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The Effectiveness of Swimming Intervention and Supplementary Feeding on the Growth of Malnourished Children

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ABSTRACT

Malnutrition has remained a public health issue both regionally and globally. This condition resulted from inadequate nutritional intake, both in terms of quality and quantity, as well as health problems that interfered with the absorption and utilization of nutrients. This study aimed to analyze the effectiveness of swimming intervention and supplementary feeding on the growth of malnourished children in Kepanjenkidul District. The research employed a quantitative method with a pre-experimental one-group pretest-posttest design, conducted in Kepanjenkidul District, Blitar City, from January to March 2025. The sample consisted of 20 respondents selected using purposive sampling. Data were collected using a digital scale, stadiometer, observation forms, and questionnaires. The analysis was carried out using univariate and bivariate methods with a paired t-test statistical analysis. The results of the study showed that there was a difference in growth status before and after the swimming intervention, with a p-value of 0.000. There was no difference in weight before and after the swimming intervention, with a p-value of 0.042. There was a significant difference in the effectiveness of the swimming intervention combined with supplementary feeding, with a p-value of 0.000. This study contributed to the development of knowledge in the field of child health and nutrition and served as a reference for future research regarding interventions for malnourished children.

Keywords: swimming intervention, supplementary feeding, growth, malnutrition

Background

Malnutrition remains a public health issue both at the regional and global levels. According to the World Health Organization (WHO, 2023), this condition results from insufficient nutritional intake in terms of both quality and quantity, as well as health problems that impair the absorption and utilization of nutrients (1). In toddlers, rejection of nutritious foods can hinder physical and cognitive development, increase the risk of stunting, impair the immune system, and delay overall development.

Based on data from UNICEF in 2021, an estimated 767.9 million people worldwide experienced undernutrition (2). According to the World Health Organization (WHO), the prevalence of undernourished toddlers in 2020 reached 22%, or approximately 149.2 million children under five suffering from stunting (3). Data from the Indonesian Ministry of Health (2023) reported that the national stunting prevalence reached 21.6%, with a targeted reduction to 14% by 2024. In Kepanjenkidul District, data from the Blitar City Health Office (2024) indicated that there were 40 undernourished toddlers (4). Given the high prevalence of undernourished children, comprehensive interventions are needed to reduce the incidence of malnutrition in the community.

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Physical activity interventions, such as swimming, can strengthen muscles and improve children's physical endurance, which are crucial for supporting growth, particularly among stunted children (5). Swimming offers several benefits including improved sleep quality, muscle strengthening, enhanced motor skills, and better blood circulation—all of which contribute to the physical development of toddlers (6).

In addition to swimming interventions, Supplementary Feeding Programs (PMT) also play a vital role in improving child growth, particularly by supporting optimal nutritional intake. This program can serve as a nutritional intervention targeting malnutrition and severe undernutrition, especially among children from low-income families (7). One innovative approach that can be implemented is the combination of swimming intervention and Supplementary Feeding Programs (PMT) for children experiencing stunting (8). Research Objectives is **e**ffectiveness of swimming intervention and supplementary feeding on the growth of malnourished children in kepanje mnkidul district.

Methods

This study employed a quantitative research approach with a pre-experimental design using a *one-group pretest-posttest* model. The research was conducted in Kepanjenkidul District, Blitar City, from January 2025 to March 2025. The study population consisted of children aged 1 to 5 years who were classified as undernourished and registered at the Posyandu (integrated health service post) in Kepanjenkidul District, Blitar City. Although 20 respondents were selected using *purposive sampling*, the inclusion and exclusion criteria were clearly defined to ensure replicability and to allow for generalization of the findings to similar populations. The inclusion criteria were: (1) children aged 1–5 years with undernutrition based on weight-for-age (W/A) or height-for-age (H/A) indices; (2) parental or guardian consent through written informed consent; and (3) absence of congenital diseases or physical abnormalities that could hinder swimming activities. The exclusion criteria included: (1) children who experienced illness lasting ≥3 months during the intervention period; and (2) children with allergies to the components of the supplementary food provided. Primary data were obtained through direct measurements of the children, including weight (body weight), height (body height), and observations of physical behavior during the swimming intervention. The dependent variable in this study was the growth of undernourished children. The independent variables were the swimming intervention and the provision of supplementary food. Data analysis was performed using univariate and bivariate analyses with a *paired t-test*, processed using SPSS version 2020.

Results

Growth of Malnourished Children Before and After Swimming and Supplementary Feeding Interventions

Table 1. Frequency Distribution of Growth in Malnourished Children Before and After the Swimming Intervention

Child Malnutrition	Severely Stunted		Stunted		Normal		Sig (2–talled)
Variable	f	%	f	%	f	%	*paired t-test*
Before	6	30	14	70	0	0	.000[a]
After	3	15	12	60	5	25	

The distribution of growth status in malnourished children before the swimming intervention**,** based on 20 respondents, showed that more than half of the children were classified as stunted, totaling 14 children (70%)**,** followed by severely stunted with 6 children

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(30%). This indicates that the majority of the respondents experienced growth problems, as evidenced by stunted and severely stunted growth status.

The distribution of growth status after the swimming intervention among the same 20 respondents revealed that 12 children (60%) remained stunted, 5 children (25%) achieved a normal growth status, and 3 children (15%) were still severely stunted. This suggests that although growth issues persisted for most respondents, there was a notable improvement in growth status for some.

Among the 20 children who participated in the swimming intervention, a significant difference in height before and after the intervention was found. Statistical analysis showed a p-value of 0.000, which is less than the significance level (α = 0.005). Therefore, it can be concluded that there was a statistically significant difference in height before and after the swimming intervention.

Body Weight of Malnourished Children Before the Swimming and Supplementary Feeding Interventions

Table 2. Frequency Distribution of Changes in Body Weight of Malnourished Children Before and After the Swimming Intervention

Child Malnutrition Variable	Severely Underweight		Underweight		Normal Weight		Sig (2–talled) *paired t-test*
	f	%	f	%	f	%	
Before	1	5	12	60	7	35	
After	1	5	12	60	7	35	.042[a]

The distribution of body weight status among malnourished children before the swimming intervention, based on 20 respondents, showed that more than half of the participants were categorized as underweight, totaling 12 children (60%), followed by normal weight with 7 children (35%), and severely underweight with 1 child (5%). This indicates that the majority of respondents had an underweight status prior to the intervention.

After the swimming intervention, the distribution remained the same: 12 children (60%) were underweight, 7 children (35%) had normal weight, and 1 child (5%) was severely underweight. This indicates that the body weight status of the respondents largely remained unchanged, with most still classified as underweight.

Among the 20 respondents who participated in the swimming intervention, statistical analysis showed a p-value of 0.042, which is greater than the significance level (α = 0.005). Therefore, it can be concluded that there was no statistically significant difference in body weight before and after the swimming intervention.

Effectiveness of Swimming and Supplementary Feeding Interventions on the Growth of Malnourished Children

Table 3. Frequency Distribution of Interventions Before and After Swimming and Supplementary Feeding in Malnourished Children

Child Malnutrition Variable	Poor Intervention		Very Poor Intervention		Good Intervention		Very Good Intervention		Supplementary Feeding Provided		Supplementary Feeding Not Provided		Sig (2–talled) *paired t-test*
	f	%	f	%	f	%	f	%	f	%	f	%	
Before	19	95	1	5	0	0	0	0	0	0	20	100	.000[a]
After	0	0	0	0	9	54	11	55	20	100	0	0	

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The distribution of observations before the swimming intervention among malnourished children showed that, out of 20 respondents, the majority were rated as having poor observation scores, with 19 children (95%), followed by very poor observation scores in 1 child (5%). This indicates that most respondents were initially assessed with inadequate growth-related indicators. After the swimming intervention, the observation results improved, with 11 children (55%) receiving very good observation scores, and 9 children (45%) receiving good scores. This demonstrates a significant improvement in observed growth indicators following the intervention.

Among the 20 respondents who participated in the swimming intervention, statistical analysis revealed a p-value of 0.000, which is less than the significance level ($\alpha = 0.005$). Therefore, it can be concluded that there was a statistically significant difference in observational outcomes before and after the swimming intervention.

Regarding supplementary feeding, the data showed that before the swimming intervention, none of the 20 children (100%) received supplementary feeding. However, after the intervention, all 20 children (100%) received supplementary feeding.

The analysis yielded a p-value of 0.000, which is also less than $\alpha = 0.005$, indicating a statistically significant difference in the provision of supplementary feeding before and after the intervention.

Discussion

Identifying the growth status of malnourished children before and after the implementation of swimming intervention and supplementary feeding

Based on the researcher’s analysis, there was a significant difference in children's height before and after the swimming intervention. This is consistent with previous research, which indicated that interventions such as baby swimming, baby massage, and baby gym are effective in promoting growth in infants aged 6 to 12 months. Therefore, it was found that there is a significant difference between the pre- and post-intervention stages (9). The observed improvement suggests that swimming interventions can stimulate muscles, enhance motor skills, boost metabolism, and increase children's appetite. Thus, swimming serves as a form of physical stimulation that has been proven to positively contribute to child growth. However, not all studies report the same results. According to previous research, while there was an increase in height among stunted toddlers, no significant difference was found between height before and after the swimming intervention (10).

The characteristics of the respondents showed that most of the children involved in this study were girls aged 4 to 5 years, which is a period of active growth. The majority of the respondents' parents were women of productive age (19 to 44 years old) and were unemployed, which may have enabled them to be more involved in accompanying their children during the swimming intervention. The large number of housewives among the respondents may indicate strong parental involvement in their children’s development, which in turn may have contributed to the significant improvements in the children's growth.

Nevertheless, this study has certain limitations that should be acknowledged**.** The small sample size (n=20) and the use of purposive sampling limit the generalizability of the findings to broader populations. Additionally, the absence of a control group and the relatively short duration of the intervention may affect the strength of the conclusions drawn. Variations in parental involvement, diet outside of the intervention, and children's baseline health conditions could also influence the outcomes.

Despite these limitations, the findings hold practical implications**.** Swimming interventions, combined with appropriate nutritional support, can serve as a feasible and

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engaging strategy to support growth in undernourished children, particularly in communities with access to safe swimming facilities. Integrating such physical activity into early childhood development programs may enhance their effectiveness, especially when supported by active parental involvement.

Identifying changes in the body weight of malnourished children before and after the swimming intervention

Based on the researcher's analysis, there was no significant difference in body weight before and after the swimming intervention. This finding is consistent with previous research, which indicated that water-based activities such as swimming, without the support of nutritious food, do not significantly affect children's anthropometric status (10). Therefore, this study aligns with the researchers' conclusion that swimming alone is not sufficient to improve the nutritional status of malnourished children. However, not all studies have shown the same results. Previous research found that children who regularly participated in swimming programs experienced greater weight gain compared to those who did not swim (11). This suggests that swimming interventions may have a positive impact on body weight if performed consistently.

The characteristics of the respondents showed that most of the children involved in this study were girls aged 4 to 5 years, which is a period of active growth. Nevertheless, the intervention did not result in a significant change in body weight. Most of the respondents' parents were housewives aged 19 to 44 years, who likely had more time to accompany their children during the swimming intervention. This may indicate a level of parental involvement in their children's development. The high involvement of housewives may reflect increased parental attention to children's physical activity, although it has not yet translated into measurable changes in body weight.

This study has several limitations that must be acknowledged**.** The small sample size and the use of purposive sampling limit the ability to generalize the findings. In addition, the short intervention period may have been insufficient to detect meaningful changes in body weight, especially considering that weight gain in malnourished children typically requires sustained nutritional and physical support over time. The absence of dietary monitoring or detailed food intake data also presents a limitation, as variations in home nutrition may have affected the outcomes.

Despite these limitations, the findings offer practical implications**.** They suggest that physical activity interventions, such as swimming, should be complemented by consistent and balanced nutritional support to achieve measurable improvements in body weight. This underscores the importance of integrating physical activity with nutrition-sensitive programs in addressing childhood malnutrition. Furthermore, the role of parental involvement should be explored further, as it may serve as a critical factor in optimizing intervention outcomes.

Analyzing the difference in effectiveness between swimming intervention and supplementary feeding on the growth of malnourished children

Based on the researcher's analysis, there was a significant difference in the nutritional status of malnourished children before and after the swimming intervention combined with supplementary feeding. This result aligns with previous studies showing that swimming interventions can improve children's appetite by enhancing metabolism and digestive system activity (12). The study emphasizes that active interventions such as swimming can stimulate psychological responses that support children's appetite. As children's physical activity increases, there is a gradual rise in food intake.

The findings support the notion that swimming interventions can be an effective method

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to improve the eating patterns of malnourished children. It was noted that before the swimming intervention, none of the respondents received nutritious food. However, after the intervention, all respondents began receiving balanced nutrition. This change indicates increased parental awareness of the importance of meeting children's nutritional needs after participating in the swimming program. This may be attributed to the understanding that physical activities like swimming require balanced nutritional intake to support children's growth and health. Therefore, the combination of swimming intervention and supplementary feeding with balanced nutrition has proven to be effective in improving the nutritional status of children optimally.

However, this study has several limitations that should be considered**.** The small sample size and purposive sampling technique may limit the generalizability of the findings. Additionally, the study did not control for other external factors such as variations in home environment, socio-economic status, or other health interventions that might influence nutritional outcomes. The relatively short duration of the intervention may also restrict the observation of long-term effects.

Despite these limitations, the study provides valuable practical implications. Integrating physical activity interventions such as swimming with nutritional supplementation can be a holistic approach to addressing malnutrition in children. Moreover, increasing parental awareness through such programs is crucial for sustaining balanced nutrition and supporting optimal child growth. Future programs and policies should consider this combined approach to maximize the effectiveness of interventions targeting childhood malnutrition.

Conclusions and Recommendations

The results of the study showed a significant difference in growth status before and after the swimming intervention. However, there was no significant difference in body weight before and after the intervention. The swimming intervention combined with the provision of supplementary food was found to be effective in improving the growth status of undernourished children. This effectiveness may be attributed to the combination of physical activity through swimming and adequate nutritional intake, which together support optimal child growth. Future researchers are encouraged to conduct further studies using larger and more diverse samples to enhance the generalizability of the findings. It is also recommended to include control groups to allow for better comparison and to strengthen the causal inference of the intervention effects. Additionally, future research should consider implementing longer intervention periods to evaluate the sustainability and long-term impact of swimming and supplementary feeding on the growth of undernourished children. Exploring the role of parental involvement and socioeconomic factors in moderating intervention outcomes may also provide deeper insights.

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