat higher awareness of an adequate stock level of usual enteral nutritional feeds during nutritional emergencies compared to respondents from the rural hospital, and this association was also statistically significant. In contrast, respondents from the rural hospital demonstrated a greater awareness of an adequate stock level of RUTFs in child nutritional emergency cases compared to respondents from the urban hospital, and this association was statistically significant as well.

### 3.5 | Barriers to Effective Nutritional Emergency Care

Table 5 indicates that a high percentage of respondents (81.8%) strongly agreed that there is a link between the hospital emergency unit and the nutrition and diet therapy unit in case of nutritional emergencies. Additionally, a majority of

**TABLE 3** | Level of preparedness of nutritionists/dietitians.

Variable	Not at all n (%)	A little bit n (%)	Somewhat n (%)	Quite a bit n (%)	Very much n (%)
Existing plan to notify nutritionist/ dietitian in nutritional emergency	0 (0.0)	0 (0.0)	0 (0.0)	2 (18.2)	9 (81.8)
Menu plan for patients with nutritional emergencies	0 (0.0)	0 (0.0)	2 (18.2)	0 (0.0)	9 (81.8)
Adequate stock for usual enteral feeds in nutritional emergencies	2 (18.2)	0 (0.0)	8 (72.7)	1 (9.1)	0 (0.0)
Adequate stock for usual parenteral feeds in nutritional emergencies	2 (18.2)	0 (0.0)	8 (72.7)	1 (9.1)	0 (0.0)
Adequate stock for RUTFs in child nutritional emergency cases	9 (81.8)	0 (0.0)	0 (0.0)	0 (0.0)	2 (18.2)

  

Metric	Minimum	Maximum	Average	Standard deviation	Interpretation
Preparedness	2.80	3.60	3.33	0.22	Lower average preparedness than knowledge, suggesting a gap between knowing and acting, relatively consistent across respondents

**TABLE 4** | Comparison of the level of preparedness of rural and urban healthcare facilities in nutrition emergency situations.

Variable	Place of facility		Fisher's exact test (p value) n (%)
	Urban n (%)	Rural n (%)	
There is an existing plan to notify the nutrition/dietetic staff when there is a nutritional emergency			
Quite a bit	1 (50.0)	1 (50.0)	1.345 (0.345)
Very much	8 (88.9)	1 (11.1)	
There is a menu plan for patients with nutritional emergencies			
Somewhat	0(0.0)	2(100.0)	10.431 (0.018)
Very much	9 (100.0)	0 (0.0)	
There is an adequate stock level for usual enteral nutritional feeds in case of nutritional emergencies			
Not at all	0 (0.0)	2 (100.0)	7.775 (0.018)
Somewhat	8 (100.0)	0 (0.0)	
Quite a bit	1 (100.0)	0 (0.0)	
There is an adequate stock level for usual parenteral nutritional feeds in case of nutritional emergencies			
Not at all	0 (0.0)	2 (100.0)	7.775 (0.018)
Somewhat	8 (100.0)	0 (0.0)	
Quite a bit	1 (100.0)	0 (0.0)	
There is an adequate stock level for ready-to-use therapeutic foods (RUTFs) in child nutritional emergency cases			
Not at all	9 (100.0)	0 (0.0)	10.431 (0.001)
Very much	0 (0.0)	2 (100.0)	

*Note:* Fisher's exact test was used to compare categorical variables between groups due to small sample sizes and low expected frequencies, which makes it more appropriate than the chi-square test in this context.

respondents (54.5%) strongly agreed that there is a link between the various doctors and nurses in the facility and the nutrition and diet therapy unit during nutritional emergencies. However, only 36.4% of the respondents indicated a moderate level of

agreement regarding the link between kitchen staff and the nutrition and diet therapy unit during nutritional emergencies. Most respondents (63.6%) strongly agreed that the number of staff in the nutrition and diet therapy unit is sufficient to handle

**TABLE 5** | Barriers to effective nutritional emergency care.

Variable	Not at all n (%)	A little bit n (%)	Somewhat n (%)	Quite a bit n (%)	Very much n (%)
Link between emergency unit and nutrition unit	1 (9.1)	0 (0.0)	1 (9.1)	0 (0.0)	9 (81.8)
Link between doctors and nurses and diet unit	0 (0.0)	0 (0.0)	0 (0.0)	5 (45.5)	6 (54.5)
Link between kitchen staff nutrition unit	3 (27.3)	0 (0.0)	2 (18.2)	4 (36.4)	2 (18.2)
Enough staff for nutritional emergencies	1 (9.1)	0 (0.0)	2 (18.2)	1 (9.1)	7 (63.6)
Necessary infrastructure, expertise, and resources are available	3 (27.3)	0 (0.0)	1 (9.1)	6 (54.5)	1 (9.1)
Technological applications available	5 (45.5)	0 (0.0)	0 (0.0)	6 (54.5)	0 (0.0)
Metric	Minimum	Maximum	Average	Standard deviation	Interpretation
Barriers	2.80	3.60	3.33	0.22	Moderate average barriers, with significant variation among respondents. A low minimum indicates critical areas needing improvement.

nutritional emergencies, whereas a majority (54.5%) indicated a moderate level of agreement regarding the availability of necessary infrastructure, expertise and resources. Lastly, 45.5% of the respondents strongly disagreed with the statement that there are technological applications that facilitate effective nutritional emergency response.

## 4 | Qualitative Results

### 4.1 | Level of Knowledge of Nutritionists/Dietitians

The degree to which research participants comprehend, are aware of, or are acquainted with the subject, methodology, or setting of the study is referred to as participant knowledge. Participants showed their knowledge of nutritional emergencies and the importance of nutrition during emergencies. One participant, Abena said,

*With regards to nutritional emergencies, there is SAM, MAM, burns, dysphagia.*

(Abena)

Again, participants revealed the classifications of nutritional emergencies as can be seen in the words of Irene:

*I know how to classify nutritional emergencies. For instance, I know what to look out for in a nutritional emergency; if it is SAM or MAM, I know what to look out for.*

(Irene)

It was however interesting to note that nutritional emergencies were not heard of regularly at some facilities. This is evident as revealed by another participant:

*You don't really hear of adult nutritional emergencies at the facility. It is once in a while that they come up.*

(Kwadwo)

From these, we realize how the knowledge of nutritional emergencies holds importance in health facilities.

One other study supports these findings where the authors observed that less than 50% of the students surveyed (47%) reported having encountered information on nutrition support during their training [17]. This indicates a significant gap in knowledge among future nutrition professionals regarding essential nutrition support practices. However, another study conducted a real-time job analysis of an ICU RDN, which revealed that medics had to rapidly adapt their practices in response to the unprecedented challenges posed by the pandemic [18]. This adaptability indicates a level of knowledge and readiness to handle emergency situations.

### 4.2 | Level of Preparedness of Nutritionists/Dietitians

The level of preparedness of every health facility to check nutritional emergencies is very crucial. Ensuring facility readiness is an essential first step towards improving the quality of care in LMICs. Readiness, as conceptualized by WHO, is the capacity of a facility to provide services to a defined minimum standard, including the presence of trained staff, commodities, and equipment; appropriate systems to support quality and safety; and provider knowledge [19]. The study sought to find out from participants how ready their facilities were to handle such cases. One participant said:

*Within the hospital, we do not have enteral and parenteral feeds, rather, the prescription is written for relatives or caretakers of the patients to purchase outside the hospital.*

(Jemimah)

This shows how health facilities should prioritize getting resources to attend to emergencies.



### 4.3 | Barriers to Effective Nutritional Emergency Care

Barriers to successful nutritional emergency care include those that prevent prompt and appropriate nutrition interventions during emergencies such as natural disasters, conflicts, or pandemics. These limitations include restricted access to food and resources, inadequate infrastructure, a scarcity of competent healthcare workers, logistical difficulties, cultural or dietary prohibitions, and insufficient money or support. Participants revealed the insufficiency of staff in their health facilities:

*The staff are insufficient for the kind of workload for a 'big' hospital. The workload is usually much as some stay at the unit and the rest are dispatched to the other wards (9 staff). Also, not many of us have been in the system for long so some are still learning on the job. When it comes to resources for effective work, I must say that they are inadequate. Sometimes we struggle with resources to even prepare feed for SAM and MAM patients.*

(Joseph)

Another participants, Gifty and Angela, also said,

*There is a link between the nutrition and dietetic staff and the kitchen staff. As a senior dietician, I plan patient's menu, print them and hand them over to the matron to follow, while a copy is also given to the patient. The challenge is that the amount of the insurance claim is little so the kitchen staff are not able to prepare a variety of meals.*

(Gifty)

*There is an existing plan to notify staff. All wards have the contact numbers of the nutrition and diet therapy unit pasted on their notice boards. It becomes a challenge when other stuffs are pasted on the notice boards to cover our contact or the hospital changes staffs for the year. Mostly, new staff members don't get our contacts early.*

(Angela)

This agrees with a finding from one study that competing priorities within the healthcare system and insufficient budgetary allocations create barriers to effective nutritional emergency preparedness [20]. From these results, it is important for health facilities to remove all barriers to ensure effective service delivery.

## 5 | Discussion

The results revealed that the majority (81.8%) of the nutritionists/dietitians practiced in the urban healthcare facility. This confirms the assertion that the majority of health professionals are said to work in metropolitan regions [21]. The distribution in gender was relatively balanced with a slight female majority (54.5%). In both healthcare facilities, the average age of the

nutritionists/dietitians was 31 years, with a range of ages skewed toward those 30 years and younger  $\pm 4.49$ . This shows that the personnel employed in the domains of nutrition and dietetics at the healthcare institutions under examination (rural and urban) are relatively young. In a related study, it was shown that Ghana suffers from a shortage of dietitians and nutritionists with the average age of Ghana's nutritionists being 31 years and 63.3% of respondents being under the age of 35 [22]. The study also found that Ghana had a small number of licensed dietitians and that the field was not well known or understood. Most of the respondents in the urban healthcare facility held a bachelor of science (BSc) in nutrition (72.7%) and worked as nutrition officers (63.6%). On the other hand, the respondents from the rural healthcare facility held a diploma in nutrition. This suggests that there may be gaps in the knowledge base for those working at rural healthcare facilities when it comes to responding effectively during an emergency. Higher educated healthcare professionals, such as those with a BSc in nutrition, are more likely to be knowledgeable and skilled in emergency response [23]; however, in rural healthcare facilities where the majority of healthcare staff have a diploma in nutrition, more training and capacity development may be required to increase their knowledge and skills in emergency response [24]. At both urban and rural healthcare facilities, the majority of nutritionists and dietitians had an average of 4.36 years' experience in their fields. This implies that the personnel in these industries are comparatively young and inexperienced. According to a similar study, a significant portion of nutritionists and dietitians in Ghana are relatively new to the field, with many having less than 5 years of experience, which may impact the quality of nutrition services provided, particularly in complex areas such as enteral and parenteral nutrition support [17].

The findings of this study indicate that all respondents from the surveyed healthcare facilities demonstrated a high level of awareness and understanding of nutritional emergencies. However, another study reported that nutritionists, particularly those with less formal education, demonstrate inadequate knowledge regarding nutritional emergencies [25]. However, some respondents expressed lower confidence in classifying and determining dietary requirements during nutritional emergencies. Research has shown that training programs significantly enhance healthcare workers' ability to identify and manage nutritional emergencies [9]. This highlights the need for targeted training programs to address knowledge gaps and enhance the competence and confidence of healthcare professionals. Specifically, practical, on-the-ground management training programs, particularly for those in rural facilities, may help bridge the knowledge gap and improve overall preparedness in nutritional emergencies [26, 27]. Further research and interventions are necessary to ensure optimal care and response in these critical situations.

The study findings indicated that although healthcare facilities demonstrated a high level of preparedness in areas such as notifying nutrition staff and menu planning for nutritional emergencies, there was a significant lack of awareness and preparedness regarding the availability of RUTFs for children. A majority of respondents expressed unawareness of RUTF availability, suggesting inadequate administration and promotion of RUTFs in the facilities. To improve the management of nutritional emergencies, it is crucial to make RUTFs available and

ensure nutrition staff are aware of their responsibility in providing them [28]. Additionally, significant differences were observed between urban and rural healthcare facilities. Urban facilities showed higher awareness and preparedness in areas such as menu planning and stock levels of enteral nutritional feeds. In contrast, rural facilities demonstrated greater knowledge and readiness regarding the availability of RUTs for nutritional emergencies. These findings suggest that socio-economic factors contribute to nutritional care inequalities between urban and rural areas in Ghana. Implementing nutrition protocols, providing training, and raising awareness of nutrition's role in care could help address these disparities [29].

The provision of adequate nutrition interventions during nutritional emergencies poses significant challenges for both rural and urban healthcare facilities. In this study, we found that interdepartmental cooperation between the hospital emergency unit and the nutrition and diet therapy unit plays a vital role in handling such emergencies. Our results align with previous research, which highlights the importance of effective communication and collaboration between medical staff and nutritionists/dietitians for improved nutritional care outcomes [30, 31]. However, it is worth noting that poor communication between these fields can lead to delays in dietary therapy, underscoring the need for enhanced coordination [32]. Moreover, the connection between kitchen staff and the nutrition therapy unit requires further attention, as effective communication between these stakeholders is essential for providing appropriate nutritional care [33]. Previous research emphasizes that coordinated emergency response systems can significantly reduce morbidity and mortality during nutritional crises [34, 35]. The absence of such plans in rural facilities underscores the need for comprehensive policy frameworks that mandate emergency preparedness planning at all levels of healthcare. Developing a national nutritional emergency response framework could provide guidelines for all facilities, ensuring that both urban and rural healthcare providers are equipped to handle emergencies effectively. In terms of staffing levels, our findings indicate that proper staffing, particularly in rural facilities, is crucial for effectively handling patients' nutritional demands during emergencies. The study noted that urban populations generally have better access to healthcare services compared to rural populations, which is consistent with findings from other studies [36, 37]. Addressing socioeconomic disparities through targeted interventions, such as improving transportation to healthcare facilities or providing financial assistance for low-income families, can enhance access to nutritional care during emergencies. Additionally, access to necessary resources, skills, and infrastructure emerged as an area of concern, particularly in rural healthcare facilities, which may hinder the efficiency of nutritional emergency response. Our study also revealed limited usage of technological applications in nutritional emergency care, highlighting the potential for incorporating telehealth and automated dietary assessment tools, which can enhance effectiveness and care coordination [38, 39]. However, the sample size of eleven nutritionists and dietitians is relatively small, as well as the collection of data from only two hospitals, which may limit the generalizability of the findings. This small sample could restrict the ability to draw broader conclusions about the preparedness and practices of nutrition professionals across the regions. Future research should aim to

include a larger and more diverse sample to provide a more comprehensive understanding of nutritional emergency preparedness in both urban and rural healthcare settings.

## 5.1 | Conclusion

In conclusion, the preparedness of rural and urban healthcare facilities for nutritional emergencies differs significantly, with urban healthcare facilities being better equipped and staffed. However, both rural and urban healthcare facilities face similar challenges in providing adequate nutrition interventions during nutritional emergencies in their facilities. In rural health facilities, limited access to essential equipment and resources poses a significant barrier to effective response to nutritional emergencies. For instance, rural facilities may face shortages of specialized feeding tubes, nutritional supplements, or diagnostic tools, hindering the timely assessment and management of patients with malnutrition or other nutritional disorders. This lack of equipment can lead to delays in diagnosis, management initiation, and monitoring, thereby compromising the quality of care provided to patients in need. Moreover, rural facilities often contend with staffing issues, including a shortage of experienced nutritionists and dietitians. The presence of inexperienced or undertrained staff members can impact the delivery of evidence-based nutritional interventions, patient counseling, and coordination of care, potentially resulting in suboptimal outcomes for individuals requiring emergency nutrition support. These deficiencies in equipment and staffing not only affect the immediate response to nutritional emergencies but also have broader implications for the overall preparedness and resilience of rural health facilities. Inadequate resources and workforce capacity can limit the ability of these facilities to implement comprehensive nutrition protocols, conduct regular training programs, and collaborate effectively with external partners, distorting the continuity and quality of care provided to vulnerable populations. Therefore, it is essential for healthcare policymakers, administrators, and stakeholders to prioritize targeted interventions in rural healthcare facilities, such as enhancing resource allocation, investing in staff training and retention programs, and fostering partnerships with urban healthcare facilities or external agencies to bolster emergency preparedness for nutritional crises. By addressing these specific challenges and tailoring interventions to the unique needs of rural settings, healthcare systems can strive towards equitable and effective responses to nutritional emergencies, ultimately improving health outcomes and reducing disparities in care delivery. Further research should increase the diversity of the sample by including respondents from other regions and healthcare facilities. Further research should be conducted to explore factors that might influence the number of nutritional emergencies in healthcare facilities and the impact of continuous professional developments (CPDs) on respondents' ability to manage nutritional emergencies effectively. More studies should also be done to capture all aspects of knowledge related to nutritional emergencies including more questions on other aspects (specific interventions, cultural considerations) to provide a more comprehensive assessment.

The availability of nutritional supplies and therapeutic meals presents issues that must be addressed using a decentralized

strategy to resource distribution. The creation of regional RUTF stockpiles will guarantee rural healthcare facilities continuous access to nutritional therapies that can save lives. Securing funds and logistical support for sustainable supply chains can be facilitated by collaborating with regional NGOs and global organizations like UNICEF and the World Food Programme. The use of mobile nutrition emergency units to assist isolated areas with high rates of malnutrition is another essential strategy. These facilities ought to be staffed by qualified dietitians and nutritionists and furnished with the necessary enteral and parenteral feeding supplies. Mobile units can help stop serious cases from becoming life-threatening by offering assessments and prompt interventions on the scene.

Additionally, to improve cooperation between emergency rooms and nutrition units, hospital-based nutrition task teams ought to be formed. These task teams will be in charge of emergency procurement procedures, stock management, and making sure that nutritional interventions are incorporated into emergency care procedures. To monitor the availability of necessary supplies and pinpoint areas in need of immediate attention, regular audits and needs assessments should be carried out.

Enhancing healthcare providers' readiness and ability to respond to nutritional emergencies requires extensive staff training. Simulation-based emergency nutrition workshops are one of the best methods; they give healthcare professionals, especially those in rural facilities, practical experience in recognizing and handling various nutritional problems. Case-based learning, hands-on enteral and parenteral feeding method demonstrations, and emergency response exercises should all be a part of these courses. Enhancing emergency response also requires better interdepartmental collaboration. To improve cooperation in delivering prompt nutritional support, emergency room staff, dietitians and kitchen staff should participate in joint training sessions. To provide prompt nutritional interventions, interdisciplinary simulation exercises can promote teamwork and assist in breaking down communication barriers.

## 5.2 | Limitations of the Study

The cross-sectional design of the study limits the ability to establish causality between variables since data are collected at only one point in time. Additionally, the reliance of the study on a specific sample of nutritionists and dietitians from urban and rural healthcare facilities may introduce selection bias as the perspectives and experiences of other healthcare professionals or stakeholders involved in emergency nutrition preparedness could be overlooked. This limitation may restrict the breadth of insights gathered and limit the diversity of viewpoints represented in the study, affecting the comprehensiveness and applicability of the findings. Potential confounding factors, such as socioeconomic conditions, healthcare access disparities, and local government policies, were not controlled for, which could further impact the validity of the study. Variations in government regulations, funding allocations, infrastructure development, and community resources can significantly impact the capacity of healthcare facilities to respond to nutritional emergencies. Failure to account for these contextual factors could confound the study results and limit the ability to draw

robust conclusions on the determinants of preparedness disparities between urban and rural settings. As a result, careful interpretation of the findings is necessary.

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### Author Contributions

**Lucy Naki Abel:** conceptualization, methodology, investigation, writing – original draft, formal analysis, data curation. **Marina Aferiba Tandoh:** writing – original draft, methodology, validation, writing – review and editing, supervision, project administration, data curation.

### Conflicts of Interest

The authors declare no conflicts of interest.

### Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

### Transparency Statement

The lead author, Marina Aferiba Tandoh, affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

### References

1. J. P. Kuwornu, J. Amoyaw, T. Manyanga, E. J. Cooper, E. Donkoh, and A. Nkrumah, "Measuring the Overall Burden of Early Childhood Malnutrition in Ghana: A Comparison of Estimates From Multiple Data Sources," *International Journal of Health Policy and Management* 11, no. 7 (December 2022): 1035–1046, <https://doi.org/10.34172/ijhpm.2020.253>.
2. "Ghana: Nutrition Profile", USAID, 2021, [https://www.usaid.gov/sites/default/files/2022-05/Copy\\_of\\_Ghana-Nutrition-Profile\\_1.pdf](https://www.usaid.gov/sites/default/files/2022-05/Copy_of_Ghana-Nutrition-Profile_1.pdf).
3. M. Boah, F. Azupogo, D. A. Amporfro, and L. A. Abada, "The Epidemiology of Undernutrition and Its Determinants in Children Under Five Years in Ghana," *PLoS One* 14, no. 7 (July 2019): e0219665, <https://doi.org/10.1371/journal.pone.0219665>.
4. W. A. Iddrisu and O. Gyabaah, "Identifying Factors Associated With Child Malnutrition in Ghana: A Cross-Sectional Study Using Bayesian Multilevel Ordinal Logistic Regression Approach," *BMJ Open* 13, no. 12 (December 2023): e075723, <https://doi.org/10.1136/bmjopen-2023-075723>.
5. H. Young, A. Borrel, D. Holland, and P. Salama, "Public Nutrition in Complex Emergencies," *Lancet* 364, no. 9448 (November 2004): 1899–1909, [https://doi.org/10.1016/S0140-6736\(04\)17447-3](https://doi.org/10.1016/S0140-6736(04)17447-3).
6. A. Ahmat, S. C. Okoroafor, I. Kazanga, et al., "The Health Workforce Status in the WHO African Region: Findings of a Cross-Sectional Study," supplement, *BMJ Global Health* 7, no. suppl. 1 (May 2022): 1–8, <https://doi.org/10.1136/bmjgh-2021-008317>.
7. S. K. Das and S. Twanabasu, "A Story to Tell or Not, a Glimpse of Emergency Setting in the Low Economic Country: Experience Sharing and Review: A Glimpse of Emergency Setting in Low Economic Country," *Journal of General Practice and Emergency Medicine of Nepal* 10, no. 15 (August 2023): 24–26, <https://doi.org/10.59284/jgpeman218>.
8. R. Opoku, B. Dwumfour-Asare, L. Agrey-Bluway, et al., "Prevalence of Self-Medication in Ghana: A Systematic Review and Meta-Analysis," *BMJ Open* 13, no. 3 (March 2023): e064627, <https://doi.org/10.1136/bmjopen-2022-064627>.
9. S. Fleischhacker, U. Colón-Ramos, L. Haynes-Maslow, and L. Clay, "Position of the Society for Nutrition Education and Behavior: The



- Importance of Emergency-Related Food and Nutrition Education Before, During, and After a Disaster,” *Journal of Nutrition Education and Behavior* 56, no. 7 (July 2024): 419–427.
10. P. Bahwere, “Severe Acute Malnutrition During Emergencies: Burden, Management, and Gaps,” supplement, *Food and Nutrition Bulletin* 35, no. 2, suppl. 1 (June 2014): S47–S51, <https://doi.org/10.1177/15648265140352S107>.
  11. L. C. Smith, M. T. Ruel, and A. Ndiaye, “Why Is Child Malnutrition Lower in Urban Than in Rural Areas? Evidence From 36 Developing Countries,” *World Development* 33, no. 8 (August 2005): 1285–1305, <https://doi.org/10.1016/j.worlddev.2005.03.002>.
  12. E. Ahlin, “Semi-Structured Interviews With Expert Practitioners: Their Validity and Significant Contribution to Translational Research,” SAGE Publications Ltd, 2019, <https://methods.sagepub.com/case/semi-structured-interviews-with-expert-practitioners-translational-research>.
  13. H. Lune and B. L. Berg, *Qualitative Research Methods for the Social Sciences*, 9th ed., global ed. (Pearson, 2017).
  14. M. M. Hennink and B. N. Kaiser, “Saturation in Qualitative Research,” in *SAGE Research Methods Foundations*, SAGE Publications Ltd, 2020, <https://methods.sagepub.com/foundations/saturation-in-qualitative-research>.
  15. B. Saunders, J. Sim, T. Kingstone, et al., “Saturation in Qualitative Research: Exploring Its Conceptualization and Operationalization,” *Quality & Quantity* 52, no. 4 (July 2018): 1893–1907, <https://doi.org/10.1007/s11135-017-0574-8>.
  16. V. Clarke and V. Braun, “Teaching Thematic Analysis: Overcoming Challenges and Developing Strategies for Effective Learning,” *Psychologist* 26 (February 2013): 120–123.
  17. R. E. A. Ayande, P. D. Agordoh, V. J. Salino, et al., “Knowledge, Attitudes, and Practices of Registered Dietitians and Nutritionists Regarding Enteral and Parenteral Nutrition Support in Ghana: A Needs Assessment Study,” *Frontiers in Nutrition* 10 (June 2023): 1197610, <https://doi.org/10.3389/fnut.2023.1197610>.
  18. P. Rothpletz-Puglia and M. D. Mena, “Emergency Preparedness in Dietetics During a Pandemic: Lessons Learned From an ICU Dietitian During Covid-19,” *Internet Journal of Allied Health Sciences and Practice* 19, no. 3 (2021): 12, <https://nsuworks.nova.edu/ijahsp/vol19/iss3/12/>.
  19. World Health Organization, “Service Availability and Readiness Assessment (SARA),” WHO Press, 2015, [https://cdn.who.int/media/docs/default-source/service-availability-and-readinessassessment\(sara\)/sara\\_reference\\_manual\\_chapter1.pdf?sfvrsn=1ca065fa\\_3&ua=1](https://cdn.who.int/media/docs/default-source/service-availability-and-readinessassessment(sara)/sara_reference_manual_chapter1.pdf?sfvrsn=1ca065fa_3&ua=1).
  20. F. Asiedu-Berkoe, G. M. Chandi, D. A. Bandoh, et al., “State of Public Health Emergency Preparedness and Response Capacity of Ghana,” *Journal of Interventional Epidemiology and Public Health* 5, no. 2 (November 2022): 4, <https://www.afenet-journal.net/content/series/5/2/4/full/>.
  21. P. B. Adongo, P. T. N. Tabong, E. Asampong, J. Ansong, M. Robalo, and R. M. Adanu, “Health Workers Perceptions and Attitude about Ghana’s Preparedness Towards Preventing, Containing, and Managing Ebola Virus Disease,” *BMC Health Services Research* 17, no. 1 (April 2017): 266, <https://doi.org/10.1186/s12913-017-2225-0>.
  22. R. Akparibo, J. Harris, B. Blankson, and P. J. Anku, “The Nutrition Workforce in Ghana: A Survey of Five Professional Groups,” *BMC Health Services Research* 15, no. 1 (2015): 1–10, <https://doi.org/10.1186/s12913-015-1087-6>.
  23. M. Desta and W. Mulugeta, “Assessment of Knowledge and Practice of Medical Emergency Team Among Nurses Working in Emergency Department of Governmental Hospitals in Addis Ababa, Ethiopia,” *BMC Nursing Journal* 17, no. 1 (2018): 1–8, <https://doi.org/10.1186/s12912-018-0315-0>.
  24. D. Nakirya, G. Ndeezi, and K. Ndikabona, “Knowledge and Skills of Health Workers in Management of Emergency Conditions at Uganda’s Primary Health Care Facilities: A Cross-Sectional Study,” *BMC Health Services Research* 19, no. 1 (2019): 1–10, <https://doi.org/10.1186/s12913-019-4351-y>.
  25. M. Shakhshir and A. Alkaiyat, “Healthcare Providers’ Knowledge, Attitude, and Practice on Quality of Nutrition Care in Hospitals From a Developing Country: A Multicenter Experience,” *Journal of Health, Population, and Nutrition* 42, no. 1 (March 2023): 15, <https://doi.org/10.1186/s41043-023-00355-9>.
  26. K. Wazny, C. Petracchi, C. Laur, et al., “3 Developing Competencies and Capacity for Effective Communication and Implementation of Nutrition Research,” in *Oral Presentations* (BMJ Publishing Group Ltd, 2022), A2, <https://nutrition.bmj.com/lookup/doi/10.1136/bmjnph-2022-summit2022.3>.
  27. J. Meeker, A. Perry, C. Dolan, et al., “Development of a Competency Framework for the Nutrition in Emergencies Sector,” *Public Health Nutrition* 17, no. 3 (March 2014): 689–699, <https://doi.org/10.1017/S1368980013002607>.
  28. A. Schoonees, M. J. Lombard, A. Musekiwa, E. Nel, and J. Volmink, “Ready-to-Use Therapeutic Food (RUTF) for Home-Based Nutritional Rehabilitation of Severe Acute Malnutrition in Children From Six Months to Five Years of Age,” *Cochrane Database of Systematic Reviews* 2019, no. 5 (May 2019): 1465–1858, <https://doi.org/10.1002/14651858>.
  29. F. N. Mambulu-Chikankheni, “Factors Influencing the Implementation of Severe Acute Malnutrition Guidelines Within the Healthcare Referral Systems of Rural Subdistricts in North West Province, South Africa,” *PLOS Global Public Health* 3, no. 8 (2023): e0002277, <https://doi.org/10.1371/journal.pgph.0002277>.
  30. A. Bendowska and E. Baum, “The Significance of Cooperation in Interdisciplinary Health Care Teams as Perceived by Polish Medical Students,” *International Journal of Environmental Research and Public Health* 20, no. 2 (January 2023): 954, <https://doi.org/10.3390/ijerph20020954>.
  31. J. Sheehan, K. Laver, A. Bhohti, et al., “Methods and Effectiveness of Communication Between Hospital Allied Health and Primary Care Practitioners: A Systematic Narrative Review,” *Journal of Multidisciplinary Healthcare* 14 (February 2021): 493–511, <https://doi.org/10.2147/JMDH.S295549>.
  32. A. R. Cass and K. E. Charlton, “Prevalence of Hospital-Acquired Malnutrition and Modifiable Determinants of Nutritional Deterioration During Inpatient Admissions: A Systematic Review of the Evidence,” *Journal of Human Nutrition and Dietetics* 35, no. 6 (April 2022): 1043–1058, <https://doi.org/10.1111/jhn.13009>.
  33. M. H. Verwijs, S. Puijk-Hekman, E. van der Heijden, E. Vasse, L. C. P. G. M. de Groot, and M. A. E. de van der Schueren, “Interdisciplinary Communication and Collaboration as Key to Improved Nutritional Care of Malnourished Older Adults Across Health-Care Settings - A Qualitative Study,” *Health Expectations* 23, no. 5 (October 2020): 1096–1107, <https://doi.org/10.1111/hex.13075>.
  34. O. Olu, A. Usman, S. Woldetsadik, D. Chamla, and O. Walker, “Lessons Learnt From Coordinating Emergency Health Response During Humanitarian Crises: A Case Study of Implementation of the Health Cluster in Northern Uganda,” *Conflict and Health* 9, no. 1 (December 2015): 1, <https://doi.org/10.1186/1752-1505-9-1>.
  35. M. E. Rifkin, “Nutrition Policy Critical to Optimize Response to Climate, Public Health Crises,” *Frontiers in Nutrition* 10 (August 2023): 1118753, <https://doi.org/10.3389/fnut.2023.1118753>.
  36. T. Wang, “Access and Quality of Healthcare in China: Rural and Urban Disparities,” *Theoretical and Natural Science* 17, no. 1 (December 2023): 209–214, <https://doi.org/10.54254/2753-8818/17/20240688>.
  37. J. Echere, O. E. Okobi, O. B. Iyun, G. K. S. Gyampoh, and S. K. Gill, “Health Disparities in Hospital Readmissions in Rural vs Urban Populations in the United States: A Comprehensive Review of Factors and

Reduction Strategies,” *Medical Research Archives* 12, no. 7 (2024), <https://esmed.org/MRA/mra/article/view/5699>.

38. B. N. Limketkai, K. Mauldin, N. Manitus, L. Jalilian, and B. R. Salonen, “The Age of Artificial Intelligence: Use of Digital Technology in Clinical Nutrition,” *Current Surgery Reports* 9, no. 7 (June 2021): 20, <https://doi.org/10.1007/s40137-021-00297-3>.

39. S. K. Das, A. J. Miki, C. M. Blanchard, et al., “Perspective: Opportunities and Challenges of Technology Tools in Dietary and Activity Assessment: Bridging Stakeholder Viewpoints,” *Advances in Nutrition* 13, no. 1 (September 2022): 1–15, <https://doi.org/10.1093/advances/nmab103>.