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Nutritional Rangers Mobile Application in Improving Child Nutrition, Feeding Response and Mother's Knowledge in Underprivileged Families

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ABSTRACT

Background: Stunting is a major public health challenge, particularly in disadvantaged communities where access to adequate nutrition and healthcare is limited. Addressing this issue requires effective interventions to improve child nutrition and feeding practices.
Purpose: This study aims to evaluate the effectiveness of the Nutritional Rangers Mobile Application in improving child nutrition, feeding responses, and mothers' knowledge among underprivileged families with stunted children aged 6 to 24 months.
Method: A pre-test and post-test design was employed, involving 22 mothers of stunted children from Kediri Regency, selected through purposive sampling. The app provided nutritional education, personalized dietary recommendations, and monitoring features over a three-month period.
Results: Significant improvements were observed in child nutrition metrics, with mean weight increasing from 11.25 kg to 14.48 kg and height showing incremental growth. Paired sample t-tests confirmed statistical significance ($p < 0.05$) in all measured Z-scores (Weight-for-Age, Height-for-Age, and Weight-for-Height). Additionally, feeding responses and maternal nutritional knowledge significantly improved ($p < 0.05$).
Discussion: The study highlights the effectiveness of the Nutritional Rangers Mobile Application in enhancing nutritional outcomes and maternal knowledge in resource-limited settings. The app's features contributed to significant improvements in child growth metrics and feeding practices.
Conclusion: The Nutritional Rangers Mobile Application is a valuable tool for empowering mothers with nutritional education and real-time monitoring, leading to sustainable improvements in child health and nutrition outcomes in disadvantaged communities.

Keywords: child nutrition, feeding practices, mobile application, mothers' knowledge, underprivileged families

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BACKGROUND

Stunting continues to be a pressing public health issue, especially in disadvantaged communities where access to proper nutrition and healthcare is frequently inadequate. This condition, marked by impaired growth and development in children, can lead to long-term deficits in cognitive abilities, educational performance, and economic productivity in the future. Effective strategies to combat stunting need to be multifaceted, addressing both the immediate nutritional needs and the broader health and educational outcomes (Beal et al., 2018; Elisaria et al., 2021; Laksono et al., 2022).

In 2022, Kediri Regency reported a stunting prevalence of 10.23% among 7,752 toddlers, underscoring the severity of the issue. Nutritional problems such as stunting significantly affect infants and young children, compromising cognitive and motor development and increasing vulnerability to various illnesses due to weakened immune systems. Economic challenges are a significant contributing factor, with many families struggling to afford nutritious food. Furthermore, inadequate cross-sectoral collaboration, poor monitoring of stunting management, and limited educational and support systems exacerbate the problem. The lack of comprehensive education and continuous support for mothers and caregivers hampers effective stunting management, often leaving families isolated and stressed, further impacting child-rearing practice (Leroy &Frongillo, 2019; Vaivada et al., 2020).

Advancements in mobile technology have created new opportunities for health interventions. Mobile applications can provide extensive reach and accessibility, delivering health information, facilitating screenings, and offering personalized recommendations to a broad audience. The "Nutritional Rangers" mobile application is an innovative tool designed to improve nutritional practices through education and behavior modification. By leveraging mobile technology, this app aims to empower families with knowledge about balanced diets and healthy eating habits, focusing on enhancing child nutrition, feeding responses, and mothers' knowledge in disadvantaged settings (Permana et al., 2021; Prasiska et al., 2020; Stasya&Sulistiadi, 2020).

OBJECTIVE

This study aims to evaluate the effectiveness of the "Nutritional Rangers" application in improving child nutrition, feeding responses, and mothers' knowledge. By assessing the impact of this mobile health intervention, the research seeks to provide valuable insights into innovative strategies for addressing nutritional challenges in underprivileged communities.

METHOD

This study employed a pre-test and post-test design to quantitatively assess the effectiveness of the "Nutritional Rangers" mobile application intervention on improving child nutrition, feeding responses, and mothers' nutritional knowledge among underprivileged families. A total of 22 mothers with stunted children (aged 6 to 24 months) from underprivileged families in Kediri Regency were selected using purposive sampling. The inclusion criteria included: mothers with children diagnosed with stunting (height-for-age Z score < -2), ownership of a smartphone, willingness to use the "Nutritional Rangers" mobile application, and consent to participate in the study.

The intervention involved mothers utilizing the "Nutritional Rangers" mobile application for three months. This app was designed to enhance maternal knowledge and behaviors that promote child nutrition through several key features: 1) Nutritional Education: Access to educational content on the nutritional needs of children, focusing on common nutrient deficiencies and age-appropriate feeding practices. 2) Personalized Dietary

Recommendations: Guidance tailored to the child's specific needs, taking into account their age, nutritional status, and food preferences. 3) Daily Dietary Records: Mothers could log their child's meals to track intake and adherence to the recommendations.

Behavior Modification Strategies: Reminders and motivational prompts were included to support the application of positive feeding practices. Monitoring Tools: The app provided tracking features for child growth metrics and maternal nutrition, giving mothers the ability to monitor and adjust dietary practices accordingly.

The intervention was structured as follows: 1) Onboarding Session: At the beginning of the study, mothers received a tutorial on how to use the application, with practical guidance on logging meals, accessing educational modules, and utilizing monitoring tools. 2) Continuous App Engagement: Mothers were encouraged to engage daily with the app over the three-month period, recording dietary information and following dietary recommendations. 3) Weekly Check-ins: The research team conducted weekly check-ins to support engagement and resolve any technical issues. 4) Data Collection Points: Baseline data was collected at the start (pre-test), and outcome data was collected at the end of the intervention period (post-test).

The "Nutritional Rangers" app is a health-education tool designed specifically for mothers in low-resource settings. It combines educational content, dietary tracking, and behavior modification techniques to support child nutrition and maternal engagement. The app's interface is user-friendly and available offline, ensuring accessibility for mothers with limited internet access.

To measure the effectiveness of the intervention over time, a time series approach was used by capturing data at the pre-test and post-test intervals (once a month for 3 month). This sequential assessment allowed for an analysis of changes in nutritional indicators, feeding responses, and maternal knowledge due to the intervention, identifying trends that reflect the intervention's impact. Outcome Measurement: 1) Child Nutrition: Growth metrics (weight-for-age, height-for-age, and weight-for-height Z scores) were collected at baseline and after three months. 2) Feeding Responses: Evaluated through a standardized feeding practices questionnaire, focusing on responsiveness to hunger cues and feeding frequency. 3) Maternal Knowledge: Assessed with a knowledge questionnaire designed specifically for the study, covering nutritional knowledge and feeding practices. Descriptive statistics summarized baseline characteristics. Paired t-tests were conducted to analyze pre- and post-test differences in child nutrition metrics, feeding responses, and maternal knowledge, with statistical significance set at $p < 0.05$.

RESULTS

Table 1. Characteristic of Respondents

Characteristic		N	%
Age	24-36 mo	6	27%
	36-48 mo	7	32%
	48-60 mo	9	41%
Sex	Male	15	68%
	Female	7	32%

The demographic characteristics of the toddlers in this study reveal a relatively balanced age distribution, with the largest group (41%) being between 48-60 months old. A significant majority of the toddlers (68%) are male.

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Table 2. Nutritional Status Pre-Test dan Post-Test (Time series)

Nutritional State	N	Pre Test			Post Test 1			Post Test 2			Post Test 3		
		Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Weight	22	11,25	9,00	12,70	12,20	10,02	13,76	13,50	11,18	15,64	14,48	12,13	16,76
Height	22	89,29	79,70	99,00	89,57	80,00	99,50	89,64	80,50	100,0	89,98	81,00	100,5

The nutritional status data from the pre-test and subsequent post-tests show a clear and consistent improvement over the intervention period. Initially, the mean weight of the toddlers was 11.25 kg, which increased significantly to 14.48 kg by the third post-test. Similarly, the mean height showed slight increases from 89.29 cm to 89.98 cm. These improvements suggest that the combined intervention of living granaries and the Nutritional Rangers mobile application positively impacted the children's growth metrics.

Table 3. Paired Sample T-Test (Z-Score) Pre Test-Post Test

		N	Mean	SD	SE	p-value
Z score Weight/Age	Pre Test	22	-2,36	0,32	0,07	0,006
	Post Test	22	-0,53	0,43	0,09	
Z score Height/Age	Pre Test	22	-1,44	0,75	0,16	0,000
	Post Test	22	1,86	0,85	0,18	
Z score Weight/height	Pre Test	22	-2,46	0,69	0,15	0,000
	Post Test	22	-2,44	0,80	0,17	

The paired sample t-test results further support these findings, indicating statistically significant improvements in all measured Z-scores (Weight-for-Age, Height-for-Age, and Weight-for-Height) from the pre-test to the post-test stages. The p-values for these improvements were all well below 0.05, underscoring the effectiveness of the intervention in addressing malnutrition among the participating toddlers.

Tabel 4. Table Paired Sample T-Test Feeding Respons and Mother's Knowledge

		N	Mean	SD	SE	p-value
Feeding Respons	Pre Test	22	15,64	3,15	0,07	0,000
	Post Test	22	21,05	3,22	0,09	
Mother's Knowledge	Pre Test	22	4,36	1,84	0,39	0,000
	Post Test	22	7,50	1,56	0,33	

Moreover, significant enhancements were observed in feeding responses and parental knowledge and skills related to child nutrition. The mean score for feeding response increased from 15.64 in the pre-test to 21.05 in the post-test, while parental knowledge and skills improved from a mean score of 4.36 to 7.50. These statistically significant changes, with p-values of 0.000 for both measures, highlight the role of the Nutritional Rangers mobile application in educating and empowering parents to improve their feeding practices, thereby contributing to better nutritional outcomes for their children.

DISCUSSION

The Nutritional Rangers Mobile Application not only serves as a pivotal tool for nutritional education and self-monitoring but also significantly enhances mothers' knowledge, skills, and confidence in feeding practices, thereby contributing to improved feeding responses and ultimately, nutritional status among children. Education through the Nutritional Rangers platform plays a crucial role in empowering mothers with comprehensive knowledge

about optimal feeding practices. By providing accessible and personalized nutritional information, the application equips mothers with insights into the types, compositions, quantities, qualities, and preparation methods of food suitable for their children's needs. This educational component is essential as it enhances mothers' understanding of nutritional requirements, fostering informed decision-making in daily feeding routines (Maryati et al., 2022; Stasya&Sulistiadi, 2020).

Moreover, the interactive nature of the Nutritional Rangers application fosters a supportive learning environment where mothers actively engage in educational content tailored to their specific circumstances. This active participation enhances not only cognitive learning but also boosts affective and psychomotor skills related to feeding practices. As mothers gain confidence in their abilities to provide nutritious meals, they are more likely to implement positive changes in their feeding behaviors, ensuring adequate calorie intake crucial for their children's growth and development (Prasiska et al., 2020; Rahma et al., 2022; Stasya&Sulistiadi, 2020).

Furthermore, the monitoring feature of the Nutritional Rangers app allows mothers to track their children's nutritional intake and growth progress regularly. This real-time feedback mechanism enables early detection of nutritional deficiencies or growth deviations, prompting timely interventions by healthcare providers or community health workers. The ability to monitor and analyze nutritional data empowers mothers to proactively manage their children's nutritional needs, enhancing the effectiveness of nutritional interventions and preventing potential health risks associated with malnutrition (Muna et al., 2021; Permana et al., 2021; Sari, 2021).

Overall, the combination of education and monitoring capabilities within the Nutritional Rangers Mobile Application not only enhances mothers' knowledge and skills but also instills confidence in their ability to provide optimal nutrition for their children. This holistic approach contributes significantly to improving feeding responses and ultimately elevating the nutritional status of children in resource-constrained settings. By addressing these critical aspects, the Nutritional Rangers app plays a pivotal role in promoting sustainable improvements in child health and nutrition outcomes.

CONCLUSION

In conclusion, the Nutritional Rangers Mobile Application demonstrates significant potential as an effective tool for enhancing child nutrition outcomes in underprivileged communities. Through its integrated approach of providing educational resources and facilitating real-time monitoring, the app empowers mothers with essential knowledge and skills to improve feeding practices. This results in notable advancements in feeding responses and nutritional status among children ($p < 0.05$), thereby addressing critical issues of malnutrition. By leveraging technology to promote sustainable health interventions, Nutritional Rangers not only supports individual families but also contributes to broader efforts in community health and well-being, emphasizing the importance of accessible and comprehensive nutritional support in achieving positive health outcomes for children.

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