

## CORRELATION OF NUTRITIONAL STATUS BETWEEN PUBLIC AND PRIVATE PRIMARY SCHOOL CHILDREN AGED 10-13 YEARS IN JIMBARAN POST-COVID-19 PANDEMIC

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### ABSTRACT

**Background:** Several studies have shown differences in the nutritional status of children attending public and private schools. The Covid-19 pandemic has had a global impact on various aspects of life, indirectly affecting the nutritional status of children. During the pandemic, children spent more time at home and tended to engage in less physical activity such as exercise or visiting the playground. This study aims to assess the nutritional status of children attending public and private elementary schools after the Covid-19 pandemic.

**Method:** The study an analytical observational study using cross sectional design conducted in July 2022 at the Academic Center room in Udayana University Hospital. It involved students from three different elementary schools in the Jimbaran, Badung, and Bali areas. The inclusion criteria were elementary school children aged 10-13 years, while the exclusion criteria included children who did not receive permission from their parents to participate in the research after being informed about the consent process. Nutritional status was assessed using anthropometric standards from WHO and Waterlow, categorized as Mild Protein Energy Malnutrition (PEM), Moderate PEM, Severe PEM, Overweight, Obese, Superobese, and Normal. The data was processed and statistically analyzed using the SPSS version 21 software, and the results were presented as proportions (percentages), numbers, means (standard deviations), and medians (range, minimum-maximum). The comparison of nutritional status was determined using Chi-Square analysis.

**Results:** 189 children were involved in this study, with a median age of 11 years (ranging from 11 to 13 years). The study found no significant difference in the nutritional status of children attending private elementary schools compared to those attending public elementary schools after the Covid-19 pandemic. Specifically, one child (0.5%) was identified as having severe protein energy malnutrition (PEM), while 50 children (26.5%) were classified as having mild PEM, and 67 children (35.4%) were determined to be normal.

**Conclusion:** The study indicates no significant difference in the nutritional status of children in public and private elementary schools post-Covid-19; 35.4% of children were found to have normal nutritional status.

**Keywords:** public elementary school., private elementary school., nutritional status., covid-19

### INTRODUCTION

Childhood nutritional status refers to receiving adequate nutrition from food that meets the body's metabolic needs. Proper nutrition not only supports growth and development but also aids in cognitive development, reduces the risk of diseases, and promotes good mental health. Children's Anthropometric Standards are based on body weight and length/height parameters, encompassing three indices: Body Weight Index according to Age (W/A), Body Length Index according to Age (L/A), or Body Height Index according to Age (H/A), and Body Weight Index according to Body Length/Height (W/L). The body weight/age index (W/A) compares a child's body weight to their Age and is used to identify underweight or severely underweight children. However, it cannot classify children as obese or severely obese. Low W/A may indicate growth issues and should be confirmed with the W/H index, W/H, or BMI/A before any intervention. The H/A or L/A index assesses a child's height or length of Age and can identify short children

(stunted) due to long-term malnutrition or frequent illnesses. The W/H or W/L index determines whether a child's body weight is appropriate for their height or length and can identify undernourished or severely wasted children, as well as those at risk of being overweight. Malnutrition can stem from recent (acute) or long-term (chronic) illnesses and nutritional deficiencies.<sup>1</sup> The Covid-19 pandemic has significantly impacted various aspects of life, including people's nutritional status. The nutritional status of the community during the Covid-19 pandemic was influenced by disruption to food access due to social restrictions and lockdowns, resulting in disruption of the food supply chain, so people experienced difficulty accessing balanced nutritious food. The decline in income caused by decreased economic activity caused many people to lose their jobs or experience a reduced income. This results in a reduction in people's purchasing power to buy nutritious food. Changes in eating behavior due to stress and anxiety caused by the pandemic can lead to changes in unhealthy eating patterns, such as overeating

or undereating. Lack of physical activity due to restrictions on activities outside the home causes people to become more sedentary, increasing the risk of obesity and other health problems. The COVID-19 pandemic has brought significant changes in various aspects of life, including the world of education. Schools worldwide were forced to close to prevent the spread of the virus, and the learning system shifted to online methods. Online learning is also called distance learning (PJJ), where all students study from home; sports lessons are reduced because children are not allowed to gather, which indirectly reduces student activity.<sup>2,3</sup> Comparing the nutritional status of children in private and public schools is a complex matter because various factors influence it. Generally, private schools have a larger budget to provide nutritious food for students, have a canteen, or collaborate with catering that guarantees quality; parents usually have financial capabilities, so giving the children nutritious provisions is better. Compared to public schools, where the availability of healthy food varies depending on the school budget and government programs, school canteens may only sometimes be available or have limited menu choices, and parents with financial limitations may have difficulty providing their children with nutritious provisions. If you look at it at a glance according to the above factors, the nutritional status of children in private schools will undoubtedly be better than in public schools. This research aims to find the correlation between nutritional status between public and private schools after the Covid-19 pandemic.<sup>4,5</sup>

#### METHOD

This research is an analytical observational study with a cross-sectional design. Sampling consecutively used the purposive sampling technique. The research took place at the Academic Center room at Udayana University Hospital in July 2022 and involved elementary school students from three schools in the Jimbaran, Badung, Bali area. The research was conducted in conjunction with Community Service activities organized by Udayana University Hospital to commemorate National Children's Day 2022. The three elementary schools included two public schools and one private school. The school has just held an offline meeting in the past 1-month post-Covid-19

quarantine program. School authorities are briefed on the planned activities, and approval is obtained from the school principal, parents, and students. The number of samples uses the total sampling method. The inclusion criteria were grade 6 elementary school patients (aged 10-13 years). In contrast, the exclusion criteria included children who did not receive permission to participate in study activities from their parents after explaining informed consent (PSP), children with chronic diseases such as malignancies, autoimmune diseases, chronic kidney disease, congenital or acquired heart disease, and epilepsy. Nutritional status was assessed using anthropometric standards from WHO and Waterlow, categorizing nutritional status into Mild Protein-energy malnutrition (PEM), Moderate PEM, Severe PEM, Overweight, Obese, Superobese, and Normal. Waterlow criteria measured by the percentage of ideal body weight, calculated by dividing the actual weight by the ideal body weight (weight-for-height/length) and multiplying by 100%, using the clinical growth charts. The percentage of ideal body weight was categorized following the Waterlow method: >90% as normal, 80–90% as mild PEM, 70–79% as moderate PEM, and <70% as severe PEM. The cutoff for BMI for underweight is below the 5th percentile, whereas the 5th–85th percentile is considered normal, 85th to < 95th percentile is considered overweight, ≥95th percentile is considered obese, and >97th percentile is considered superobese.<sup>10,12</sup> All data was collected, recorded, and then processed and analyzed statistically using the SPSS version 21 program for Windows. The results were displayed in the form of proportions (percentages), numbers, means, and standard deviations. The comparison of nutritional status with school type was analyzed using the Chi-Square test.

#### RESULT

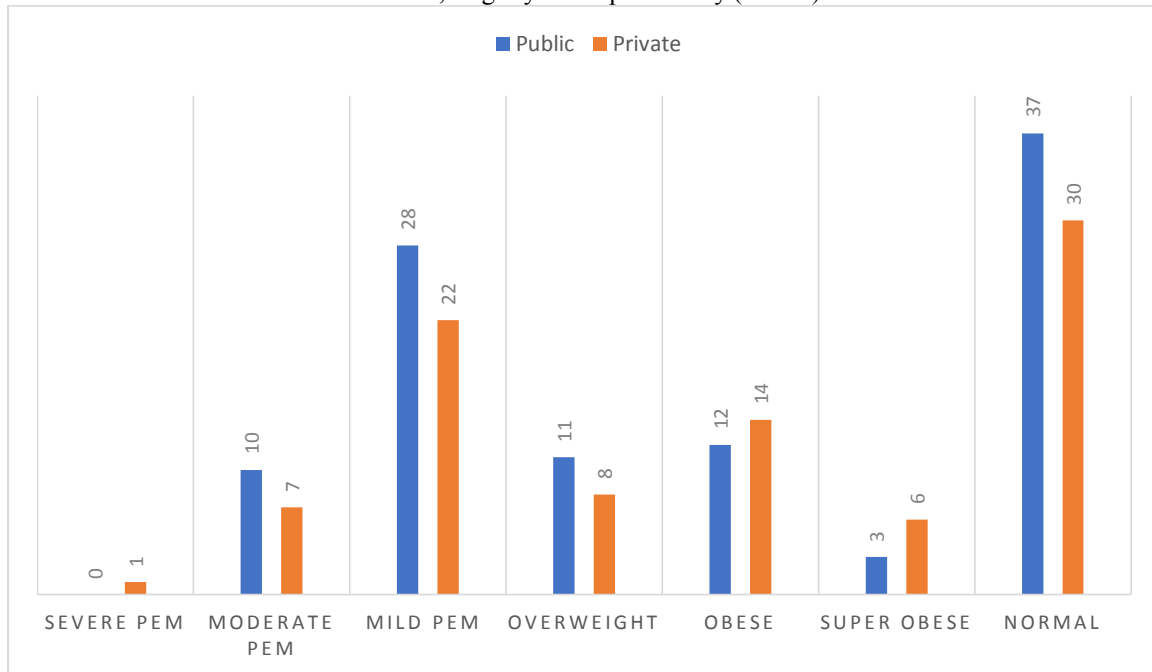
In July 2022, a total of 189 elementary school children were included in the research, meeting both inclusion and exclusion criteria. Out of these, 101 children attended public elementary schools, while 88 children attended private elementary schools. There were 106 boys and 83 girls in the research group. The median age of the children was 11 years, with an age range of 11 to 13 years. This information is summarized in Table 1.

**Table1.** Baseline characteristic

Karakteristik dasar	N (%), Total=189
Gender	
Male	106 (56,1)
Female	83 (43,9)
Age, yrs	
11	116 (61,4)
12	71 (37,6)
13	2 (1,1)
Nutritional Status	
Severe PEM	1 (0,5)
Moderate PEM	17 (9)
Mild PEM	50 (26,5)
Normal	67 (35,4)
Overweight	18 (9,5)
Obese	36 (19,2)
Jenis Sekolah	
Negeri	101 (54,3)
Swasta	88 (46,6)

**Graphic 1** show the comparison of nutritional status base on school category. The nutritional status was categorized into six groups based on WHO and Waterlow criteria. The highest nutritional status was good/normal nutrition, with 67 children (35.4%) in this category. Mild PEM was observed in 50 children (26.5%), and obesity was present in 36 children (19.2%). There was 1 child (0.5%) with severe PEM in private schools. In public schools, malnutrition was found in 64 children, slightly

higher than the 58 children in private schools. Malnutrition in public schools included moderate PEM in 10 children (0.9%), mild PEM in 28 children (27.7%), overweight in 11 children (10.8%), obesity in 12 children (11.8%), and super obesity in 3 children (0.29%). In private schools, there was 1 child with severe PEM (1.1%), 7 with moderate PEM (0.79%), 22 with mild PEM (0.25%), 8 with overweight (0.9%), and 6 with super obesity (0.68%).



**Graphic 1.** Comparison nutritional status between public and private school

**Table 2** shows A Pearson chi-square test was conducted to determine the relationship between nutritional status and school type. The test yielded a

Pearson chi-square value of 0.713 (>0.05), indicating that there was no relationship between school type and nutritional status

**Table 2.** Subgroup analysis of correlation between nutritional status and school category

	Normal	Malnutrisi	Total	PR	P
Public	37	64	101	0,71	>0,05
Private	30	58	88		

## DISCUSSION

During the school years, children undergo various significant changes - physically, psychologically, emotionally, and socially. These changes can significantly affect their overall health. Hence, it's important for children to develop healthy habits from a young age to better adapt to these changes and lead healthy and happy lives.<sup>7</sup>

A study found that both public and private elementary school students had good nutrition. Out of the total 67 children (35.4%), no significant difference was observed between public and private schools (public 36.6%, private 34.1%). Another study conducted in Mumbai, India by Aniruddh et al. among school children aged 10-14 years yielded similar results, showing good average nutritional values with similar BMI results in both public and private schools (Private: 62.14%, Public: 58.05%).

In a separate study by Waghmare et al. in 2022 in Pradesh, India, involving teenagers aged 11-18 years, no significant differences in anthropometric indices were observed at ages 11-15 and 18 years. However, at ages 16-17 years, significant differences in height, weight, MAC, and BMI were noted, likely due to a growth spurt during adolescence. By the age of 18, there was no significant difference, possibly due to higher student acceptance at that age.<sup>3,13,14</sup>

Prakash et al.'s research in 2016 in Visakhapatnam, India among children aged 10-16 years revealed different findings. In public schools, 56% of children were found to be well-nourished compared to 93.4% in private schools. The underweight nutritional status was 44% in public schools, while no children were underweight in private schools. The significant difference was due to children in private schools receiving additional

nutrition during the day (mid-day school meal), amounting to 727 calories.<sup>2,12</sup>

Mild and moderate protein energy malnutrition (PEM) tends to be found more in public schools, namely 38 children (37%), compared to 29 children (32.9%) in private schools. In line with research by Aniruddh et al., it was found that the incidence of mild and moderate PEM in government schools was 38.5% compared to 9% in private schools. This is due to socio-economic differences and different nutritional intakes in the two schools, but further research is needed to confirm this. Srivasta's 2012 research, which examined the nutritional status of school-age children in urban areas, found that the prevalence of underweight and stunting was high at the age of 11-13 years while wasting was high at the age of 5-7 years.<sup>4,20</sup> Nutritional status is positively correlated with age. The younger the child, the worse the child's nutritional status, so nutritional interventions are focused on younger ages.<sup>4,19</sup> Srivastava also explained that the incidence of malnutrition at a younger age is related to several risk factors such as low socio-economic abilities (generally children who attend public schools), children not receiving exclusive breast milk, parents with low education to parents who are busy working/business.

In this study, private schools found that more children were obese and super obese, namely 20 children, compared to 15 children in public. Aniruddh's research aligns with this study's results where the prevalence of overweight or obesity is greater in private schools (37.25%) than in public schools (3.39%).<sup>2</sup> Research conducted by Baniissa in the United Arab Emirates (UAE) obtained results that are contrary to this research, 111 children who went to public schools were obese compared to 54 children in private schools ( $p=0.028$ ), BMI  $\geq 85$ th percentile.<sup>6</sup> Another exciting thing from Bennis's research is that most of the children who went to public schools are a native of the Emirates, when compared with private schools where the average population is immigrants (expatriates) ( $p<0.001$ ) with parental income, public schools have incomes below the average compared to private schools ( $p<0.001$ ). Several studies were also conducted in Indonesia to prove the difference in obesity in public and private schools. Research in Surabaya by Makhmudin and Sri compared the level of nutritional status of class XII students at SMAN 1 Sangkapura and SMA Umar Masud Sangkapura; the sample size was 67 children. A total of 17 children (58.6%) in private schools were obese, and 23 children (60.5%) in public schools were obese. These results indicate that there is no significant difference in the level of nutritional status between public and private high school students ( $p=0.873$ ).<sup>8</sup> Research in Jambi by Ramadani found cases of obesity in elementary school children amounting to 17 children (15%).<sup>9,10</sup> Research in Jakarta by Annisa, which used a cross-sectional design with a total of 805 samples, obtained results showing that in private schools, the rates of overweight (17.0%) and obesity (30.75%) were much higher than the rates of overweight and obesity. (14.8%) in Public Elementary Schools.<sup>9</sup>

The nutritional statuses were compared, and then a chi-square analysis was conducted between different school categories and nutritional statuses. The study found

a prevalence ratio value of 0.71 ( $p>0.005$ ). Based on this, it can be concluded that there was no significant difference between the type of school and nutritional status in this study after the Covid-19 pandemic. During the Covid-19 pandemic, authorities implemented various policies to reduce transmission rates. These included social restrictions, social distancing, temporary school closures, general restrictions on public places, limitations on mass gatherings, and the requirement to wear masks. These policies directly impacted society, particularly school-age children. A study found that children engaged in less physical activity during the pandemic, with around 70% reducing their activity due to social restrictions. Other research indicates that children aged 2-19 experienced an increase in BMI, with a 16.1% rise in the incidence of obesity. Factors contributing to this included poor diet due to financial constraints, inadequate nutrition, low hygiene levels, limited access to healthcare, and the rapid spread of diseases during the pandemic. In Africa, research found a higher prevalence of SARS-CoV-2 virus infection but lower mortality rates in children in low- to middle-income countries compared with Western nations.<sup>16</sup> In 2020, 22% of malnutrition and 52% of deaths in children under 5 years of age in low- to middle-income countries came from the sub-Saharan Africa region, despite a decrease in stunting from 40% in 1990 to 24.2% in 2019. However, the prevalence remains above 30% in these countries.<sup>15</sup> The pandemic led to increased food insecurity and disrupted access to healthcare and nutrition programs for many children, particularly those in poorer and developing countries. The explanation above supports the theory that, during the Covid-19 pandemic, changes in eating patterns, children's physical activity, and the risk of infection were relatively similar for children attending private and public schools, leading to no significant differences in their nutritional status. Further research is needed to confirm this theory. During the Covid-19 pandemic, authorities implemented various policies to reduce transmission rates.<sup>17</sup> These included social restrictions, social distancing, temporary school closures, general restrictions on public places, limitations on mass gatherings, and the requirement to wear masks. These policies directly impacted society, particularly school-age children. A study found that children engaged in less physical activity during the pandemic, with around 70% reducing their activity due to social restrictions. Other research indicates that children aged 2-19 experienced an increase in BMI, with a 16.1% rise in the incidence of obesity. Factors contributing to this included poor diet due to financial constraints, inadequate nutrition, low hygiene levels, limited access to healthcare, and the rapid spread of diseases during the pandemic.<sup>14</sup> In Africa, research found a higher prevalence of SARS-CoV-2 virus infection but lower mortality rates in children in low- to middle-income countries compared with Western nations. In 2020, 22% of malnutrition and 52% of deaths in children under 5 years of age in low- to middle-income countries came from the sub-Saharan Africa region, despite a decrease in stunting from 40% in 1990 to 24.2% in 2019. However, the prevalence remains above 30% in these countries.<sup>20</sup> The pandemic led to increased food insecurity and disrupted access to healthcare and nutrition programs

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#### CONCLUSION

The study indicates no significant difference in the nutritional status of children in public and private elementary schools post-Covid-19; 35.4% of children were found to have normal nutritional status. These results influenced by social restrictions, social distancing, temporary school closures, general restrictions on public places, changes in eating patterns, children's physical activity, and the risk of infection were relatively similar for children attending private and public schools, leading to no significant differences in their nutritional status. Further research is needed to confirm this theory

#### CONFLICT OF INTEREST

The authors declare that they have no competing interests.

#### INSTITUTIONAL REVIEW BOARD STATEMENT

This research was conducted following the Declaration of Helsinki and was approved by the Research Ethics Committee Unit of the Faculty of Medicine, Udayana University.

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