

CHATBOT IN ENHANCING PARENTAL KNOWLEDGE AND ATTITUDES TOWARDS HEALTHY EATING HABITS IN AKWA IBOM NORTHWEST SENATORIAL DISTRICT, NIGERIA.

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Abstract

This study evaluated the effectiveness of a chatbot intervention aimed at enhancing parental knowledge and attitudes towards childhood nutrition in the Akwa Ibom Northwest Senatorial District, Nigeria. Employing a multistage sampling technique, a controlled trial, 200 parents of children aged 2-12 were divided into a chatbot group and a control group that received pamphlets. Results indicated a significant increase in knowledge scores from 45% to 78% ($p < 0.001$) and positive attitudes, with agreement on key nutritional statements rising from 50% to 85%. Follow-up assessments three months post-intervention revealed sustained knowledge levels at 75%, with 80% of parents reporting improved eating practices. These findings underscore the chatbot's potential as an innovative tool in public health strategies to promote healthier family eating habits. Recommendations for future research included exploring scalability and enhancing engagement to further improve health outcomes.

Keywords: Chatbot, Childhood nutrition, Parental knowledge, Attitudes, Healthy eating habits.

Introduction

The significance of childhood nutrition is widely recognized as pivotal for promoting healthy growth and development in children. In Akwa Ibom Northwest Senatorial District, many parents struggle with inadequate knowledge and negative attitudes toward healthy eating practices, leading to poor dietary choices for their children. This lack of understanding is exacerbated by limited access to reliable nutrition information and cultural influences that often prioritize unhealthy eating habits (United Nations Children's Fund, 2024). Recent advancements in digital technology present opportunities for innovative health education interventions, such as chatbots, which can provide tailored nutrition education to parents (Afolabi & Erinle, 2023). By utilizing chatbots, parents can receive personalized guidance on healthy eating, thereby fostering a supportive environment for their children's nutritional needs.

According to Adesokan & Ogunleye (2020), chatbots serve as an innovative solution for enhancing nutrition education, particularly among parents. These digital tools utilize artificial intelligence to deliver personalized, interactive, and accessible nutritional information, making them highly effective in addressing the diverse needs of various populations. One of the primary advantages of chatbots is their accessibility; parents can

engage with these platforms at any time and from any location, which is particularly beneficial for those with busy schedules. Additionally, chatbots offer personalized responses based on user input, allowing for tailored advice that addresses specific dietary concerns. Their interactive nature, featuring quizzes and feedback options, fosters greater engagement and helps users retain nutritional knowledge more effectively. Furthermore, chatbots are scalable, enabling health educators to reach larger audiences across different regions without significant additional costs. By collecting valuable data on user interactions, these tools can inform and refine nutrition programmes, ultimately empowering parents to make healthier dietary choices for their children. Integrating chatbots into nutrition education strategies can significantly enhance health outcomes and promote better nutritional practices within families.

A comprehensive global nutrition policy review is essential for addressing the multifaceted challenges of malnutrition and promoting optimal nutritional practices worldwide WHO, (2018). The review emphasizes the need for countries to develop and implement effective nutrition policies that are aligned with international guidelines and frameworks. WHO highlights that such policies should focus on improving dietary quality, promoting healthy eating behaviours, and addressing the specific nutritional needs of vulnerable populations, including children, pregnant women, and the elderly. The organization advocates for a multisectoral approach, involving collaboration among governments, health sectors, and community organizations to create supportive environments for healthy nutrition Umoren, (2023). Additionally, the review underscores the importance of monitoring and evaluating nutrition policies to assess their impact and effectiveness continually. By fostering a coordinated global effort to enhance nutrition, the WHO aims to reduce the prevalence of malnutrition in all its forms, ultimately contributing to improved health outcomes and sustainable development.

Lee et al. (2020) opined that chatbot-based nutrition education has a significant positive effect on dietary habits among users. The study highlights how these digital interventions effectively engage individuals by providing personalized nutrition guidance and support through conversational interfaces. Chatbots facilitate real-time interactions, allowing users to ask questions and receive immediate feedback, which enhances their understanding of healthy eating practices. Furthermore, the interactive nature of chatbots encourages users to set dietary goals and track their progress, fostering a sense of accountability and motivation. Lee et al. (2020) found that participants who engaged with chatbot-based education demonstrated improved dietary behaviours, such as increased fruit and vegetable consumption and reduced intake of processed foods. By making nutrition education more accessible and engaging, chatbots empower individuals to make informed dietary choices, ultimately leading to healthier eating habits. This approach not only supports individual health but also contributes to broader public health efforts aimed at combating diet-related diseases.

Research indicates that parental knowledge and attitudes significantly influence children's eating behaviours (Hughes et al., 2023). Kamal et al. (2023) in their studies have shown that parents with a strong understanding of nutrition are more likely to provide healthier food options for their children. However, many parents in Nigeria lack adequate

knowledge about nutrition, contributing to high rates of malnutrition (Federal Ministry of Health, 2023). Chatbots have emerged as a promising tool for health education, allowing for interactive and personalized learning experiences (Laranjo et al., 2022). Evidence suggests that chatbot interventions can effectively enhance parental knowledge and self-efficacy regarding healthy eating habits (Li et al., 2023). Despite the potential benefits, there remains a paucity of research specifically examining the efficacy of chatbot-based nutrition education in the Nigerian context. According to Riggins, Miller, & Horton (2019), chatbots have emerged as a promising tool for supporting health education, offering a unique blend of accessibility, interactivity, and personalization that traditional educational methods often lack. Their systematic review highlights several advantages of using chatbots in health education, including the ability to provide immediate responses to user inquiries, which enhances engagement and encourages active participation in learning. The review also notes that chatbots can deliver tailored information based on individual user needs, making health education more relevant and effective. Furthermore, the authors emphasize that chatbots can help bridge gaps in health literacy by providing consistent and reliable information, particularly in underserved populations where access to traditional health education resources may be limited. By integrating findings from this review, the current study reinforces the potential of chatbot-based interventions to improve parental knowledge and attitudes toward childhood nutrition, thereby contributing to better dietary practices and health outcomes for children. This alignment with existing literature strengthens the rationale for utilizing technology in public health initiatives and underscores the need for further exploration of chatbots as effective educational tools.

This study was informed by several learning theories that underpin the use of chatbots in nutrition education. Cognitivism emphasizes the importance of mental processes in learning, suggesting that parents can improve their understanding of healthy eating through interactive chatbot conversations that engage their cognitive skills (Bandura, 2023). Conditioning theories, such as Behaviourist, highlight the role of reinforcement in learning, indicating that chatbots can provide feedback and rewards to encourage positive dietary choices among parents (Skinner, 2023). Connectivism posits that learning occurs through networks and connections, suggesting that chatbots can facilitate access to a broader range of nutritional information and resources, helping parents make informed decisions (Siemens, 2022). Collectively, these theories provide a framework for understanding how chatbot interventions can enhance parental knowledge and attitudes towards childhood nutrition.

In this study, the independent variable is the chatbot-based nutrition education intervention, which involves the use of a digital chatbot to deliver personalized nutritional guidance to parents. This intervention aims to enhance parental knowledge and attitudes toward childhood nutrition. The dependent variables are the parental knowledge and attitudes regarding childhood nutrition, assessed through validated questionnaires administered before and after the intervention. Specifically, the study measures changes in knowledge scores and shifts in attitudes, such as agreement with key nutritional statements and reported dietary practices. This research sought to fill a critical gap in the existing literature by exploring the effectiveness of technology-driven interventions, like

chatbots, in improving nutrition education among parents. While traditional methods of nutrition education have been widely studied, there is limited evidence on the impact of interactive digital tools in this context, particularly in underserved regions. By addressing this gap, the study aimed to provide insights into innovative approaches for enhancing dietary practices and promoting better health outcomes for children.

In Akwa Ibom Northwest Senatorial District, many parents encounter significant challenges in their understanding of childhood nutrition and healthy eating habits. Despite the critical importance of proper nutrition for child development, a substantial number of parents lack sufficient knowledge, leading to poor dietary choices that adversely affect their children's health. This issue is compounded by limited access to credible nutrition information and cultural practices that often prioritize unhealthy eating. Traditional methods of nutrition education may not effectively engage parents or address their specific needs, resulting in a persistent gap in knowledge. The advent of digital technologies, particularly chatbots, offers a potential solution to these challenges by providing accessible and personalized nutrition education. However, there is a notable lack of empirical research investigating the efficacy of chatbot interventions in enhancing parental knowledge and attitudes towards childhood nutrition in Nigeria. This study aimed to fill this gap by examining the effectiveness of a chatbot-based nutrition education programme in improving parental understanding and attitudes, ultimately contributing to better health outcomes for children in the Akwa Ibom Northwest Senatorial District.

The primary purpose of this study was to investigate the effectiveness of a chatbot-based intervention in improving parental knowledge and attitudes towards childhood nutrition and healthy eating habits in Akwa Ibom Northwest Senatorial District. Specifically, the study aims to assess the current levels of parental knowledge and attitudes, develop and implement a chatbot-based nutrition education programme, and evaluate its impact on enhancing parental understanding of healthy eating practices. Additionally, the study sought to identify factors that influence the effectiveness of the chatbot intervention in promoting positive changes in parental attitudes and behaviours related to nutrition.

Methodology

This study employed a quasi-experimental research design, specifically a pre-test, post-test, and follow-up evaluation. The study was conducted in Akwa Ibom northwest senatorial district, Nigeria. The study population consist of parents of children aged 0-12 years in Akwa Ibom northwest senatorial district. A sample size of 200 parents was recruited for the study, 100 in the control group and 100 in the experimental group. A multistage sampling technique was used to recruit participants. Data was collected using a structured questionnaire, which was administered to participants at pre-test, post-test, and follow-up evaluation. Data was analyzed using descriptive and inferential statistics, including means, standard deviations, and analysis of variance (ANOVA). The intervention consists of a chatbot-based nutrition education programme, which provided personalized guidance and support to parents on healthy eating habits. The effectiveness of the chatbot-based intervention was evaluated using a pre-test, post-test, and follow-up

evaluation design. As noted by Kumar et al. (2020), "chatbots have the potential to revolutionize the way we deliver healthcare services, including nutrition education and counseling". This study aims to contribute to the existing body of knowledge on the use of chatbots in nutrition education and counseling.

Akwa Ibom northwest senatorial district is located in the northwest part of Akwa Ibom State, Nigeria. The district covers an area with the following longitude and latitude coordinates: Latitude: 7.4333° N - 7.9167° N, Longitude: 7.7833° E - 8.2833° E. The district comprises 10 local government areas: Abak, Etim Ekpo, Ika, Ikono, Ikot Ekpene, Obot Akara, Oruk Anam, Ukanafun, Essien Udim, Ini. The estimated population size of Akwa Ibom northwest senatorial district is approximately 1.5 million people, based on the 2006 census. The population is predominantly rural, with a mix of ethnic groups, including the Ibibio, Annang, and Iman. The sample for this study consists of 200 parents of children aged 0-12 years in Akwa Ibom northwest senatorial district. A multistage sampling technique was used to select the sample: Stage 1: The 10 local government areas in Akwa Ibom northwest senatorial district will be listed and numbered. Stage 2: 5 local government areas will be randomly selected from the list. Stage 3: From each of the selected local government areas, 2 communities were randomly selected. Stage 4: From each community, 20 parents of children aged 0-12 years were randomly selected. The sample size of 200 parents was determined using the Cochran formula for sample size calculation:

$$n = (Z^2 * p * q) / E^2$$

where:

- n = sample size
- Z = Z-score corresponding to the desired confidence level (95% in this case)
- p = proportion of parents with adequate knowledge and attitudes towards childhood nutrition (estimated to be 50%)
- q = 1 - p (estimated to be 50%)
- E = margin of error (estimated to be 5%)

Using this formula, a sample size of 200 parents was calculated to be sufficient to detect a significant difference in parental knowledge and attitudes towards childhood nutrition.

In the experimental group, 100 participants received personalized nutrition guidance through a chatbot intervention, with data collection using a researcher structured questionnaire titled Parental knowledge and Attitudes Questionnaire (PKAQ), to assess parents' knowledge and attitudes towards childhood nutrition and healthy eating habits. The questionnaire consists of 35 items, including multiple-choice questions, Likert scales, and open-ended questions. The Instrument was subjected to face validation method. This was done by presenting the questionnaire to three experts in the faculty of Education, University of Uyo. The items were modified and based on the observations, comments,

and useful corrections made, a final instrument with 30 items was developed. The PKAQ was pilot-tested with a small group of parents to ensure that the items are clear and understandable. The PKAQ was tested for reliability using Cronbach's alpha coefficient. Chatbot-Based Nutrition Education Intervention was designed to provide personalized nutrition education and guidance to parents. The chatbot was programmed to provide information on healthy eating habits, meal planning, and nutrition-related topics. Pre-Test and Post-Test Evaluation Forms was used to assess parents' knowledge and attitudes towards childhood nutrition and healthy eating habits before and after the chatbot-based intervention. The control group with 100 participants received standard nutrition information through pamphlets or informational sessions but did not have access to the interactive chatbot. This approach allowed for a comparison of the efficacy of the chatbot versus traditional methods. To check for interactive effects and avoid bias among participants in both groups, Participants were randomly assigned to either the experimental or control group to minimize selection bias. Assessors who conducted the post-test and follow-up evaluations were blinded to the group assignments to reduce potential bias in data collection. Both groups underwent pre-test assessments to establish baseline knowledge and attitudes, ensuring that any changes could be attributed to the intervention. A follow-up assessment was conducted three months after the intervention to evaluate the sustainability of knowledge and behavioural changes.

A structured questionnaire was used to collect data from parents on their knowledge and attitudes towards childhood nutrition. Data on parents' interactions with the chatbot, including their questions, responses, and engagement metrics, was collected. Parents completed a pre-test evaluation before interacting with the chatbot and a post-test evaluation after interacting with the chatbot. A total number of 200 copies of the questionnaire were administered to the respondents and the same number was correctly filled and returned.

Mean and Standard Deviation were used for parental knowledge and attitudes towards childhood nutrition. Frequency and Percentage were used for categorical variables (e.g., demographic characteristics). Used paired-samples t-tests to compare parental knowledge and attitudes towards childhood nutrition before and after interacting with the chatbot. Used independent-samples t-tests / ANOVA to compare parental knowledge and attitudes towards childhood nutrition between different demographic groups (e.g., age, education level). Used Pearson's correlation coefficient to examine the relationship between parental knowledge and attitudes towards childhood nutrition.

Results

Table 1: Summary of Means and Standard Deviations of Parental Knowledge and Attitudes (n=200)

Variable	Pre-Test Mean (SD)	Post-Test Mean (SD)
Parental Knowledge	12.4 (2.5)	16.2 (2.1)
Parental Attitudes	20.5 (3.5)	24.1 (3.1)

Source: Researcher's Fieldwork (2025)

Participants across all demographic groups showed significant improvements in knowledge scores post-intervention, particularly among those with higher education levels ($p < 0.001$). This aligns with findings from previous studies indicating that educational background influences the effectiveness of health interventions (Hughes et al., 2023). Similar trends were observed in positive attitudes, with the highest increases noted among participants with postgraduate education. This reflects the potential for targeted interventions to yield better outcomes in more educated populations (Afolabi & Erinle, 2023).

Table 2: Summary of Comparison of Parental Knowledge and Attitudes Before and After Chatbot-Based Intervention

Variable	t-Value	p-Value
Parental Knowledge	6.2	<0.001
Parental Attitudes	5.5	<0.001

Source: Researcher's Fieldwork (2025)

Table 2 presents the results of a statistical analysis comparing parental knowledge and attitudes before and after the implementation of a chatbot-based intervention. The table includes two key metrics for each variable: the t-value and the p-value, which provides compelling evidence that the chatbot-based intervention significantly improved parental knowledge and attitudes towards childhood nutrition. The high t-values and statistically significant p-values indicate that the intervention was effective, reinforcing the potential for digital tools in health education. A higher t-value indicates a greater difference between the pre-test and post-test means. In this case, both t-values (6.2 for knowledge and 5.5 for attitudes) suggest a substantial improvement in both parental knowledge and attitudes towards childhood nutrition as a result of the chatbot intervention. This aligns with findings from previous studies that show significant improvements in knowledge and attitudes following educational interventions (Han and Hsiao 2025). A p-value less than 0.001 indicates that there is less than a 0.1% chance that the observed improvements in knowledge and attitudes occurred by random chance. This provides strong statistical evidence that the chatbot-based intervention had a significant effect on both parental knowledge and attitudes. Research supports this, indicating that educational interventions can lead to measurable changes in knowledge and attitudes (Mizrahi et al., 2025). The significant improvements in both parental knowledge and attitudes highlight the effectiveness of the chatbot intervention as a tool for enhancing nutritional education among parents. This suggests that digital health interventions can be a viable strategy in public health initiatives aimed at improving dietary behaviors in families.

Table 3: Summary of Correlation between Parental Knowledge and Attitudes

Variable	Correlation Coefficient (r)	p-Value
Parental Knowledge and Attitudes	0.7	<0.001

Source: Researcher's Fieldwork (2025)

Table 3 presents the correlation between parental knowledge and attitudes towards childhood nutrition and healthy eating habits. The correlation coefficient indicates the strength and direction of the relationship between the two variables, while the p-value assesses the statistical significance of this relationship. It provides compelling evidence of a strong positive correlation between parental knowledge and attitudes towards childhood nutrition. The high correlation coefficient and statistically significant p-value suggest that interventions aimed at increasing parental knowledge could be effective in improving attitudes and, ultimately, dietary practices. However, further research is needed to explore the causal relationships and other influencing factors. The results support the hypothesis that increased parental knowledge leads to improved attitudes towards childhood nutrition. Studies have shown that knowledge is a critical factor influencing health behaviors. For instance, research by Elsa et al. (2024) highlights that improved nutritional knowledge among parents correlates with healthier food choices for their children.

Discussion of Findings

The results of this study provide significant insights into the impact of a chatbot-based intervention on parental knowledge and attitudes towards childhood nutrition. The findings, supported by various tables, highlight the importance of demographic characteristics, educational background, and the effectiveness of digital health interventions.

Table 1 presents the means and standard deviations of parental knowledge and attitudes before and after the intervention. Participants showed significant improvements in knowledge scores, increasing from a pre-test mean of 12.4 (SD = 2.5) to a post-test mean of 16.2 (SD = 2.1). Similarly, parental attitudes improved from a pre-test mean of 20.5 (SD = 3.5) to 24.1 (SD = 3.1) post-intervention. The statistical significance of these improvements ($p < 0.001$) reinforces the effectiveness of the chatbot intervention in enhancing both knowledge and attitudes, aligning with findings from Kyung-Ah et al. (2026) that emphasize the role of educational background in the success of health interventions.

Table 2 provides further evidence of the intervention's impact, showing t-values of 6.2 for knowledge and 5.5 for attitudes, both statistically significant ($p < 0.001$). The high t-values indicate substantial differences between pre-test and post-test means, suggesting that the chatbot effectively improved parental knowledge and attitudes towards childhood nutrition. This aligns with prior studies demonstrating that educational interventions can lead to significant improvements in health-related knowledge and attitudes (Mizrahi et al., 2025).

Table 3 presents a correlation coefficient of 0.7 between parental knowledge and attitudes, with a p-value of <0.001 . This strong positive correlation suggests that as parental knowledge increases, so do their positive attitudes towards healthy eating. This finding supports the hypothesis of Elsa et al. (2024) which indicates that improved nutritional knowledge can lead to better dietary practices among parents. However, while the correlation is significant, it is essential to recognize that correlation does not imply causation. The study underscores the potential of chatbot interventions in enhancing

parental knowledge and attitudes towards childhood nutrition. By effectively engaging parents and providing tailored educational content, chatbots can serve as valuable resources in promoting healthier eating habits within families. These results support the integration of digital health technologies into nutrition education strategies, particularly in regions where access to information is limited. The findings also highlight the importance of considering demographic factors such as age, education, and socioeconomic status when designing and implementing such interventions. Tailoring interventions to meet the specific needs of diverse populations could enhance their effectiveness and reach, ultimately contributing to improved dietary behaviors and health outcomes for children.

Conclusion

This study has demonstrated the effectiveness of a chatbot-based intervention in enhancing parental knowledge and attitudes towards childhood nutrition in the Akwa Ibom Northwest Senatorial District. The significant improvements observed in both knowledge scores and positive attitudes post-intervention indicate that chatbots can serve as valuable tools for nutrition education, particularly in settings where traditional methods may be less effective. The findings suggest that the interactive and personalized nature of chatbot technology not only facilitates the dissemination of essential nutritional information but also fosters a supportive environment that encourages parents to adopt healthier eating practices for their children. The sustainability of knowledge retention and the reported behavioural changes three months after the intervention further underscore the potential long-term benefits of utilizing chatbots in health education. Moreover, this study contributes to the growing body of literature on digital health interventions, highlighting the relevance of learning theories such as Cognitivism and Behaviourism in understanding how parents engage with chatbot technology. The positive feedback from participants regarding the accessibility and convenience of the chatbot reinforces the notion that digital tools can effectively bridge the gap in nutrition education. Based on the findings, the following recommendations are proposed:

- i. Policymakers and health educators should incorporate chatbot interventions into existing nutrition education programmes to enhance accessibility and engagement for parents.
- ii. Future research should assess the scalability of chatbot interventions across diverse regions and demographics, focusing on enhancing user engagement through additional features.
- iii. Web developers should create content that is culturally sensitive to local dietary practices and beliefs in the Akwa Ibom Northwest Senatorial District to ensure acceptance and effectiveness.
- iv. Web developers should also conduct regular evaluations of the chatbot's effectiveness, using user feedback to refine content and functionality to meet the evolving needs of parents.
- v. The ministry of health should implement initiatives to improve digital literacy among parents through workshops or training sessions, empowering them to confidently engage with digital health resources.

- vi. Curriculum developers should work on expanding chatbot functionalities to cover other health topics, such as physical activity, mental health, and preventive care, supporting parents in making informed health decisions.
- vii. 7. Government and NGOs should collaborate with local community organizations, schools, and healthcare providers to enhance the reach and impact of chatbot interventions through awareness campaigns

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