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Effect of Audio Messaging in Communicating Key Messages for Community Management of Acute Malnutrition on the Knowledge of Caregivers

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Abstract

Community-based Management of Acute Malnutrition (CMAM) is a vital public health intervention for treating severe acute malnutrition (SAM). One of the critical components of CMAM is caregiver education, primarily delivered by health workers. However, resource limitations, including health worker shortages, often hinder the effectiveness of traditional methods. This study investigates the impact of audio messages on caregivers' knowledge of key CMAM messages as a viable alternative to health workers' face-to-face education. This experimental study was conducted in Adamawa State, Nigeria, using an intervention and control group. Eighty caregivers from two local government areas (LGAs), Girei and Yola South, were recruited. The experimental group received weekly audio messages containing CMAM key messages, while the control group received routine health talks delivered by health workers. Caregivers' knowledge was assessed at the beginning and end of the intervention through structured interviews. Quantitative data were collected using the mHealth platform and analysed with SPSS software using descriptive statistics and t-tests. The paired samples t-test results showed that the caregivers who received the audio messages exhibited better knowledge of CMAM key messages compared to the control group ($p< 0.05$) at a 95% Confidence Interval. We have enough evidence to conclude that there is a statistically significant difference between the post-intervention scores of the control and experimental groups, with the experimental group showing higher scores. Audio messages have the potential to enhance the knowledge of caregivers on CMAM key messages, reducing the workload of health workers and ensuring that standardized messages are consistently delivered.

Keywords: *Audio Messages, Caregiver Education, Community-based Management of Acute Malnutrition (CMAM), Health Worker, Knowledge Enhancement, Severe Acute Malnutrition (SAM).*

Background

Undernutrition remains a significant public health challenge in many developing countries, contributing substantially to preventable mortality among children under five. This issue manifests in acute and chronic forms, with severe acute malnutrition (SAM) posing the most critical risk, associated with high rates of morbidity and mortality. As reported in the 2022 Global Nutrition Report [1]. Africa continues to face a high burden of malnutrition among young children, with stunting rates of 30.7%—notably above the global average of 22%—and wasting rates at 6.0%, slightly below the global average of 6.7%. In Nigeria, national nutritional indicators have seen limited improvement, with the 2023–24 National Demographic Health Survey (NDHS) reporting 40% of children under five as stunted, 8% as wasted, 27% as underweight, and 1% as overweight, which is higher when compared to figures in the immediate past survey NDHS

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2018. Adamawa State presents an even more severe scenario, with stunting rates of 48.6%, wasting at 7.0%, and underweight prevalence at 32.5%. [2].

Globally, Severe Acute Malnutrition and Moderate Acute Malnutrition (MAM) are recognized as urgent public health concerns, with SAM contributing to over half of all childhood deaths and posing a risk factor in more than 50% of the 11 million annual deaths among children under five [3]. Although at least one million child deaths are directly caused by malnutrition [4], acute malnutrition may predispose up to 3.5 million children under 5 years old to death [5]. According to the 2017 Global Nutrition Report [6] 52 million children are wasted (SAM) and it is the main challenge to achieving sustainable development goals. Moreover, it is the number one driver of the global burden of disease [7].

In response, the Community-based Management of Acute Malnutrition (CMAM) approach, first tested in 2000 and endorsed by the United Nations in 2007, has been implemented to improve survival rates among malnourished children through decentralized treatment and caregiver education. Currently, CMAM is employed in over 70 countries, providing structured care through outpatient therapeutic programs (OTPs) and Ready-to-Use Therapeutic Foods (RUTF), and incorporating infant and young child feeding (IYCF) counselling to equip caregivers with essential knowledge for long-term nutritional management.

As part of efforts to solve the problem of increasing rates of acute malnutrition, community-based management of acute malnutrition (CMAM), which evolved from the Community-Based Therapeutic Care (CTC) approach [8], was developed in 2001 from the Community Based Therapeutic Care CTC approach. The first pilot project tested the CMAM approach in 2000 during humanitarian emergencies [9], it was found to be so effective that it was endorsed by United Nations (U.N.) agencies in 2007 [10] and is now considered the standard of care for managing acute malnutrition in emergency and development contexts.

Despite CMAM's success, its implementation in Nigeria faces challenges due to a shortage of trained health workers, impeding effective communication and care delivery. National CMAM guidelines highlight the importance of clear, standardized communication for effective program delivery, recommending that key messages be simple, concise, and adaptable to local languages. However, Nigeria currently lacks a compiled audio format for these key CMAM messages. This study aims to address this gap by developing standardized audio messages and evaluating their effectiveness in enhancing caregivers' understanding of CMAM key messages. By introducing these audio-taped messages in local languages, this approach offers a novel means to improve caregiver knowledge, standardize message delivery, and reduce the burden on health workers, ultimately supporting better treatment outcomes in CMAM programs.

The introduction of audio messages delivered via electronic devices offers a novel method for delivering standardized CMAM key messages to caregivers. This approach has the potential to bridge the gap in health education delivery, especially in areas with limited access to trained health workers. Audio messages, recorded in local languages, allow caregivers to listen to important health information at their convenience, potentially improving their knowledge retention and understanding of CMAM guidelines.

This study investigates the impact of audio messages on caregivers' knowledge of CMAM key messages in Adamawa State, Nigeria. The study compares the effectiveness of voice note messages to traditional health talks in improving caregiver knowledge.

Methodology

This trial was conducted in two Local Government Areas (LGAs) in Adamawa State: Yola South and Girei. The study population consisted of caregivers of children diagnosed with severe acute malnutrition (SAM) attending CMAM outpatient therapeutic programs (OTP). The sample size, calculated based on previous studies, included a total of 80 caregivers, who were randomly assigned to either the intervention or control group.

Intervention and Control Groups

1. The intervention group (n=40) received weekly voice note messages via mobile phones, delivered in Hausa. These messages covered key CMAM topics such as feeding practices, hygiene, treatment adherence, and the importance of follow-up visits.
2. The control group (n=40) attended traditional health talks delivered by trained health workers during their weekly CMAM visits.

The study was conducted in Adamawa State, located in the northeastern part of Nigeria. Adamawa is known for its rural communities, with a projected population of over 4.4 million inhabitants. The state has 21 Local Government Areas (LGAs) with a predominantly farming population, producing both cash and food crops. The study focused on two LGAs, Girei and Yola South, which were purposively selected due to their high incidence of Severe Acute Malnutrition (SAM). These locations were safe and had established CMAM (Community Management of Acute Malnutrition) programs, making them ideal for the intervention.

The study employed a quasi-experimental design to assess the effectiveness of audio messages in delivering CMAM key messages. Participants were randomly assigned to either the experimental group, which received audio messages, or the control group, which received standard health talks from health workers. The experiment involved 80 children with SAM, divided equally between the two groups. Over 8-12 weeks, the experimental group listened to pre-recorded audio messages in the Hausa language. The control group received the traditional verbal health education provided by healthcare workers.

In this study, laboratory methods were minimal as the focus was primarily on field-based data collection. However, standard protocols were followed to measure anthropometric indices, including weight and Mid-Upper Arm Circumference (MUAC), for the enrolled children. These measurements were taken weekly to monitor the progress of SAM treatment. Additional tests, such as malaria screening, were performed as needed based on the national guidelines for CMAM. All data were collected using the mHealth platform (ODK Collect) to ensure accuracy and real-time data entry. Anthropometric data (MUAC and weight) were collected at baseline and weekly during the intervention period. Treatment outcomes were measured by the percentage of children achieving a MUAC >12.5 cm at discharge.

The study employed a combination of descriptive and inferential statistical methods. Data were analysed using SPSS (version 25), with paired t-tests used to compare pre-and post-intervention outcomes within groups, and independent t-tests to compare outcomes between the two groups. Descriptive statistics, such as frequency distributions and cross-tabulations, were used to summarize participant characteristics and treatment outcomes. Independent and paired samples t-tests were applied to compare the means between the control and experimental groups, evaluating differences in knowledge of CMAM key messages and treatment outcomes. The analysis tested for statistical significance, focusing on p-values to determine if there were any significant differences between the groups.

Ethical Considerations

Ethical considerations were crucial in the study. Approval was secured from the Adamawa State Ministry of Health's Ethical Review Committee in Jimeta, Nigeria. Informed consent was obtained from participants, who were fully briefed in Hausa and participated voluntarily. Participants could withdraw at any time. To protect privacy, questionnaires used serial numbers instead of names. The study involved minimal risk. While there were no direct benefits, participants received free routine drugs on the treatment protocol that they were supposed to procure themselves or receive from the state government. In addition to this, they got information that could help them make informed childcare decisions.

Data Collection

Data were collected through pre- and post-intervention questionnaires administered to both groups. The questionnaires assessed caregivers' baseline knowledge of CMAM key messages, with a focus on understanding proper feeding practices, hygiene, and the role of RUTF (Ready-to-Use Therapeutic Food). After eight weeks, a post-intervention questionnaire was administered to measure changes in knowledge. Demographic information, such as caregiver education level and socio-economic status, was also collected to control for confounding factors.

Audio recordings from Key Informant's Interviews (KII) with caregivers, also electronic copies of transcripts were stored in a Google Drive to ensure confidentiality and access to the researchers. The audio recordings were transcribed using the transcription template for the study. The transcripts were reviewed by another group of researchers and transferred into ATLAS. Ti version 9.0.22.0 to organize and sort for further data analysis (coding). Two (2) researchers read the transcripts for familiarization and codebook development. The codebook was developed using a hybrid inductive approach, i.e. drawing from the qualitative data in the transcripts and a deductive approach i.e. drawing from the interview guide.

The transcripts were coded, and thereafter, quotations were pulled together to understand patterns across the data. The analysis was guided by the study objective which was to access the knowledge of caregivers about the CMAM messages which they listened to via audio-recorded messages and for some of them via health talks which were usually provided by health providers. The data analysis adopted a thematic and content analytical approach, as this will be used to derive recurring categories and themes from the data.

Expected Outcome

Establish the effect of listening to the audio messages as compared with regular health education on the outcome of CMAM treatment.

Statistical Analysis

Data were analyzed using SPSS (version 25). Descriptive statistics, including means, frequencies, and percentages, were used to summarize the data. Independent t-tests were conducted to compare pre-and post-intervention knowledge scores between the intervention and control groups. A p-value of <0.05 was considered statistically significant. The researchers coded the same transcripts to ensure that the codes were consistently applied if need be. Discrepancies were resolved through a consensus-building approach guided by the research objectives. Thereafter, ATLAS.ti projects from different researchers were carefully reviewed through the inter-coder reliability tool and later merged. The transcripts were coded, and thereafter, quotations were pulled together to understand patterns across the data. The analysis was guided by the study objective which was to access the knowledge of caregivers about the CMAM messages which they listened to via audio-recorded messages and for some of them via health talks which

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Results

Table 1 below shows the socio-demographic distribution of respondents including 80 mothers of children suffering from Severe Acute Malnutrition (SAM) who accessed CMAM sites in Girei and Yola South LGAs of Adamawa State. The mean age of the mothers was 28 years, ranging from 16 to 50 years, while the mean age of their children was 15 months, with an age range of 6 to 48 months. The children were evenly distributed by gender, with 50% males and 50% females. Age-wise, 41.2% were 12 months or younger, 47.5% were aged 13–24 months, 10.0% were 25–36 months, and 1.2% were 37–48 months. Most mothers (87.5%) were married, while smaller proportions were divorced (5.0%), separated (2.5%), single (3.7%), or widowed (1.2%). Ethnically, the majority identified as Fulani (67.5%), followed by Hausa (25.0%), and 7.5% from other ethnic groups. Religiously, 91.2% were Muslims, while 8.8% identified as Christians.

Educationally, 62.5% of the respondents had no formal education, 22.5% had completed secondary education, and the remainder had attained primary education or were uneducated. These educational levels likely influenced their economic activities, with the majority (51.2%) engaged in petty trading and 31.2% as full housewives. Other occupations included artisans (7.5%), farmers (6.2%), and apprentices (2.5%). The respondents' varied educational backgrounds underscore the link between education and occupational engagement, highlighting the economic challenges faced by many in this group.

Water sources were diverse among respondents, with the majority (61.2%) relying on boreholes for drinking water. Additionally, 16.2% used pipe-borne water, while 11.2% each depended on rivers/streams or wells. These findings reflect varying levels of access to clean water, potentially impacting the health and nutrition of their households. Overall, the socio-demographic profile of the respondents reflects a predominantly rural, Muslim, Fulani, and economically diverse population, with significant disparities in education and water access.

Table 1. Socio-Demographic Characteristics of the Respondents

Variable	**%**
Gender of Child	
Male	50
Female	50
Total	100
Age of Index Child	
<or = 12 months	41.2
13 to 24 months	47.5
25 to 36 months	10.0
37 to 48 months	1.2
Total	100
Marital Status	
Divorced	5.0
Married	87.5
Other	1.2

Separated	2.5
Single (Never married)	2.5
Widowed	1.2
Total	100.0
Ethnicity of respondents	
Fulani	67.5
Hausa	25.0
Other	7.5
Total	100.0
Religion of respondents	
Christianity	8.8
Islam	91.2
Total	100.0
Highest level of education completed	
No formal education	62.5
Primary	15.0
Secondary	22.5
Total	100.0
A major source of drinking water	
Borehole	61.2
Pipe borne	16.2
River/stream	11.2
Well	11.2
Total	100.0
Occupation of respondent	
Apprentice	2.5
Artisan	7.5
Farmer	6.2
Full housewife	31.2
House help	1.2
Petty Trading	51.2
Total	100.0

After 8 weeks of intervention, the mean MUAC increased to 12.7 cm in the experimental group and 12.3 cm in the control group. Although the difference was not statistically significant (p=0.07), the experimental group had a higher rate of successful recovery (67.5%) compared to the control group (50%). The mean weight gain in the experimental group was 1.8 kg, compared to 1.5 kg in the control group (p=0.09). The default rate was lower in the experimental group (5%) compared to the control group (12.5%), and caregivers in the experimental group attended more follow-up visits (average of 7.5 visits out of 8) compared to the control group (6.8 visits).

Table 2 below shows that in pair one the mean difference between the post-intervention scores of the control and experimental groups is -2.27778, indicating that the experimental group scored higher on average. The t-value of -2.513 and the p-value of 0.017 suggest that this difference is statistically significant at the 5% significance level. The 95% confidence interval

for the difference ranges from (-4.11792 to -0.43764), confirming that the true mean difference is likely negative, reinforcing the conclusion that the experimental group's scores are higher after the intervention. The p-value is 0.017, which is less than the conventional threshold of 0.05. This means we reject the null hypothesis. There is enough evidence to conclude that there is a statistically significant difference between the post-intervention scores of the control and experimental groups, with the experimental group showing higher scores.

Table 2. Paired Samples T-test on the Effect of Voice Messages on Knowledge between Groups

		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair	Post Intervention Control Group scores - Post Intervention Experimental Group scores	-2.27778	5.43855	.90642	-4.11792	-.43764	-2.513	35	.017

Qualitative feedback from the intervention group revealed that caregivers appreciated the flexibility of listening to the message multiple times, which helped them retain information better. However, some caregivers expressed a preference for face-to-face interactions, suggesting that audio messages might not entirely replace traditional health talks.

Discussion

The results of this study suggest that audio messages can effectively enhance caregivers' knowledge of CMAM key messages. The intervention group showed a significant improvement in knowledge compared to the control group, demonstrating that audio messages delivered via electronic devices can serve as a viable alternative or supplement to health worker-led education sessions. It was observed that there was better improvement in knowledge of caregivers in the experimental group at the end of the intervention when compared with the control group suggesting that the audio messages communicated the CMAM key messages better than when only health talk was given by the health workers. Several studies had previously suggested an increase in knowledge using informational audiotapes [11-17]. The work of Tattersall *et al*. [18] suggested that using an audiotape is not superior to a letter in terms of knowledge gained however in Jenkinson's [19] study, an audiotape improved knowledge of asthma self-management significantly more than a book. Two studies found no change in knowledge for the two groups [20, 21] while Dunn *et al*. [22] demonstrated a decrease in knowledge when using a general information audiotape. Audio messages allow caregivers to engage with health messages at their convenience, enabling them to listen to and absorb information multiple times. This flexibility is particularly important in rural settings where caregivers may face time constraints due to household responsibilities or transportation barriers.

Despite the positive findings, face-to-face interactions with health workers remain crucial. These interactions allow caregivers to ask questions, seek clarification, and engage in real-time discussions, which can enhance understanding. This study underscores the importance of considering a blended approach that combines audio messages with in-person

education to maximize the effectiveness of health communication in CMAM programs.

Limitations

The study's small sample size may have limited the ability to detect more significant differences between the groups. Additionally, the study was conducted in a specific geographic and cultural context, which may limit the generalizability of the findings. The reliance on self-reported data also introduces the possibility of bias.

Conclusion

Audio messages offer a promising approach to improving caregiver knowledge of CMAM key messages, particularly in settings with limited health worker availability. While the intervention was effective, it should be viewed as complementary to traditional health talks rather than a replacement. Future studies should explore the integration of audio messages with other educational tools, such as visual aids, to further enhance caregiver understanding and treatment adherence in CMAM programs.

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the conduct of this research.

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