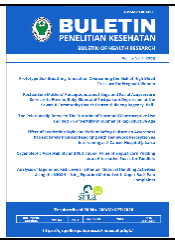

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Personal Hygiene and Nutrition Impact on Academic Performance of Primary School-Aged in Urban and Rural Gorontalo

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ABSTRACT

Introduction: Cultural and socioeconomic factors affecting sanitation, hygiene, and academic performance in Gorontalo remain unexplored, necessitating further study to develop targeted interventions and foster collaboration among stakeholders. This research aims to analyze the relationship between nutrition, personal hygiene, and academic performance among primary school students in Gorontalo.
Methods: An observational cross-sectional study was conducted in Gorontalo City and Gorontalo Regency in 2019, involving 456 children aged 8–11. Data were collected through questionnaires, interviews, weight (digital scales), and height measurements (microtoise). Statistical analysis was performed using chi-square and logistic regression techniques.
Results: Results indicated no significant difference in personal hygiene between urban and rural students (p=0.805), but significant variation in nutritional status (p=0.006). Regression analysis showed a strong correlation between personal hygiene and academic performance (β=1.880, OR=6.556, p=0.002). These findings underscore personal hygiene as a critical factor for improving academic performance, particularly as outdoor play activities may compromise hygiene among primary school-aged children. Enhancing personal hygiene should therefore be prioritized to improve both health and education outcomes.
Conclusion: Although no major differences in hygiene were found, nutritional disparities highlight the need for interventions addressing access to nutrition and hygiene education. Recommendations include fostering collaboration between schools, families, and community stakeholders to address sanitation and hygiene issues comprehensively. Further research should investigate cultural and socioeconomic factors influencing the interplay between hygiene, nutrition, and academic outcomes, ensuring context-specific strategies are implemented to enhance children's well-being and performance.

INTRODUCTION

Life expectancy at birth (LE SP2020), access to education, and a decent standard of living are three essential aspects that serve as indicators of human development (Central Agency of Statistics, 2018). Education and health are strategic indicators that should be core programs of the government to accelerate human development in Indonesia. The increase in the number of schools and their infrastructure, as well as the improvement in their quality through the current government's fiscal policy, which allocates 5% of the state budget to health and 20% to education, has not yet had a significant impact on Indonesia's Human Development Index (Mongan, 2019). Enhancing the quality of amenities and infrastructure sanitation in primary schools is a key priority for achieving Sustainable Development Goals (SDGs). Key indicators for this goal include access to safe and sustainable drinking water, adequate and separate basic sanitation facilities, and well-maintained handwashing stations with running water (Ministry of Education and Culture, 2017).

The holistic development of primary school-aged children can be stimulated by various factors, including a conducive learning environment equipped with sanitation facilities such as handwashing stations, toilets, and comfortable classrooms; a supportive social environment facilitated by private and segregated toilet facilities; encouragement of students' creativity through appropriate teaching methods; and opportunities for physical activity with adequate facilities. These factors contribute significantly to the development of students' psychomotor skills (UNICEF 2012). Moreover, primary school-aged children are a vulnerable group that is susceptible to malnutrition, which affects their health and nutritional status, consequently affecting their academic achievement. This situation is further exacerbated by the quality of their living environments, such as high population density, poor environmental sanitation, and inadequate access to clean and drinking water, as well as the absence of wastewater disposal facilities. Inaccessibility to quality healthcare, unhealthy eating habits, and awareness of balanced nutrition contribute to the deterioration of primary school-aged children's health (Yeasmin & Islam, 2016).

Sufficient nutritional intake will significantly influence the academic performance of primary school-aged children. The duration and intensity of self-study at home are not primary factors in achieving outstanding academic accomplishment. Other supporting factors that contribute to academic performance are physical health, which is determined by the quality of their nutritional intake (Rizki, Awaluddin, & Tursinawati, 2017). Nutritional intake affects a child's nutritional status, food with adequate and appropriate nutritional intake prevents children from nutritional problems (Supariasa, Bakri, & Fajar, 2016). Based on research conducted by Asmare et al. (2018), there is a significant association between nutritional status and the academic performance of primary school students (Asmare et al., 2018). Stunting is the worst consequence of insufficient nutritional requirements. Children with nutritional deficiency have difficulty understanding each learning process, consequently affecting their academic achievement (Shariff, Bond, & Johnson, 2000).

Based on a study conducted by Zaini et al. (2005), there is a difference in the nutritional status of primary school students in urban and rural areas of Malaysia. This is a consequence of other supporting factors, such as differences in socio-cultural conditions between urban and rural areas which affect nutritional intake and as a result are related to their academic performance (Anuar Zaini, Lim, Low, & Harun, 2005). Indonesia and Malaysia, as ASEAN countries with similar socio-cultural conditions, have a similar trend in nutritional problems, namely an increasing prevalence of stunting since 2010 (Soekatri, Sandjaja, & Widodo, 2013).

Stunting is associated with various health problems experienced by children, particularly diarrhea. Infectious diseases caused by viruses, parasites, and bacteria are prevalent among populations in developing countries that have limited access to clean water and adequate sanitation (Keusch et al., 2006). A study by Rosenberg et al. (1977) revealed that children with digestive disorders tend to consume food of inadequate quality and quantity (Rosenberg, Solomons, & Schneider, 1977). This condition is exacerbated by malabsorption due to damage to the intestinal

epithelial or mucosal lining resulting from bacterial overgrowth, even after acute diarrhea has resolved (Ashworth, 1969). Diarrhea remains a leading cause of death worldwide, especially in children. Poor hygiene practices, particularly handwashing, were major contributing factors. The preparedness of handwashing facilities, clean water, and adequate sanitation is a key intervention to prevent diarrhea and, consequently, stunting (Gebrehiwot et al., 2020).

According to the Center for Data and Statistics of Education and Culture (PDSPK), under the Secretary-General of the Ministry of Education, Culture, Research, and Technology in 2017, as many as 19,123 (12.9%) primary schools were devoid of toilets as sanitation facilities. A total of 46,458 (31.40%) primary schools had proper, separate, and well-maintained toilets (Ministry of Education and Culture, 2017). According to the school sanitation profile data in 2016/2017, Gorontalo Province ranked 23rd in the category of primary schools with proper toilets (separate and in good condition) at 29.86%, primary schools with proper but non-separate toilets at 59.61%, and 10.53% of schools still had inadequate or no toilets. Regarding access to basic water at all levels of schools in Gorontalo Province, 67.05% of the schools had a proper and accessible water source (Directorate General of Basic and Secondary Education, 2018). Adequate toilet facilities significantly support good hygiene practices among primary school students, ultimately affecting their health. There is a correlation between the availability of adequate facilities and the edification of good hygiene practices in schools (p-value = 0.001), emphasizing the importance of toilets equipped with adequate water sources and handwashing stations with soap (Karon, Cronin, Cronk, & Hendrawan, 2017). A research by (Damanik, Soeyoko, & Husodo, 2014) found that soil-transmitted helminths (STH) among primary school students were closely related to the quality of sanitation facilities in schools (p = 0.000, Exp B = 10.026). Providing adequate sanitation facilities in primary school environments can maintain students' health and reduce absenteeism rates by 26%–58%, especially among female students (O'Reilly et al., 2008 ;Trinies et al., 2016). Although sanitation conditions are not the primary cause of impaired nutrient absorption among elementary school students, their impact can lower academic performance (Jasper et al., 2012; Joshi & Amadi, 2013; Freeman et al., 2017).

Based on the aforementioned data, a research study is required to investigate the association between personal hygiene practices and nutritional status in relation to the academic performance of primary school-aged students in both the urban and rural regions of Gorontalo.

METHODS

This analytical observational cross-sectional study was conducted in 2019. The objective of this study was to compare nutritional issues and personal hygiene practices among elementary school students in both urban and non-urban areas of Gorontalo and to examine their correlation with academic achievement. Academic performance in this study was defined as the optimal attainment of students in the teaching-learning process within a specific period. It was measured by analyzing the report card grades of primary school students in the 2013 curriculum.

The subjects of this study were fourth, fifth, and sixth graders. This age group was chosen because children aged 8-11 years are capable of logical thinking about concrete objects, although their thinking is still practically limited. Additionally, egocentrism decreases at this age, allowing them to be mindful and accept guidance and perspectives from others (Izzaty et al., 2007). The inclusion criteria were students who were not currently unwell and agreed to participate. The total study population consisted of 561 students. The sample size was determined using *the infinite population proportion estimation* formula, resulting in a sample of 228 students in an urban area. To maintain a 1:1 ratio, the sample size for the rural area was set at 228 students, bringing the total sample size to 456. *Simple random sampling* was used to select students who met the inclusion criteria until the desired sample size was reached.

This research was conducted at public primary schools, namely SDN 28, SDN 29, SDN 32, and SDN 34, located in Kota Selatan District, the administrative center of Gorontalo Province. For rural

areas, the research was implemented at public elementary schools, SDN 7, SDN 8, and SDN 9 Batudaa, located in Batudaa District, Gorontalo Regency. These locations were selected based on the criteria for rural areas as defined by the Head of the Central Bureau of Statistics Regulation No. 37 of 2010 concerning the classification of urban and rural areas in Indonesia.

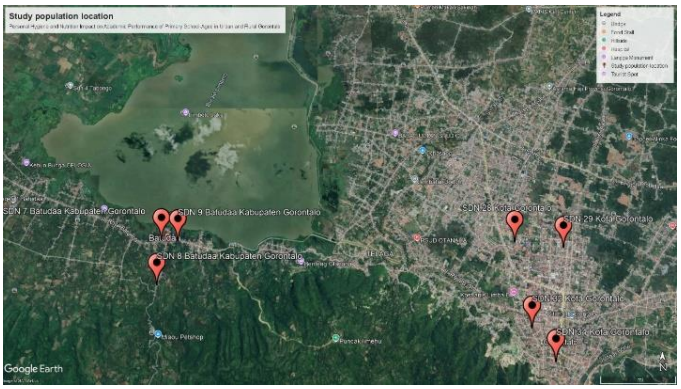

Figure 1. Location of Study Participants

The independent variables in this study were the determinants of personal hygiene (knowledge, attitudes, habits, and parenting style) and nutritional status. The dependent variable was students' academic performance, as measured by report card grades in the 2013 curriculum. This study used both primary and secondary data. Primary data referring to respondent characteristics, determinants of personal hygiene (knowledge, attitudes, habits, and parenting style), and academic performance were collected through questionnaires and direct interviews. Nutritional status was assessed using body mass index (BMI-for-Age) for age. Weight was measured using a digital scale with a precision of 0.01 kg, while height was measured using a microtoise with a precision of 0.1 cm. Secondary data, specifically student achievement records, were used to evaluate academic performance based on the 2013 curriculum standards. The minimum competency criterion (MCC/KKM) average for all subjects was used as a benchmark. Students were considered to have not met the minimum standards or were under-achieved if their scores were below or equal to (≤ 75).

Data analysis was conducted using univariate, bivariate, and multivariate approaches with the assistance of a statistical analysis software. Univariate analysis provided a detailed overview of data distribution, including measures of central tendency (mean, median, and mode) and dispersion (range, variance, and standard deviation). Additionally, it calculated the frequency and percentage of each response category, encompassing respondents' nutritional status and academic performance. Prior to conducting bivariate and multivariate analyses, the Kolmogorov-Smirnov test was performed to assess data normality. The results of this test served as the basis for selecting the appropriate statistical tests. Bivariate analysis, specifically the chi-squared test, was employed to identify significant differences in the determinants of personal hygiene and nutritional status between urban and rural students. To identify variables that significantly influenced or were associated with academic achievement, multivariate analysis using logistic regression was conducted. This study was approved by the Health Research Committee of the Faculty of Public Health, Diponegoro University (certificate number 488/EA/KEPK-FKM/2019) to ensure compliance with the established ethical standards in human research.

RESULTS

The Socio-Economy characteristics of respondents

Table 1. Univariate Analysis of Socio-Economy Characteristics of Respondents

Variables	Urban Primary School-Aged Students n (%)	Rural Primary School-Aged Students n (%)
Paternal Occupation		
Civil servant	56 (24.56)	36 (15.79)
Private sector employee	21 (9.21)	24 (10.53)
Self-employed	93 (40.79)	31 (13.60)
Farmer, construction worker, etc	44 (19.30)	105 (46.05)
Other (Fisherman and Chauffeur)	14 (6.14)	32 (14.04)
Maternal Occupation		
Civil servant	36 (15.79)	38 (16.67)
Private sector employee	17 (7.46)	7 (3.07)
Self-employed	38 (16.67)	10 (4.39)
Stay-at-Home Mother/Wife	135 (59.21)	160 (70.18)
Other (domestic worker)	2 (0.88)	13 (5.70)
Household income		
< Rp. 1.800.000	102 (44.74)	102 (44.74)
≥ Rp. 1.800.000	126 (55.26)	126 (55.26)
Number of full siblings		
≤ 2 siblings	104 (45.61)	99 (43.42)
> 3 siblings	124 (54.39)	129 (56.58)
Birth order		
Firstborn child	73 (32.02)	75 (32.89)
Second-born child	92 (40.35)	82 (35.96)
Third-born child	52 (22.81)	49 (21.49)
Other (Fourth, Fifth-born child)	11 (4.82)	22 (9.65)

Based on the results of the univariate analysis presented in Table 1, the majority of fathers of primary school students in urban areas were self-employed, comprising 93 students (40.79%), while 56 students (24.56%) were employed as civil servants (PNS), including military personnel (TNI), police (POLRI), and teachers. In contrast, the fathers of primary school students in rural areas were predominantly farmers and construction workers, accounting for 105 students (46.05%), while 36 students (15.79%) were employed as civil servants (Indonesian National Armed Forces (TNI), POLRI, teachers, etc.). Furthermore, frequency distribution analysis revealed that the majority of mothers in both urban (135 students, 59.21%) and rural (160 students, 70.18%) areas were homemakers. According to the data, in both urban and rural areas, most families have an income exceeding 1,800,000 rupiah per month.

Additional characteristic data presented in Table 1 show that the majority of students who participated in this study, both in urban (124 students, 54.39%) and rural areas (129 students, 56.58%), had more than three siblings. A total of 92 students (40.35%) in urban areas and 82 students (35.96%) in rural areas were predominantly second-born children in their families. Furthermore, 73 students (32.02%) in urban areas and 75 (32.89%) in rural areas were first-born children in their families.

Univariate Analysis of the Determinants of Personal Hygiene among Primary School-Aged Students in Urban and Rural Areas of Gorontalo

Based on the univariate analysis of personal hygiene determinants presented in Table 2, the assessment of elementary school students' knowledge in both urban and rural areas generally fell into the good category. However, closer examination revealed that only female students in both urban and rural areas consistently demonstrated a good level of knowledge, with 105 (89.74%) urban female students and 112 (95.73%) rural female students falling into this category. Regarding attitude

assessment, a significant proportion of students (140 (61.40%) in urban areas and 187 (82.02%) in rural areas) exhibited poor attitudes towards personal hygiene. Regarding the assessment of habits, a higher percentage of students in both urban (179, 78.51%) and rural (146, 64.04%) areas were found to have poor hygiene habits. Interestingly, all respondents, both in urban and rural areas, demonstrated good parenting styles, with 226 (99.12%) reporting positive parenting practices.

Table 2. Univariate Analysis of Determinants of Personal Hygiene (Knowledge, Attitude, Habit, Parenting Style) among Primary School-Aged Students in Urban and Rural Areas of Gorontalo.

Personal Hygiene	Urban			Rural		
	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)	Total n (%)
Knowledge						
Poor	17 (15.32)	12 (10.26)	29 (12.72)	15 (13.51)	5 (4.27)	20 (8.77)
Good	94 (84.68)	105 (89.74)	199 (87.28)	96 (86.49)	112 (95.73)	208 (91.23)
	Total		228 (100)	**Total**		228 (100)
Min-Max	42.86 – 100	57.14 – 100		57.14 – 100	57.14 – 100	
Mean ± SD	89.19 ± 11.27	89.38 ± 9.77		90.86 ± 11.84	94.99 ± 8.45	
CI (95%)	87.07 – 91.31	87.59 – 91.17		88.63 – 93.09	93.45 – 96.54	
Attitude						
Poor	77 (69.37)	63 (53.85)	140 (61.40)	90 (81.08)	97 (82.91)	187 (82.02)
Good	34 (30.63)	54 (46.15)	88 (38.60)	21 (18.92)	20 (17.09)	41 (17.98)
	Total		228 (100)	**Total**		228 (100)
Min-Max	25.00 – 100	25.00 – 100		50.00 – 100	50.00 – 100	
Mean ± SD	81.76 ± 13.46	84.83 ± 16.07		78.15 ± 12.21	77.78 ± 11.73	
CI (95%)	79.22 - 84.29	81.89 – 87.77		75.86 – 80.45	75.63 – 79.93	
Habit						
Poor	88 (79.28)	91 (77.78)	179 (78.51)	69 (62.16)	77 (65.81)	146 (64.04)
Good	23 (20.72)	26 (22.22)	49 (21.49)	42 (37.84)	40 (34.19)	82 (35.96)
	Total		228 (100)	**Total**		228 (100)
Min-Max	33.33 – 100	33.33 – 100		33.33 – 100	33.33 – 100	
Mean ± SD	67.57 ± 15.54	68.52 ± 14.81		72.37 ± 16.28	71.79 ± 17.84	
CI (95%)	64.64 - 70.49	65.81 - 71.23		69.31 - 75.44	68.53 - 75.06	
Parenting Style						
Poor	1 (0.90)	1 (0.85)	2 (0.88)	1 (0.90)	1 (0.85)	2 (0.88)
Good	110 (99.10)	116 (99.15)	226 (99.12)	110(99.10)	116 (99.15)	226 (99.12)
	Total		228 (100)	**Total**		228 (100)
Min-Max	70.00 – 100	70.00 – 100		70.00 – 100	50.00 – 100	
Mean ± SD	98.92 ± 4.34	99.15 ± 3.84		97.12 ± 6.24	98.80 ± 5.28	
CI (95%)	98.10 – 99.73	98.44 – 99.85		95.94 – 98.29	97.84 – 99.77	

As shown in Table 3, the mean values of weight, height, and body mass index for primary school students in both urban and rural areas of Gorontalo were statistically similar. The urban students had a mean weight of 32.25 kg (Â ± 6.70 kg), height of 136.41 cm (Â ± 6.63 Â cm), and BMI of 17.26 kg/m^2 (± 2.83 kg/m^2). Meanwhile, rural students had a mean weight of 32.51 kg (Â ± 8.11 kg), height of 137.27 cm (Â ± 7.81 cm), and BMI of 17.02 kg/m^2 (± 3.16 kg/m^2).

The majority of respondents, specifically 158 (69.30%) elementary school-aged students in both urban and rural areas, were categorized as having a normal nutritional status. A significant proportion (45 (19.74%) of students in urban areas and 25 (21.37%) in rural areas) were classified as overweight. Notably, a higher proportion of overweight students were female, with 31 (26.50%) female students in urban areas and 25 (21.37%) in rural areas falling into this category. Most students exhibited good academic performance: 220 (96.49%) in urban areas and 212 (92.98%) in rural areas. Female students in both areas generally demonstrated good academic performance: 116 (99.15%) in urban areas and 110 (94.02%) in rural areas.

Tabel 3. A Univariate Analysis of Age-Based Body Mass Index, Nutritional Status (BMI-for-Age), and Academic Performance Among Primary School-Aged Students in Urban and Rural Areas of Gorontalo

Age (Year-old)	Urban			Rural		
	Weight (Kg) Mean ± SD	Height (Cm) Mean ± SD	Body Mass Index (Kg/m²) Mean ± SD	Weight (Kg) Mean ± SD	Height (Cm) Mean ± SD	Body Mass Index (Kg/m²) Mean ± SD
8	36.88 ± 5.69	133.40 ± 6.69	20.82 ± 3.64	30.29 ± 8.12	129.71 ± 6.15	17.89 ± 4.15
9	26.65 ± 4.91	129.86 ± 7.18	15.90 ± 2.05	28.80 ± 8.73	130.70 ± 7.28	16.57 ± 3.32
10	31.35 ± 8.08	135.75 ± 8.48	16.78 ± 2.94	29.42 ± 8.32	133.90 ± 7.48	16.19 ± 3.19
11	32.37 ± 8.30	137.56 ± 8.07	16.94 ± 3.19	33.36 ± 8.97	138.84 ± 7.71	17.14 ± 3.57
12	36.50 ± 10.33	141.36 ± 7.22	18.08 ± 4.17	32.66 ± 8.02	139.27 ± 7.55	16.63 ± 2.64
13	29.75 ± 2.90	140.50 ± 2.12	15.05 ± 1.01	40.52 ± 6.47	151.20 ± 10.66	17.70 ± 2.08
Mean ± SD	32.25 ± 6.70	136.41 ± 6.63	17.26 ± 2.83	32.51 ± 8.11	137.27 ± 7.81	17.02 ± 3.16
Nutritional Status (BMI-for-Age)	**Male n (%)**	**Female n (%)**	**Total n (%)**	**Male n (%)**	**Female n (%)**	**Total n (%)**
Underweight	12 (10.81)	13 (11.11)	25 (10.96)	21 (18.92)	8 (6.84)	29 (12.72)
Normal	85 (76.58)	73 (62.39)	158 (69.30)	74 (66.67)	84 (71.79)	158 (69.30)
Overweight	14 (12.61)	31 (26.50)	45 (19.74)	16 (14.41)	25 (21.37)	41 (17.98)
	Total		228 (100)	**Total**		228 (100)
Academic Performance	**Male n (%)**	**Female n (%)**	**Total n (%)**	**Male n (%)**	**Female n (%)**	**Total n (%)**
Poor	7 (6.31)	1 (0.85)	8 (3.51)	9 (8.1)	7 (5.98)	16 (7.02)
Good	104 (93.69)	116 (99.15)	220 (96.49)	102 (91.89)	110 (94.02)	212 (92.98)
	Total		228 (100)	**Total**		228 (100)

The Differences in Personal Hygiene and Nutritional Status among Primary Aged-School Students in Urban and Rural Areas of Gorontalo.

Based on the chi-square test results for all indicators of personal hygiene practice determinants (knowledge, attitude, habits, and parenting styles) presented in Table 4, the calculated chi-square value (χ^2) of 0.061 was less than the critical chi-square value (χ^2) of 3.84, and the p-value of 0.805 (>0.05). Therefore, there is no significant difference in personal hygiene quality between primary-aged school students in the urban and rural areas of Gorontalo.

Tabel 4. Bivariate Analysis of the Differences in Personal Hygiene and Comparison of Nutritional Status (BMI-for-Age) among Primary School-Aged Students in Urban Rural Areas of Gorontalo

Personal Hygiene	Urban Primary School-Aged Students			Rural Primary School-Aged Students			χ^2	p
	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)	Total n (%)		
Poor	5 (4.50)	3 (2.56)	8 (3.51)	6 (5.41)	3 (2.56)	9 (3.95)		0.805
Good	106 (95.50)	114 (97.44)	220 (96.49)	105 (94.59)	114 (97.44)	219 (96.05)	0.061	
	Total		228 (100)	**Total**		228 (100)		
	Min – Max		70 – 100	Min – Max		67 – 100		
	Mean ± SD		87.30 ± 5.83	Mean ± SD		87.96 ± 6.23		
Nutritional Status (BMI-for-Age)	**Urban Primary School-Aged Students**			**Rural Primary School-Aged Students**			χ^2	p
Underweight	25 (10.96)			29 (12.72)			10.231	0.006
Normal	158 (69.30)			158 (69.30)				
Overweight	45 (19.74)			41 (17.98)				
Min – Max	-3.37 – 3.07			-4.62 – 3.11				
Mean ± SD	-0.39 ± 1.38			-0.51 ± 1.50				

The results of a chi-square test comparing the nutritional status of elementary school students in urban and rural areas of Gorontalo. The calculated chi-square value (χ^2) of 10.231 was significantly higher than the critical chi-square value (χ^2) of 5.991, with a p-value of 0.006 (<0.05). This indicates a statistically significant difference in nutritional status between elementary school students in urban and rural areas of Gorontalo.

The Associated Between Personal Hygiene and Nutritional Status on Academic Performance of Primary Aged-School Students in Urban and Rural Areas of Gorontalo

Table 5 presents the results of the logistic regression analysis conducted to examine the association between personal hygiene and nutritional status on academic performance. Their findings revealed that only personal hygiene was significantly associated with academic performance. A regression coefficient (β) of 1.880, with a significance level (p) of 0.002, indicated a strong positive influence of personal hygiene on academic performance. Furthermore, the Odds Ratio (OR) of 6.556 suggests that students with good personal hygiene have 6.556 times higher odds of achieving higher academic achievement than those with poor personal hygiene.

Table 5. Multivariate Analysis of the Associated Between Personal Hygiene and Nutritional Status on Academic Performance of Primary Aged-School Students in Urban and Rural Areas of Gorontalo

Variables	Academic Performance		
	β	ρ	OR
Personal Hygiene	1.880	0.002	6.556
Nutritional Status	0.272	0.480	1.313

DISCUSSIONS

The Socio-Economy characteristics of respondents

Univariate analysis provided information on the respondents' socioeconomic status, including parental income and occupation. Koendjaningrat (1983) posited that nutritional status and lifestyle are influenced by socioeconomic status, encompassing factors such as education, occupation, and income. This notion is supported by Dwi Agung Hermawan's research (2005), which concluded that there is a significant positive correlation between parental socioeconomic status and child nutritional status (Fariza, 2013). Furthermore, Sukarni (2002) suggested that in addition to socioeconomic status, family size can influence family health. Children with fewer siblings tend to have a better nutritional status and growth than those with many siblings, which can affect family food consumption. Zeitlin et al. (1990) corroborated this finding, arguing that having many siblings can divide parental attention, leading to suboptimal child growth (Puspitasari, 2014).

The Determinants of Personal Hygiene among Primary School-Aged Students: A Study of Knowledge, Attitudes, Habits, and Parenting Styles

Based on the univariate analysis results shown in Table 2, it is evident that average female students had better personal hygiene quality than male students. This is attributed to the fact that girls are generally more adept at understanding concepts and can focus better than boys. Additionally, girls excel in communication compared with boys; they are more skilled in articulating their thoughts and managing body language, such as emotions, empathy, and tone (Sari & Hidayat, 2018). Educating children about clean and healthy living both at school and at home through experiential learning, opening intensive communication channels, and educational efforts aims to improve knowledge, attitudes, and behaviors to implement healthy living practices to maintain and preserve individual health (Notoatmodjo, 2012). Education and knowledge about clean and healthy living behaviors in schools significantly impact the quality of students' personal hygiene, as schools are the second most significant place for student interaction after family. Instilling health behavior concepts in children from an early age enhances their quality of life, thus preventing learning achievement and

developmental problems. Health issues among school-aged children require special attention, ranging from care, knowledge development, to monitoring clean and healthy living behaviors, ensuring children develop good habits early for their future lives (Gabur, Yudiernawati, & Dewi, 2017). However, it should be noted that primary school-aged children tend to focus more on outdoor play activities; hence, their personal hygiene attitudes still require support from parents, teachers, and health workers (Triasmari & Kusuma, 2019).

Age-Based Body Mass Index, Nutritional Status (BMI-for-Age), and Academic Performance Among Primary School Students in Urban and Rural Gorontalo.

Table 3 indicates that the mean body mass index (BMI) of elementary school students in both urban and rural areas was within the normal range. This suggests that physical activity levels, potentially exceeding energy intake, contribute to the healthy weight of students. Consistent with Liu et al. (2012), our findings showed a relationship between physical activity, screen time, and BMI among children aged 2-19 in rural and urban settings (Liu et al., 2012). Furthermore, this aligns with Gunter et al. (2015), who reported a negative correlation between moderate-to-vigorous physical activity (MVPA) and BMI in rural primary school children (Gunter, Nader, & John, 2015). Environmental factors, including parental involvement, peer influence, and community conditions, are known to influence children's physical activity (Saputri, Setyawan, Wuryanto, & Udiyono, 2019)

The nutritional status of primary school-aged students in both urban and rural areas of Gorontalo was predominantly classified as normal. However, a notable trend was the higher prevalence of overweight among the female students. This condition may be attributed to households' ability to access staple foods through their livelihoods and parents' income levels that align with the provincial minimum wage (PMW) set by the government. Such economic factors undoubtedly influence the nutritional status of children. According to Soetjiningsih (1995) and Suhardjo (2007), as cited in Puspitasari (2014), adequate parental employment correlates with improved family economic status, which in turn positively impacts children's nutritional status. Additionally, parenting practices related to dietary intake and physical activity play a significant role in determining children's nutritional outcomes (Puspitasari, 2014).

Table 3 shows that primary school students in both urban and rural areas demonstrated good academic performance. Nutritional status is a known determinant of academic achievement as it significantly affects children's growth and intellectual development (Sa'adah, Herman, & Sastri, 2014). However, teacher competence and pedagogical skills also influence student academic performance. This aligns with Pingge and Wangid (2016), who reported a positive correlation between teacher competence and academic performance among primary school students. (Pingge & Wangid, 2016).

The Differences in Personal Hygiene and Nutritional Status among Primary Aged-School Students in Urban and Rural Areas of Gorontalo.

Based on the statistical test results presented in Table 4, there were no significant differences in personal hygiene quality and nutritional status between the two groups of respondents. Personal hygiene is a self-care practice influenced by various determinants, such as knowledge, habits, behaviors, attitudes, and parenting styles related to fulfilling basic personal hygiene needs (Triasmari & Kusuma, 2019). Personal hygiene behaviors are influenced by various media or information sources, including parents, mass media, teachers, counselors, and healthcare providers. Moreover, positive behavior requires the support of adequate facilities and infrastructure. Poor sanitation facilities, limited access to clean water, and unsanitary school conditions can negatively impact students' health and behavior (Mardliyah, Yugistyowati, & Aprilia, 2014). The absence of significant differences in personal hygiene between urban and rural elementary school students in Gorontalo can be attributed to the availability of sanitation facilities and infrastructure, and the role of teachers in promoting students' health.

Factors influencing the nutritional status of elementary school students include parents' lack of knowledge about nutritious foods, socioeconomic conditions, and geographical factors (location and living conditions). Dietary diversity is essential for meeting recommended dietary allowances (RDAs). Children commonly exhibit food faddism, a strong preference for specific foods, which can lead to nutritional deficiencies, as it results in an imbalanced intake of essential nutrients (Utari, Ernalia, & Suyanto, 2016). Additionally, parental education plays a crucial role in determining the quality of children's nutritional status as it is linked to parenting practices and the dissemination of information regarding education and health (Soetjiningsih & Gde Ranuh, 2016)

The Associated Between Personal Hygiene and Nutritional Status on Academic Performance of Primary Aged-School Students in Urban and Rural Areas

The multivariate analysis results presented in Table 5 indicate that nutritional status is not significantly associated with academic achievement. This finding aligns with research conducted by Tazkya et al. (2017), which suggests that student achievement is influenced by various factors, including family involvement. The family serves as the primary educational environment for children, and factors such as parent-child interactions, parental guidance, parental education, home environment, and family socioeconomic status play crucial roles in shaping student outcomes. Amany and Sekartini (2017) further emphasized that positive learning outcomes are determined by internal factors, such as student interest and motivation, as well as external factors, such as school facilities, infrastructure, and teaching methods (Amany & Sekartini, 2017). Additionally, Mulyadi (2019) highlighted that students' apathy towards academics and their level of environmental support can significantly impact academic performance. Students with adequate environmental support and positive encouragement from their surroundings are more likely to prioritize their studies and achieve higher academic outcomes (Mulyadi, Rahfiludin, & P, 2019). These collective findings suggest that academic performance in primary school students is a multifaceted outcome influenced by a range of factors beyond nutritional status, as also indicated by Zaini et al. (2005), who identified breastfeeding history, parental income and education, and household income as significant contributors. Consequently, interventions aimed at improving parental socio-economic status and antenatal care may positively influence primary students' academic performance (Zaini, Lim, Low, & Harun, 2005).

Ghanim et al. (2016) found a significant correlation between knowledge and practice of personal hygiene and academic achievement (Ghanim et al., 2016). Infectious diseases caused by poor personal hygiene can significantly disrupt students' learning, as increased absenteeism negatively affects the quality of their academic performance (Temitayo, 2016). Therefore, to enhance students' academic achievement, it is crucial to prioritize personal hygiene. The quality of personal hygiene is influenced by various factors, including knowledge, habits, attitudes, and parenting styles (Mardliyah et al., 2014); (Triasmari & Kusuma, 2019). To improve students' personal hygiene, it is essential to address these determinants to reduce the risk of infectious diseases and ensure optimal learning outcomes.

Comparison with Previous Studies

Previous studies by Hirachand et al., (2015) and Karak et al., (2018), have demonstrated a strong correlation between personal hygiene, nutrition, and academic performance (Hirachand, Talakeri, Angolkar, & Sah, 2015) (Karak, Maiti, Das, & Karmakar, 2018). For instance, both studies have indicated that students with improved hygiene practices and balanced nutrition tend to exhibit higher academic achievement. A systematic review conducted by Tracy L. Burrows et al. (2017) found that dietary intake, including regular meal consumption and adherence to national fruit intake recommendations, positively influences academic achievement (Burrows et al., 2017). In line with these findings, studies have shown that poor nutrition can lead to cognitive deficits and lower academic performance.

Implications for Public Health

Improving personal hygiene and nutrition among school-aged children can yield significant public health benefits. Better hygiene practices can reduce the transmission of infectious diseases such as diarrhea and respiratory infections, which can lead to school absenteeism and lower academic performance (Ghanim et al., 2016) . Improved nutrition can enhance cognitive development, concentration, and overall health, resulting in better academic outcomes and long-term wellbeing (Naotunna et al., 2017) (Burrows et al., 2017).

Limitations and Cautions

There are several limitations and cautions to consider in this research area. Many studies are cross-sectional, making it difficult to establish causality, whereas a cohort study design is optimally suited for testing causal hypotheses regarding the association between personal hygiene, nutritional status, and academic achievement among primary school-aged students. Factors such as socioeconomic status, parental education, and access to health care can confound the results, and variations in cultural practices and dietary habits can affect the generalizability of the findings. Additionally, the sample size may have been too small, which could have led to an overestimation of the effect. To more clearly elucidate the differential effects of personal hygiene, nutritional status, and academic performance between urban and rural students, it is recommended that the study be conducted in rural primary-aged schoolchildren located hundreds of kilometers away from the provincial capital.

Recommendations for Future Research

Future research should focus on several key areas to advance our understanding of the relationship between hygiene, nutrition, and academic performance. First, longitudinal studies are essential for establishing causality and tracking changes over time. These studies will allow a deeper understanding of how hygiene and nutrition influence academic outcomes across various periods.

Second, utilizing objective measurements for hygiene practices and nutritional intake is critical for minimizing bias. To enhance the accuracy of data analysis, it is recommended to employ a ratio scale of measurement. This scale, characterized by an absolute zero point and the capacity to form meaningful ratios, enables more precise statistical calculations, leading to more reliable findings.

Intervention studies should be conducted to assess the impact of specific initiatives aimed at improving hygiene and nutrition on academic performance. Such studies could provide valuable insights into the effectiveness of targeted interventions. Finally, conducting context-specific research in diverse settings will help to explore how cultural and socioeconomic factors shape the relationship between hygiene, nutrition, and academic performance. This approach contributes to a more nuanced understanding of how different contexts affect these critical variables.

CONCLUSION

A bivariate analysis comparing urban and rural elementary school students in Gorontalo revealed no significant differences in sanitation practices. However, there was a significant disparity in the health status between the two groups. Multivariate analysis indicated a positive correlation between cleanliness and academic performance, but no significant association between nutritional well-being and academic achievement. These findings suggest that schools' efforts to provide sanitation facilities have positively impacted students' hygiene. Nevertheless, to further enhance students' cleanliness, a more comprehensive school health program involving closer collaboration among schools, parents, and other stakeholders is needed. The disparity in nutritional well-being between urban and rural students can be attributed to various factors such as parental knowledge of nutrition, socioeconomic conditions, and geographic location. Parental education also plays a significant role in determining children's health through parental practices. While nutrition is an

important factor, overall academic achievement is more influenced by internal factors, such as interest and motivation, as well as external factors, such as the quality of learning resources and teaching methods. Therefore, to achieve optimal academic performance, comprehensive support from families, schools, and communities is essential.

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