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The Effectiveness of Probiotic Supplementation in Treatment Stunting in Children

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ABSTRACT

Background: Stunting is a growth disorder in toddlers that is not normal, such as height or body length measurement results for children of the same age. Malnutrition is an indicator of social and political instability because it represents many people with diverse problems related to poverty, food insecurity, and poor hygiene and health.
Purpose: The purpose of this study was to determine the effect of giving probiotics to children who experience stunting.
Methods: This study uses a quantitative quasi-experimental design research type, with the design used being Non-Equivalent Pretest-posttest with control group design. In this study, there were 2 groups, namely the Probiotic therapy group and the control group with a total sample of 20. Data analysis conducted was Paired T-test and Independent T-test.
Results: The results of the analysis showed that there was no difference in weight, height, or head circumference between the intervention and control groups.
Conclusion: This indicates that the administration of probiotics did not have a significant effect on children's anthropometric values.

Keywords: childern, probiotics, stunting

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BACKGROUND

Stunting is a condition of impaired growth and development in children under the age of five, primarily caused by chronic malnutrition and recurrent infections. It is characterized by a child's height falling below minus two standard deviations from the median growth standards set by the World Health Organization (WHO, 2014). Stunting reflects delayed physical growth that does not align with the child's age and serves as a critical indicator of a population's nutritional status.

Several factors contribute to stunting, including inadequate nutritional intake, poor maternal nutrition during pregnancy, low household socioeconomic status, frequent infectious diseases, suboptimal parenting practices, and inadequate healthcare and environmental sanitation (Martono, 2023). Malnutrition, a major underlying factor, often mirrors broader social inequalities, poverty, food insecurity, and poor hygiene and healthcare access.

Globally, approximately 149 million children under the age of five were estimated to be stunted in 2020, with 45 million of them also suffering from wasting **(Soofi et al., 2021)**. In Indonesia, data from the 2022 Indonesian Nutrition Status Survey (SSGI) reported a stunting prevalence of 21.6%, a slight decrease from 24.4% in the previous year (Ministry of Health of the Republic of Indonesia, 2022). Although this figure shows improvement, it remains above the WHO target threshold of 20% (WHO, 2014). Some provinces, such as East Nusa Tenggara (35.3%), Papua (34.6%), West Nusa Tenggara (32.7%), and Aceh (31.2%), continue to report alarmingly high stunting rates.

The persistent high prevalence of stunting in Indonesia underscores the urgent need for strategic interventions, particularly because young children, whose immune systems are still maturing, are more vulnerable to infections that can exacerbate growth delays. An increasingly studied area is the role of gut microbiota, the complex community of microorganisms that colonize the gastrointestinal tract shortly after birth and play critical roles in immune system development and nutrient metabolism.

Maintaining a balanced gut microbiota is essential for optimal growth and development. Disruptions or imbalances in the gut microbial community (dysbiosis) due to malnutrition can negatively impact child health outcomes (Chehab et al., 2021). Research indicates that children with adequate nutritional status typically exhibit gut microbiota dominated by Bacteroides and Bifidobacterium, whereas malnourished children show a decrease in Bifidobacterium, a key genus that protects the intestinal environment from pathogenic colonization.

Recent studies have also highlighted a positive correlation between the abundance of Prevotella and improved height and weight in children, while Bifidobacterium dominance is associated with a healthier gut environment (Philips & Mulyanti, 2023). Furthermore, supplementation with probiotics such as Lactobacillus plantarum has been shown to reduce the population of pathogenic Enterobacteriaceae, promote gut health, and enhance nutrient absorption.

Considering the vital role of gut microbiota in supporting child growth, probiotic supplementation emerges as a promising complementary intervention in the management of stunting. Therefore, this study aims to investigate the effects of probiotic administration on improving the nutritional status and growth outcomes of stunted children.

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METHODS

Study Design

This study employed a quantitative quasi-experimental design using the Non-Equivalent Pretest-Posttest with Control Group Design. There were two groups involved in this study: Probiotic Therapy Group/intervention group (n = 10) Children receiving probiotic supplementation (L-Bio/Probiokid) for 14 days. Control Group (n = 10) Children who do not receive probiotic supplementation. Both groups are selected based on inclusion criteria: children aged 2-5 years, diagnosed with stunting, and with parental consent.

Study Location and Population

The study was conducted in Bangkalan Regency. The study population consisted of children under five years of age who were diagnosed with stunting.

Sample and Sampling Technique

The total sample consisted of 20 stunted children, divided equally into two groups (10 children per group). The sampling technique used was purposive sampling, where participants were selected based on specific inclusion and exclusion criteria.

Intervention

The probiotic used in this study was L-Bio/Probiokid. Probiotic Therapy Group: Children in this group were given probiotic supplementation daily for a period of 14 days. Control Group: Children in this group did not receive any intervention during the study. The optimal duration for probiotic consumption is often a subject of debate in clinical research. According to a study by Awad et al. (2021), administering probiotics for 14 days in children with growth disorders, such as stunting, resulted in significant changes in the composition of gut microbiota. Over this two-week period, probiotics helped improve the absorption of essential nutrients and reduce gut inflammation, which can otherwise hinder growth (Fanning et al., 2019).

Ethical Considerations

Prior to the study, informed consent forms were provided and signed by the parents or guardians of all participants in both the treatment and control groups.

Measurements and Instruments

The following measurements were taken before and after the intervention: Anthropometric Measurements:Weight-for-Age (WFA), Length-for-Age (LFA) or Height-for-Age (HFA), Weight-for-Height (WFH), Head Circumference (HC), Body Mass Index-for-Age (BMI-for-Age) and Additional Assessments: Increment in body length, Increment in body weight, Upper-lower body segment rasio, Mid-parental height and genetic potential for height

Data Processing

Data collected from each group underwent editing, scoring, coding, and tabulating before further analysis.

Data Analysis

Univariate analysis: Descriptive statistics using frequency distribution tables. Bivariate analysis: Paired T-test was used to compare pre- and post-treatment differences within each group. Independent T-test (for normally distributed data) or Mann-Whitney U test (for non-normally distributed data) was applied to compare the improvement in stunting management between the two groups. No. Etik : 2151/KEPK/STIKES-NHM/EC/V/2024.

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RESULTS

This research is funded by Kementerian Pendidikan, Kebudayaan, Riset dan Teknologi Direktorat Jendral Pendidikan Vokasi under the 2024 fiscal year research and community service grant program. The findings of this study are critical in understanding the role of probiotics, specifically **L-Bio/Probiokid**, in improving the nutritional status and growth parameters of children suffering from stunting. This research aimed to evaluate the effectiveness of probiotic supplementation in addressing key anthropometric measures, such as **weight-for-age (WFA)**, **height-for-age (HFA)**, **weight-for-height (WFH)**, and **body mass index-for-age (BMI-for-Age)**. The study also examined additional indicators of growth such as body length and weight increment, and the ratio of upper and lower body segments, all of which provide a comprehensive picture of a child's nutritional and developmental status.

In the following section, the results from both the **probiotic therapy group** and the **control group** will be presented and analyzed. These results will provide valuable insights into the potential benefits of probiotic supplementation as a tool for combating stunting, compared to children who did not receive any intervention. The study findings will be discussed with respect to their implications for improving child health in areas affected by stunting and undernutrition.

1. PRE-POST TEST IN THE INTERVENTION GROUP

Variables	Pre (Mean ± SD)	Post (Mean ± SD)	p-value	Information
Weight	9.84 ± 2.53	10.50 ± 2.60	0,000	There is a difference
Height	84.28 ± 11.82	84.35 ±11.85	0.209	No difference
Head Circumference	44.91 ± 1.77	44.91 ± 1.77	-	Cannot be analyzed because difference = 0

In the intervention group, a significant change in body weight was found between before and after probiotic administration (p-value = 0.000).

2. PRE-POST TEST ON CONTROL GROUP

Variables	Pre (Mean ± SD)	Post (Mean ± SD)	p-value	Information
Weight	9.61 ± 2.22	9.66 ± 2.18	0.356	No difference
Height	84.08 ± 10.81	84.10 ±10.83	0.343	No difference
Head Circumference	44.63 ± 1.96	44.63 ± 1.96	-	Cannot be analyzed because difference = 0

In the control group, no changes were found in body weight, height, or head circumference between the pretest and posttest measurements.

3. TEST OF DIFFERENCES BETWEEN GROUPS

Variables	Mean ± SD Intervention Group (n=10)	Mean ± SD Control Group (n=10)	p-value	Information

Pretest				
Weight	9.84 ± 2.53	9.61 ± 2.22	0.834	No difference
Height	84.28 ± 11.82	84.08 ± 10.81	0.444	No difference
Head Circumference	44.91 ± 1.77	44.63 ± 1.96	0.969	No difference
Posttest				
Weight	10.50 ± 2.60	9.66 ± 2.18	0.961	No difference
Height	84.35 ±11.85	84.10 ±10.83	0.741	No difference
Head Circumference	44.91 ± 1.77	44.63 ± 1.96	0.741	No difference

The results of the analysis showed that there was no difference in weight, height, or head circumference between the intervention group (given probiotics) and the control. This indicates that the administration of probiotics did not have a significant effect on children's anthropometric values.

DISCUSSION

Malnutrition is a condition where the body does not get enough nutritional intake or an imbalance between the food consumed and the nutritional needs needed for growth, development and maintaining health. Malnutrition in children can be caused by several factors including diet, parenting, health conditions, environmental sanitation, economic and social conditions of the family and lack of knowledge and awareness of family members about adequate nutritional intake (Komalasari et al, 2023). In terms of food product standards, the community has the right to food that meets the criteria for quantity and quality, as well as being safe and of high quality. For this reason, the Indonesian Food and Drug Supervisory Agency (BPOM) carries out controls on food before and after it is marketed, including being applied to food products containing probiotics (Bardosono & Sutanto, 2015).

This study showed the results of the analysis that there was no difference in weight, height, or head circumference between the intervention and control groups. This could be because the probiotic intervention period was only 14 days. Based on research by Saran et al. (2002), curd intervention containing probiotic L. acidophilus in children aged 2-5 years for 6 months, was significantly able to increase weight and height when compared to controls. Another study by Surono et al., (2011), with the intervention of Enterococcus faecium IS-27526 added to UHT milk in children aged 15-54 months for 90 days can increase weight and IgA levels when compared to placebo. In addition, based on Sazawal et al., (2010), milk intervention containing Bifidobacterium lactis HN019 combined with prebiotic oligosaccharides in children aged 1-4 years for 1 year can increase weight. However, looking at the average body weight before and after giving probiotics, it shows an increase in the respondents' body weight.

The human body is inhabited by millions of microorganisms, including bacteria, viruses, fungi, archaea, and protozoa, which form vital ecological groups. Among these, the intestinal microbiota consists of approximately 1,000 species of bacteria. While the microbiota typically remains stable, it can undergo significant dysbiosis due to factors like malnutrition or infectious processes, potentially leading to various pathologies. In fact, about 30% of energy, proteins, and carbohydrates cannot be digested by human enzymes. Once these substances reach the large intestine, they are metabolized by anaerobic bacteria, which release enzymes that aid in their digestion and absorption. In malnutrition, the release of cytokines such as tumor necrosis factor (TNF), IL-1, and IL-6 is commonly observed. During

stress, immune cells are recruited to adipose tissue, initiating an inflammatory response that causes metabolic disruptions. Given these processes, preventing malnutrition is critical, and one effective strategy involves the use of probiotics. Probiotics support the recovery of the intestinal microbiota by restoring balance in a timely manner, thereby helping to prevent the complications associated with malnutrition. The administration of probiotics aids in the development of a healthy gut microbiota, promoting the growth of microorganisms that enable survival mechanisms in challenging conditions like malnutrition. By modulating the host's physiological functions, probiotics play a significant role in influencing overall health and disease resistance. Beneficial bacteria administered via probiotics can reduce or prevent health issues by replacing pathogenic microorganisms with those that provide positive effects in the gut. This is crucial, as addressing malnutrition solely through diet can be challenging and recovery may be prolonged. Therefore, probiotics can provide a more effective and efficient means of restoring muscle strength and other vital physiological processes (Flores & Humaran, 2020).

Probiotics are live microorganisms that promote health by helping balance the gut microbiota and inhibiting the growth of harmful pathogens. Lactic acid, a byproduct of lactic acid bacteria, plays a key role in preventing the growth of pathogenic bacteria. For a product to be classified as a probiotic, it must contain a minimum concentration of 107 cfu /ml of probiotic bacteria. These bacteria need to withstand processing, tolerate bile salts, and survive stomach acid with a pH ranging from 3 to 5. Furthermore, they must endure in the digestive tract to effectively confer health benefits to the body. This ability to thrive in the gastrointestinal environment is why lactic acid bacteria, particularly strains of Lactobacillus, are commonly used as probiotic agents (Retnowati & Kusnadi, 2014).

A person who experiences malnutrition or lack of nutrition will experience a decrease in muscle thickness. Probiotic supplementation showed less loss of muscle mass in the jejunum and showed that the presence of probiotic microorganisms causes higher accessibility to dietary amino acids, which can reduce protein depletion in muscle and tissue. This is most likely due to the ability of probiotics to improve the integrity of the intestinal barrier and increase the entry of nutrients from the intestinal lumen (Azevedo et al, 2014).

Probiotics are included in functional foods, namely foods that when consumed by the body can provide health benefits for the body. In general, food products that are included in functional foods have active compound content. The classification of probiotics as functional foods is because probiotics contain good bacteria that can improve the balance of gut microbes in the intestines, so that they can make the intestines healthy by providing a protective effect and optimal nutrient absorption (Komalasari et al, 2023).

Probiotics when consumed in sufficient quantities can improve the balance of intestinal microflora when entering the digestive tract and provide a weight change effect. For example, giving probiotics Lactobacillus reuteri can increase body weight and height in children aged 1-6 years. Giving Lactobacillus fermentum has the effect of increasing body weight in infants aged 1-6 months and there is an increase in body weight after giving 1 month of probiotics in children (Maisharoh, 2019). In addition, probiotics Streptococcus thermophilus and Lactobacillus helveticus can contribute to faster recovery from intestinal atrophy caused by malnutrition (Azevedo et al, 2014).

CONCLUSION

This study showed that there was no difference in weight, height, or head circumference between the intervention group (given probiotics) and the control. This

indicates that the administration of probiotics did not have a significant effect on children's anthropometric values.

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