

Analysis of the Relationship between Hygiene Level and Nutritional Status among Children in Wonosari Village, Boalemo, Gorontalo

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ABSTRACT

Introduction: Nutritional status is a complex health outcome determined by multiple interacting factors, while hygiene's independent role remains unclear. This study examined its link with nutritional status in Wonosari Village, Gorontalo.

Method: A cross-sectional study of 48 children aged 10–13 years in Wonosari Village, Boalemo, Gorontalo was conducted in July 2026. BMI was calculated from measured weight and height. Hygiene level was assessed using a standardized questionnaire, with scores categorized by median split into poor (<8) and good (≥8). Nutritional status was determined based on BMI-for-age using CDC 2000 growth charts and classified into three categories: underweight, normal, and overweight (combining overweight and obesity). The Fisher-Freeman-Halton Exact Test was used due to violated Chi-Square assumptions.

Results: The majority of respondents had normal nutritional status (62.5%), followed by overweight (29.2%) and underweight (8.3%). The mean score for hygiene level was 7.17 ± 2.10 , with a range of 4 to 12. 21.4% of children with poor hygiene were overweight, 7.1% were underweight, and 71.4% had a normal nutritional condition. Of the children who practiced good hygiene, 10.0% were underweight, 40.0% were overweight, and 50.0% had normal nutritional status. Hygiene status and nutritional status did not significantly correlate, according to the Fisher-Freeman-Halton Exact Test ($p = 0.3181$).



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Conclusion: No association was found between hygiene level and nutritional status in this study. This finding suggests that while hygiene may play a role, nutritional status is influenced by a complex interplay of dietary, socioeconomic, behavioral, and environmental factors that extend beyond hygiene practices alone.

Keywords: Body mass index, elementary school children, hygiene level, nutritional status

Introduction

One important indicator of public health and child development is the nutritional status of school-age children. Well-nourished children have improved immune system performance, physical development, and cognitive abilities.¹ On the other hand, malnutrition, both undernutrition and overnutrition, can lead to a number of health problems, such as stunted growth, impaired cognitive development, metabolic disorders associated with obesity, and increased susceptibility to infection.² Nutritional status is a complex health outcome that is influenced by a number of interrelated factors, such as dietary intake, physical activity, socioeconomic conditions, and the burden of infectious diseases.³

Maintaining personal hygiene is essential, especially for kids. The risk of infectious disorders including diarrhoea, respiratory infections, and soil-transmitted helminth infections is greatly decreased by good hygiene habits, such as frequent hand washing with soap, keeping fingernails clean, oral hygiene, and bathing techniques.⁴ Recurrent infections can impede the absorption and utilisation of nutrients, which can eventually impact a child's growth and nutritional status.⁵ Despite being a component of this intricate system, it is unclear how hygiene behaviours, particularly in adult populations, independently impact nutritional status.

Previous studies have demonstrated a significant relationship between personal hygiene and nutritional status in children. Previous research has found that poor personal hygiene is associated with a higher risk of stunting in children under five years of age.⁶ Similarly, research in several developing countries has shown that children with good hygiene practices have better anthropometric measurements and lower prevalence of undernutrition.⁷

However, the relationship between personal hygiene and nutritional status in Indonesian elementary school children, particularly in rural and peri-urban areas, remains insufficiently explored. Wonosari Village in Boalemo Regency, Gorontalo Province, represents a unique setting where socioeconomic conditions, access to clean water and sanitation facilities, and nutritional patterns may differ from urban centers. The double burden of malnutrition, where both undernutrition and overnutrition coexist, is increasingly observed

in such communities. The aim of this study was to examine the connection between the nutritional status and hygiene level of the people living in Wonosari Village, Boalemo, Gorontalo. It is anticipated that the results would aid in the creation of focused health promotion initiatives in rural areas.

Methods

Study design and settings

This study was carried out in Wonosari Village, Boalemo Regency, Gorontalo Province, Indonesia, using a cross-sectional design. In July 2026, a single day was dedicated to data collecting. Wonosari Village was chosen as the research site because it exemplifies Gorontalo's rural settlements with a range of socioeconomic circumstances and restricted access to sanitary facilities.

Population and sample

This study was conducted at SDN 11 Wonosari, a single elementary school in Wonosari Village, selected purposively based on accessibility and school willingness to participate. Wonosari Village has two elementary schools; the other school was unavailable during the data collection period. Thus, the study population comprised all students aged 10–13 years enrolled at SDN 11 Wonosari, with 48 students meeting the eligibility criteria. Inclusion criteria were (1) active student status, (2) age 10–13 years, and (3) parental consent and child assent. Exclusion criteria included chronic diseases or disabilities affecting nutritional status. Given the single-school setting, the findings are not generalizable to all children in the village.

Variables

The independent variable was hygiene level, assessed using a standardized questionnaire consisting of items measuring handwashing habits, fingernail cleanliness, bathing frequency, oral hygiene, and overall cleanliness behavior. The maximum possible score was 12. Respondents were classified into two categories using a median split: "poor hygiene" (score < 8) and "good hygiene" (score ≥ 8).

The dependent variable was nutritional status, assessed using Body Mass Index (BMI) calculated as weight (kg) divided by height squared (m²). Nutritional status was determined based on BMI-for-age according to the CDC 2000 growth charts, which classify nutritional status into four categories: Underweight: BMI < 5th percentile; Normal weight: BMI 5th to < 85th percentile; Overweight: BMI 85th to < 95th percentile; and Obesity: BMI ≥ 95th percentile.

The CDC 2000 growth reference was selected because it is widely used in Indonesian epidemiological studies and provides age- and sex-specific BMI percentiles that are applicable

for school-aged children in this population. For the purpose of statistical analysis, the overweight and obesity categories were combined into a single "overweight" category, resulting in three nutritional status categories: underweight, normal, and overweight. This consolidation was necessary to address the small sample size (N=48), as the original four-category classification resulted in very low expected cell counts (more than 20% of cells had expected counts less than 5), which would violate the assumptions of the Fisher-Freeman-Halton Exact Test. Combining these two categories also provides clinically meaningful interpretation, as both overweight and obesity represent excess adiposity and are often grouped together in public health analyses when sample size is limited. This consolidation was necessary to meet the minimum expected cell count requirements for the Fisher-Freeman-Halton Exact Test and to provide clinically meaningful interpretation.

Data collection

Anthropometric measurements were conducted by trained physicians and physiotherapists. Weight was measured using a digital scale with an accuracy of 0.1 kg, with the children wearing light clothing and barefoot. Height was measured using a portable stadiometer with an accuracy of 0.1 cm, with the children standing upright barefoot. Hygiene data were collected through direct observation and in-person interviews using a structured questionnaire. The questionnaire was administered and completed directly by trained researchers (the authors) based on their observations of each child's hygiene practices and the children's verbal responses to standardized questions. This approach minimized bias from parental over-reporting and ensured consistent data collection across all participants.

Data analysis

Data were analyzed using SPSS version 25.0. Descriptive statistics were presented as frequencies, percentages, means, and standard deviations. The Fisher-Freeman-Halton Exact Test was used to examine the association between hygiene level category and nutritional status category, as the Chi-Square test assumptions were violated (more than 20% of cells had expected counts less than 5). A p-value < 0.05 was considered significantly significant.

Ethical considerations

This study used written consent obtained from parents/guardians, and verbal assent was obtained from all participating children. All data was anonymized and treated confidentially.

Result

A total of 48 children aged 10-13 years from Wonosari Village, Boalemo, Gorontalo participated in this study. The demographic and descriptive characteristics are presented in Table 1. The respondents' average age was 10.63 ± 0.73 years. According to the age

distribution, the majority were 10 years old (43.8%), followed by 11 years old (39.6%), 12 years old (14.6%), and 13 years old (2.1%). In terms of sex distribution, there were somewhat more female respondents (54.2%) than male respondents (45.8%). Hygiene level assessment revealed that 58.3% of children had poor hygiene, while 41.7% had good hygiene.

Table 1. Demographic characteristics of study participants from Wonosari Village, Boalemo, Gorontalo (N=48)

Characteristic	Category	Frequency (n)	Percentage (%)
Age (years)	10	21	43.8
	11	19	39.6
	12	7	14.6
	13	1	2.1
Sex	Male	22	45.8
	Female	26	54.2
Hygiene Level	Poor	28	58.3
	Good	20	41.7

As shown in Table 2, the majority of respondents had normal nutritional status (62.5%), followed by overweight (including obesity) (29.2%), and underweight (8.3%).

Table 2. Distribution of nutritional status among respondents in Wonosari Village, Boalemo, Gorontalo (N=48)

Nutritional Status	Frequency (n)	Percentage (%)
Underweight	4	8.3
Normal	30	62.5
Overweight (including obesity)	14	29.2

Table 3 shows that hygiene scores ranged from 4 to 12, with a mean score of 7.17 ± 2.10 , indicating moderate overall hygiene practices among the study population in Wonosari Village.

Table 3. Hygiene level descriptive statistics (N=48)

Variable	Minimum	Maximum	Mean	Std. Deviation
Hygiene Score	4.00	12.00	7.17	2.10

The cross-tabulation analysis on Table 4 shows that among children with poor hygiene, 71.4% had normal nutritional status, 21.4% were overweight, and 7.1% were underweight. Among children with good hygiene, 50.0% had normal nutritional status, 40.0% were overweight, and 10.0% were underweight.

Table 4. Cross-tabulation of hygiene level and nutritional status in Wonosari Village, Boalemo, Gorontalo

Hygiene Category	Underweight	Normal	Overweight	Total
Poor	2 (7.1%)	20 (71.4%)	6 (21.4%)	28 (100.0%)
Good	2 (10.0%)	10 (50.0%)	8 (40.0%)	20 (100.0%)
Total	4 (8.3%)	30 (62.5%)	14 (29.2%)	48 (100.0%)

The Fisher-Freeman-Halton Exact Test found no statistically significant correlation ($p = 0.3181$) between children's nutritional status and hygiene level in Wonosari Village. This suggests that there was no significant correlation between the research population's nutritional status and hygiene level.

Discussion

This study investigated the relationship between hygiene level and nutritional status among elementary school children aged 10-13 years in Wonosari Village, Boalemo, Gorontalo. Data were collected in July 2026. The findings revealed that the majority of children had normal nutritional status (62.5%), with a considerable proportion being overweight/obese (29.2%) and a smaller proportion being underweight (8.3%). Hygiene scores were generally moderate, with more than half of the children categorized as having poor hygiene (58.3%). However, no statistically significant association was found between hygiene level and nutritional status.

The prevalence of overweight/obesity (29.2%) in this study population is concerning and reflects the growing trend of childhood obesity in Indonesia, including in rural and peri-urban areas such as Gorontalo. This finding is consistent with recent national data showing an increasing prevalence of overweight and obesity among school-aged children across various regions.⁸ The double burden of malnutrition, where undernutrition and overnutrition coexist, is evident in this population, although with overnutrition being more prevalent. Similar findings have been reported in other developing countries undergoing rapid economic and nutritional transitions.⁹ The prevalence of overweight in this study is higher than that reported in some

other rural Indonesian settings, where rates typically range between 10-20%.¹⁰ This relatively high prevalence may reflect the specific socioeconomic and dietary characteristics of Wonosari Village, which may be undergoing a more rapid nutritional transition than other rural areas.

Interestingly, the proportion of overweight children was higher in the good hygiene group (40.0%) compared to the poor hygiene group (21.4%). Although this difference was not statistically significant, this finding warrants cautious interpretation. One possible explanation, based on findings from previous studies, is that families with better socioeconomic status may have greater access to hygiene facilities and education, but may also have higher purchasing power for processed snacks and sugary beverages, which are known contributors to excess weight gain in children.¹¹ Additionally, in some rural settings, the perception of a "well-fed" child may be associated with higher social status, potentially leading to overfeeding.¹² This phenomenon highlights the complexity of nutritional status determinants and suggests that interventions targeting nutritional status must be multidimensional rather than focusing solely on hygiene promotion. However, it is important to note that socioeconomic status, dietary patterns, and purchasing power were not directly measured in this study. Therefore, this explanation remains speculative and should be interpreted with caution. Another possible interpretation is that the lack of a significant association simply reflects the limited statistical power of the study due to the small sample size (N=48), rather than indicating a true absence of relationship. The finding highlights the complexity of nutritional status determinants and suggests that further research with larger samples and comprehensive measurement of socioeconomic and dietary factors is needed to better understand the underlying mechanisms.¹³

The lack of a significant correlation between nutritional status and hygiene in this study contradicts the results of several previous studies conducted in developing countries.^{7,14} This difference may be explained by several factors. First, children living in rural or village areas constituted the majority of the study population, which may differ from urban populations in terms of nutritional habits and hygiene practices. Second, there may not have been sufficient statistical power to identify a true association due to the study's small sample size (N=48). Third, poor hygiene can contribute to malnutrition through recurrent infections, but this association may be less pronounced in populations where overall access to clean water and sanitation may be suboptimal but not a primary driver of nutritional status. This is because the cross-sectional study design cannot establish temporal causality.

The use of the Fisher-Freeman-Halton exact test was necessary due to the violation of the chi-square test assumptions. When expected cell counts are low, this particular test yields more trustworthy p-values, guaranteeing that the statistical conclusion is strong even with a

small sample size.

The importance of personal hygiene in preventing infectious diseases that lead to undernutrition, especially in children under five, has been repeatedly shown by earlier studies. However, among school-age children living in rural areas, the relationship might be more complicated and mediated by additional variables like parental education, physical activity, dietary quality, socioeconomic status, and access to healthcare services.¹⁵ According to this research, nutritional status is impacted by a complex interaction of dietary, socioeconomic, behavioural, and environmental factors that go beyond hygiene practices alone, even though hygiene may play a part.

Study limitations

This study has several limitations. First, the small sample size limited statistical power and may have prevented the detection of significant associations. Second, the cross-sectional design precludes causal inference. Third, hygiene was assessed using self-reported questionnaires, which may be subject to social desirability bias. Fourth, the study was conducted in a single village/school, limiting generalizability to other populations in Gorontalo or elsewhere. Future studies with larger sample sizes, longitudinal designs, and objective hygiene measures are needed to confirm these findings.

Conclusion

There was no statistically significant correlation ($p = 0.3181$) between children's nutritional status and hygiene level in Wonosari Village, Boalemo, Gorontalo. According to this research, nutritional status is impacted by a complex interaction of dietary, socioeconomic, behavioral, and environmental factors that go beyond hygiene practices alone, even though hygiene may play a part. However, Wonosari Village needs integrated school-based and community-based health promotion programs that address both hygiene practices and healthy nutrition, as evidenced by the alarming prevalence of overweight/obesity (29.2%) and the discovery that a significant portion of children (58.3%) had poor hygiene. To fully comprehend the intricate relationship between hygiene practices and nutritional outcomes in this age group and environment, more research with larger sample sizes and longitudinal designs is necessary.

Conflicts of Interest

The authors declare no conflicts of interest in this study.

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References

1. Morales F, Montserrat-de la Paz S, Leon MJ, Rivero-Pino F. Effects of Malnutrition on the Immune System and Infection and the Role of Nutritional Strategies Regarding Improvements in Children's Health Status: A Literature Review. *Nutrients*. 2023;16(1):1.
2. Titi-Lartey OA, Daley SF. Severe Acute Malnutrition: Recognition and Management of Marasmus and Kwashiorkor. *StatPearls* [Internet]. 2025 Aug 2 [cited 2026 Jul 29]; Available from: <https://www.ncbi.nlm.nih.gov/books/NBK559224/>
3. Wrottesley S V., Mates E, Brennan E, Bijalwan V, Menezes R, Ray S, et al. Nutritional status of school-age children and adolescents in low- and middle-income countries across seven global regions: a synthesis of scoping reviews. *Public Health Nutr*. 2022;26(1):63.
4. Angelica E, Wardani S, Firdaus J, Hermansyah B, Utami WS, Armiyanti Y. Personal Hygiene as a Risk Factor for STH Infection Among Farmers In Jember Regency. *J Vocat Heal Stud*. 2026;9(3):169–75.
5. Grant FK, Wanjala R, Low J, Levin C, Cole DC, Okuku HS, et al. Association between infection and nutritional status among infants in a cohort study of vitamin A in western Kenya. *Front Nutr*. 2022;9:921213.
6. Nusantri rusdi PH. Hubungan personal hygiene dengan kejadian stunting pada balita. *Hum Care J*. 2022;7(2):369.
7. Chakrabarti S, Singh P, Bruckner T. Association of Poor Sanitation With Growth Measurements Among Children in India. *JAMA Netw Open*. 2020;3(4):e202791.
8. Rachmi CN, Li M, Alison Baur L. Overweight and obesity in Indonesia: prevalence and risk factors—a literature review. *Public Health*. 2017;147:20–9.
9. Leocádio PCL, Lopes SC, Dias RP, Alvarez-Leite JI, Guerrant RL, Malva JO, et al. The Transition From Undernutrition to Overnutrition Under Adverse Environments and Poverty: The Risk for Chronic Diseases. *Front Nutr*. 2021;8:676044.
10. Fithra Alhanifa A, Ananda Dewi Purbasari T, Cintya Denny Yuliyatni P, Fithra Alhanifa JI Sudirman AP, Sudirman K, et al. Prevalence, Trends, and Projections of Overweight and Obesity Among Children and Adolescents in Indonesia, 1993–2050: A Meta-Analysis of Observational Studies. *Maj Kesehat Indones*. 2026;7(3):131-154–131–154.

11. Darmon N, Drewnowski A. Contribution of food prices and diet cost to socioeconomic disparities in diet quality and health: a systematic review and analysis. *Nutr Rev.* 2015;73(10):643–60.
12. Ewusie TB, Coulthard H, Sharps M, Ochieng B. Influence of cultural beliefs and parental feeding practices on obesity among primary schoolchildren aged 6–12 in Ghana: a qualitative study. *BMJ Open.* 2025;15(5):e087160.
13. Autret K, Bekelman TA. Socioeconomic Status and Obesity. *J Endocr Soc.* 2024;8(11):bvae176.
14. Bhattacharyya H, Medhi G., Pala S, Sarkar A, Lynrah W, Kharmujai OM. Nutritional status and personal hygiene practices of primary school children: A cross-sectional study from Meghalaya, India. *J Fam Med Prim Care.* 2020;9(11):5506.
15. Adeline Mia, Anggraeni LD, Pasaribu J. Faktor-Faktor Yang Berhubungan Dengan Status Gizi Lebih Pada Anak Sekolah Dasar Swasta Rw 006 Kelurahan Sunter Agung Jakarta Utara. *Carolus J Nurs.* 2021;3(1):44–59.