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Effectiveness of the Makanan Bergizi Gratis Program on the nutritional status of elementary school children: a mixed methods study

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ABSTRAK

Latar Belakang: *Masalah gizi pada anak usia sekolah masih menjadi tantangan di Indonesia, termasuk anemia dan gizi kurang yang dapat menghambat pertumbuhan fisik, perkembangan kognitif, dan prestasi belajar. Pemerintah merespons kondisi ini dengan meluncurkan Program Makan Bergizi Gratis (MBG) di sekolah sebagai upaya peningkatan kualitas gizi dan sumber daya manusia sejak dini.*

Tujuan: *Penelitian ini bertujuan mengevaluasi efektivitas program MBG terhadap status gizi siswa sekolah dasar di Kota Gorontalo serta mengidentifikasi faktor-faktor yang memengaruhi keberhasilan implementasinya.*

Metode: *Desain penelitian menggunakan desain mixed methods dengan pendekatan single-group pretest-posttest expermental design. Penelitian dilaksanakan pada bulan Juni-Agustus 2025 pada 283 siswa kelas IV–VI, dipilih secara stratified random sampling. Data kuantitatif diperoleh melalui pengukuran antropometri dan kadar hemoglobin, sedangkan data kualitatif dikumpulkan melalui wawancara mendalam dan observasi dengan guru, orang tua, dan pengelola program.*

Hasil: *Hasil penelitian menunjukkan tidak terdapat perbedaan signifikan secara statistik pada IMT sebelum dan sesudah intervensi (p=0,062), meskipun terdapat perbaikan ditandai dengan penurunan proporsi overweight dan obesitas. Status hemoglobin siswa relatif stabil, menunjukkan perlunya strategi tambahan seperti menu kaya zat besi atau suplementasi mikronutrien. Temuan kualitatif mengindikasikan bahwa program MBG diterima dengan baik oleh siswa, orang tua dan pihak sekolah, namun tantangan muncul terkait preferensi makanan siswa dan pemborosan pangan.*

Kesimpulan: *Secara keseluruhan, MBG berpotensi mendukung perbaikan status gizi anak usia sekolah apabila dilaksanakan secara konsisten dan berkelanjutan, di dukung oleh kolaborasi lintas sektor serta diintegrasikan intervensi tambahan. Penelitian ini menegaskan pentingnya program gizi berbasis sekolah sebagai intervensi komprehensif dalam mendukung tumbuh kembang dan prestasi akademik anak.*

KATA KUNCI: *hemoglobin; indeks massa tubuh; program makan bergizi gratis; status gizi*

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ABSTRACT

Background: *Nutritional problems among school-aged children remain a significant public health challenge in Indonesia, including anemia and undernutrition, which can hinder physical growth, cognitive development, and academic performance. The government has responded by implementing the Program Makan Bergizi Gratis (MBG) in schools to improve nutritional status and human resources from an early age.*

Objectives*: This study aimed to evaluate the effectiveness of the MBG program on the nutritional status of elementary school students in Gorontalo City and to identify factors influencing its implementation.*

Methods: *A mixed-methods study with a single-group pretest-posttest design was conducted from June to August 2025 among 283 students in grades IV–VI, selected through stratified random sampling. Quantitative data were obtained from anthropometric measurements and hemoglobin levels, while qualitative data were collected through in-depth interviews and observations involving teachers, parents, and program managers.*

Results: *No statistically significant difference in BMI was found before and after the intervention (p=0.062), although a reduction in overweight and obesity prevalence was observed. Hemoglobin levels remained relatively stable, indicating the need for additional strategies such as iron-rich menus or supplementation. Qualitative findings indicated strong program acceptance, despite challenges related to food preferences and waste.*

Conclusions: *The MBG program shows potential to improve nutritional status when implemented consistently and supported by cross-sectoral collaboration and complementary interventions.*

KEYWORDS*: body mass index; free nutritious meal program; hemoglobin; nutritional status*

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INTRODUCTION

Nutritional problems among school-aged children remain a major global public health challenge. According to the World Health Organization, approximately 149 million children worldwide are stunted, 45 million are wasted, and over 37 million are overweight (1). School-aged children constitute a vulnerable population due to their heightened nutritional requirements for physical growth and cognitive development, which are influenced by dietary intake, environmental conditions, and lifestyle factors. Evidence indicates that school-based nutrition interventions can improve dietary diversity and nutritional outcomes. A systematic review and meta-analysis demonstrated that greater dietary diversity is strongly associated with a reduced risk of undernutrition among school-aged children (2). Similarly, multi-component school nutrition programs across Asia significantly reduced BMI-for-age z-scores, whereas single-component interventions such as nutrition education alone had limited effects (3). An umbrella review further reported that healthy eating programs for adolescents improved dietary behaviors. However, their impact on anthropometric indicators, such as BMI and hemoglobin levels, varied by program duration and components (4).

In Africa, mixed-methods studies have highlighted challenges in ensuring menu diversity and nutritional adequacy within school feeding programs, which are influenced by caterers, student food preferences, and food waste (5). In Indonesia, nutritional problems among school-aged children remain considerable. The 2023 National Basic Health Research (Riskesdas) reported that anemia affected 23% of children aged 5–12 years, while the prevalence of overweight and obesity in the 5–18-year age group exceeded 19% (6). Local evidence suggests that school feeding programs, including MBG, can improve BMI and reduce the prevalence of anemia among elementary school students (7). Qualitative studies in Palembang also found that MBG implementation correlated with higher student attendance and concentration, with potential benefits for educational engagement and motivation (8,9). The program additionally aims to strengthen local supply chains by involving small

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and medium enterprises (UMKM) and local farmers, supporting both nutritional and economic sustainability (10). However, operational challenges persist, including menu monotony, limited local resources, and logistical constraints. Despite the potential of MBG, evidence on its effectiveness and implementation challenges remains limited, particularly in Gorontalo City, where child malnutrition and anemia prevalence exceed national averages. Existing studies have largely examined either quantitative nutritional outcomes or descriptive aspects of program implementation, with limited integration of anthropometric, hematological, and stakeholder perspectives within a single analytical framework. Moreover, evidence from eastern Indonesian regions with relatively constrained program infrastructure remains scarce.

To address this gap, the current study evaluates MBG's effectiveness in improving the nutritional status of elementary school students and identifies factors influencing program success. A mixed-methods approach, combining quantitative assessment of anthropometric and hemoglobin indicators with qualitative exploration of implementation processes, is employed. Findings are expected to provide evidence-based recommendations to optimize school-based nutrition interventions and inform local and national policy.

MATERIALS AND METHODS

Study Design and Setting

This study employed a mixed-methods design with a single-group pretest-posttest experimental design for quantitative assessment of nutritional status and qualitative methods (in-depth interviews and direct observations) to explore the context of MBG implementation. The study was conducted in Gorontalo City, Indonesia, targeting 4th–6th elementary schools that had implemented MBG for at least three months. Schools were selected based on active participation in MBG, representation of urban and semi-urban areas, and availability of student administrative records.

Study Population and Sampling

The study population comprised all 4th–6th-grade students in the selected MBG schools, totaling approximately 600. Inclusion criteria were active enrollment in grades 4–6, participation in MBG for at least three months, and parental consent. The minimum required sample size was calculated using Lemeshow's formula, assuming a 50% prevalence of normal nutritional status, 95% confidence level, and 5% margin of error, yielding 234 students. To accommodate potential dropouts or incomplete data, 15% was added, resulting in a total sample of approximately 270 students. Stratified random sampling was applied according to grade level, with proportional allocation across schools.

First, all participating elementary schools implementing the MBG program were identified, and the total number of students in grades IV–VI in each school was obtained from school administrative records. Second, students were stratified according to grade level (grades IV, V, and VI) to ensure proportional representation of each grade. Third, the required sample size for each stratum was determined proportionally based on the total number of students in each grade across the selected schools. Finally, within each stratum, students were selected using simple random sampling with a random number list generated by computer. Selected students who met the inclusion criteria and provided parental consent were enrolled in the study.

Intervention (MBG Program)

The MBG program provided one nutritious meal per school day, prepared according to standardized menus developed by the local education and health offices. Meals included staple foods, animal and plant-based proteins, vegetables, and fruits. The intervention period lasted for three consecutive months (January–March 2025).

Data Collection

Quantitative Data

Anthropometric measurements: Body weight and height were measured using calibrated digital scales and stadiometers. Body Mass Index (BMI) was calculated and interpreted according to WHO growth standards. Attendance at the MBG meal sessions was recorded daily to indicate whether participants consumed the program meal (yes/no). *Hemoglobin levels*: Measured using a portable

Hemocue analyzer from capillary blood samples obtained via finger prick. *Dietary factors*: While consumption of the MBG meal was monitored through daily attendance records, detailed dietary intake outside the MBG program was not assessed. The absence of comprehensive dietary intake data is acknowledged as a potential limitation, as daily food consumption may influence changes in BMI and hemoglobin.

Qualitative Data

In-depth interviews and direct observations were conducted with teachers, parents, and program organizers to explore perceptions, challenges, and facilitators of MBG implementation. Interview guides were semi-structured and validated by experts in nutrition and public health. In-depth interviews were conducted with a total of 15 key informants, consisting of 6 teachers, 5 parents, and 4 MBG program organizers, selected using purposive sampling based on their direct involvement in MBG implementation. Participant recruitment continued until data saturation was achieved, indicated by the absence of new themes emerging from subsequent interviews. Direct observations were also conducted during meal distribution and consumption to complement interview findings. Semi-structured interview guides were developed and validated by experts in nutrition and public health before data collection.

Data Analysis

Quantitative data were analyzed using SPSS version 31. Paired t-tests were used to compare mean BMI and hemoglobin levels before and after the approximately 3-month intervention period. A significance level of $p<0.05$ was applied. Qualitative data were analyzed thematically, following Braun and Clarke's six-step framework, to identify recurring patterns related to program acceptability, barriers, and sustainability.

Ethical Considerations

This study received ethical clearance from the Health Research Ethics Committee, Faculty of Health Sciences, Universitas Muhammadiyah Gorontalo (Certificate No: 017/KEPK-FIKES/VII/2025). Written informed consent was obtained from parents or guardians, and verbal assent was obtained from all participating students. Confidentiality and anonymity of participants were strictly maintained throughout the study.

RESULTS AND DISCUSSIONS

A total of 283 elementary school students participated in this study. The majority of respondents were aged 10–11 years. Specifically, 82 students (29%) were 10 years old, and 116 students (41%) were 11 years old. Students aged 8, 9, and 12 years accounted for 6 (2.1%), 64 (22.6%), and 15 (5.3%) participants, respectively.

Table 1. Respondent Characteristics

Characteristic	Number (n)	Percentage (%)
Age		
8 years	6	2.10
9 years	64	22.60
10 years	82	29
11 years	116	41
12 years	15	5.30
Gender		
Male	126	44.50
Female	157	55.50

Source: Primary data, 2025

Regarding gender distribution, 157 students (55.5%) were female, and 126 students (44.5%) were male (**Table 1**). These results indicate a relatively balanced gender distribution, with a slightly higher proportion of female participants. A total of 283 students completed both baseline and endline assessments. As shown in **Table 2**, the mean BMI-for-age z-score showed a slight improvement after the intervention, from -0.21 ± 1.10 to -0.18 ± 1.08, though the change was not statistically significant ($p = 0.062$). Despite this, there was a trend toward improvement, with

reductions in the proportion of students classified as overweight (10.2% to 9.2%) and obese (7.4% to 6.7%) (**Table 2**). Hemoglobin levels remained largely unchanged, with a mean of 12.3 ± 1.1 g/dL pre-intervention and 12.4±1.0 g/dL post-intervention (p = 0.317). The prevalence of anemia did not decrease significantly, suggesting that MBG alone may not adequately address micronutrient deficiencies, particularly iron.

Table 2. Mean BMI-for-age z-score and hemoglobin concentration before and after MBG implementation

Variable	Pre-Test Mean ± SD	Post-Test Mean ± SD	p-value
BMI (z-score)	-0.21 ± 1.10	-0.18 ± 1.08	0.062
Hemoglobin (g/dL)	12.30 ± 1.10	12.40 ± 1.00	0.317

Qualitative Findings

Thematic analysis revealed three main themes:

High acceptance and enthusiasm: Students generally welcomed MBG meals, particularly familiar foods. Teachers and parents perceived the program as supportive of school performance and attendance. This was reflected in participants' statements, such as:

> "*Students enjoy the meals because the menu is similar to the foods they usually eat at home, so most of them finish their meals."* (Teacher)
>
> "*Since the MBG program started, my child is more enthusiastic about going to school and rarely complains about hunger*." (Parent)

Food preferences and waste: Some students disliked certain vegetables and protein sources, leading to partial consumption and food waste. Menu monotony also affected intake.

> "*When certain vegetables or protein dishes are served, many students only eat the rice and leave the rest.*" (Teacher)
>
> "*My child sometimes does not finish the meal, especially when the menu is repetitive over several days.*" (Parent)

Implementation barriers: Limited resources, logistical challenges, and kitchen facilities constrained program consistency, although stakeholders expressed strong support for sustaining MBG.

> "*The implementation of MBG is sometimes constrained by limited kitchen facilities and manpower, which affects daily consistency*." (Program organizer)
>
> "*Despite the challenges, we strongly support this program because the benefits for the children are very clear."* (Teacher).

This study evaluated the effectiveness of the Program Makan Bergizi Gratis (MBG) on the nutritional status of elementary school students using a mixed-methods approach. Quantitative findings indicated no statistically significant change in BMI-for-age z-scores (p = 0.062) or hemoglobin levels (p = 0.317). Several factors may explain the absence of statistically significant differences in this study. First, the intervention duration of approximately three months may have been insufficient to produce measurable changes in anthropometric and hematological indicators, which generally require longer-term sustained nutritional improvements (11,12). Second, the MBG program primarily provides balanced meals to meet daily energy and macronutrient needs, without targeted micronutrient fortification or supplementation, which may limit its impact on hemoglobin levels. Third, variability in individual food consumption, influenced by students' food preferences and partial meal intake observed during implementation, may have reduced participants' overall nutritional exposure.

Despite the lack of statistical significance, a modest reduction in the proportion of overweight and obese students was observed, suggesting a trend toward improvement in nutritional status. Despite the lack of statistical significance, a modest reduction in the proportion of overweight and obese students was observed, suggesting a trend toward improvement in nutritional status. This finding aligns with previous studies indicating that school feeding programs can contribute to gradual improvements in nutritional outcomes, although measurable anthropometric changes often require longer and more intensive interventions (13–15). The limited impact on BMI aligns with previous international studies.

Mohammed et al. reported that school feeding programs can improve children's nutritional outcomes, yet changes in anthropometric measures may be modest without complementary interventions (13). Similarly, Wang et al. highlighted that multi-component school nutrition programs are more effective than single-component interventions, particularly when meals are combined with nutrition education or micronutrient supplementation (14). The lack of significant improvement in hemoglobin underscores the need for targeted micronutrient strategies. Perveen et al. and Cliffer et al. found that integrating iron-folic acid or multiple-micronutrient supplementation into school-based programs significantly improved hemoglobin levels and reduced anemia prevalence (16,17). These findings suggest that MBG alone, which primarily provides energy and macronutrients, may be insufficient to address micronutrient deficiencies, especially iron deficiency. Additional evidence also highlights that nutrition-sensitive and nutrition-specific interventions are more effective when implemented synergistically (18).

Qualitative findings from this study revealed high acceptance of MBG meals among students, parents, and teachers, particularly when menus incorporated culturally familiar foods. This high acceptance aligns with international evidence emphasizing the importance of culturally appropriate meals in enhancing program adherence, as familiar foods not only increase consumption but also foster engagement from parents and teachers (19,20). Nevertheless, several challenges were identified, including individual food preferences, menu monotony, and food waste, reflecting barriers reported in global studies on effective school feeding implementation (21,22).

Implementation challenges such as limited resources, logistical constraints, and inconsistent kitchen facilities were also noted. These operational barriers may affect program consistency and nutrient delivery, thereby influencing outcomes. Similar challenges have been reported in other low- and middle- income country settings, where sustainable school feeding requires adequate funding, multisectoral collaboration, and adaptive implementation strategies (23,24). Despite modest quantitative outcomes, MBG demonstrates potential as a scalable intervention to support child nutrition and educational performance. Integration with micronutrient fortification, targeted supplementation, and nutrition education could enhance both anthropometric and hematological outcomes (25). Furthermore, engaging parents, local farmers, and school staff was identified as a key facilitator, consistent with international evidence indicating that community involvement strengthens adherence and sustainability of school nutrition programs (26).

In summary, while the MBG program did not produce statistically significant changes in BMI or hemoglobin over the study period, contextual factors identified within this study -such as intervention duration, absence of targeted micronutrient strategies, and variability in meal consumption- provide plausible explanations for these findings. Observed trends and qualitative insights suggest positive movement toward improved nutritional outcomes. Sustained implementation, menu diversification, micronutrient integration, and community engagement are essential to achieve meaningful improvements in child health and nutrition (27,28).

CONCLUSION AND RECOMMENDATION

The present study evaluated the effectiveness of the Program Makan Bergizi Gratis (MBG) on elementary school students' nutritional status using a mixed-methods approach. Quantitative results indicated modest positive trends, particularly in reducing overweight and obesity, though changes in BMI-for-age z-scores and hemoglobin were not statistically significant. Qualitative findings revealed high acceptance of MBG meals among students, parents, and teachers, especially when menus included culturally familiar foods. Still, challenges such as menu monotony, food preferences, leftover waste, and logistical constraints limited the program's full impact.

To enhance effectiveness, recommendations include menu diversification with nutrient-rich foods, integration with targeted micronutrient supplementation, regular monitoring of consumption and outcomes, and capacity building for staff and caterers. Policy support and multisectoral collaboration, including engagement

with parents and local communities, are essential for sustainability. Overall, MBG shows promise as a school-based nutrition intervention, with its success dependent on consistent implementation, community engagement, and ongoing evidence-informed adaptation.

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