



COMPARISON BETWEEN NUTRITIONAL STATUS AND VALUES OF THE PEDIATRIC SYMPTOM CHECKLIST 17 QUESTIONNAIRE CROSS-SECTIONAL STUDY AT 5 ELEMENTARY SCHOOLS IN CIHERANG VILLAGE

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Abstract

Child malnutrition, both over and undernutrition, is a serious problem affecting millions of children worldwide, with significant short- and long-term impacts on children's health and development. This research study the correlation between dietary status and emotional and behavioural problem among primary school children in Ciherang Village. This study is a cross-sectional design in which children who satisfy the specified criteria will undergo weight and height measurements. Their body mass index (BMI) will be calculated and compared to the BMI-for-age chart (BMI/Age). Additionally, the children will complete the Pediatric Symptom Checklist 17 (PSC-17) questionnaire. A total of 246 children from 5 schools in the Ciherang area met the inclusion criteria. The analysis revealed a significant correlation between the average difference in body mass index and the total PSC 17 score (p -value=0.026). This study identified a comparison between children's dietary health and emotional and behavioural disorders. This serves as a reminder of the significance of monitoring children's development and implementing a well-rounded diet to promote children's mental well-being.

Keywords : Body Mass Index, Pediatric Symptoms Checklist (PSC-17), Malnutrition

Introduction

Every children has right to access good nutrition, house, sosial and healthcare. Childhood malnutrition is a significant global issue, particularly among children under age of five. Proper nutrition is essential for children to achieve optimal growth, development, play, and learning engagement. Malnutrition refers to inadequate nutrient consumption, resulting in undernutrition, wasting, stunting, and deficiencies in essential micronutrients. It also includes excessive intake of nutrients leading to obesity. By 2022, the global population of children suffering from severe acute malnutrition was projected to reach 7.3 million, while 165 million children worldwide were stunted, in which 90% lived in Africa and Asia. Obesity rates among children aged 5-19 worldwide have risen significantly, with an increase from 0.7% to 5.6% in women and 7.8% in males. By 2030, the number of persons affected is projected to reach 254 million. According from Indonesia Nasional Basic Health Research (Riskesdas) 2018, the prevalence of malnutrition among children under the age of five was 13.8%, with 8% suffering from malnutrition and another 8% being classified as obese.^{1,2}

Malnutrition is a complex problem that has several risk factors, such as food availability, government regulations, access to healthcare facilities, socio-cultural influences, maternal health during pregnancy, biological factors, availability of clean water, and cultural practices related to food processing. Malnutrition has both short and long term effects. The short term effect of malnutrition include increased rates of illness, delays in physical and mental development, and reduced cognitive abilities and even death. Meanwhile, long term effect include physical development problems, increased vulnerability to diseases, and disability.^{3,4}

Children and teenagers often encounter mental health issues. Mental health significantly influences emotional and behavioural disorders, which are defined by difficulties in forming relationships with peers and displaying deviant conduct. Identifying this behaviour can be challenging since mischievous, rebellious, and impulsive actions, as well as outbursts of anger, destruction of objects, and instances of cheating or stealing at a small level, are commonly perceived as typical among school-age children. According to a study conducted in 2011, the worldwide occurrence of mental disorders among children falls between 10-20%. In a meta-analysis study focusing on teenagers in schools, it was discovered that 23.3% of them faced emotional and behavioural problem. These problems were more prevalent in remote areas and among individuals with lower economic status than in urban areas.⁵⁻⁷

Malnutrition in children are known for their effects on developmental delays. Furthermore, research indicates that malnutrition may adversely affect emotional and behavioural problem, academic performance, and children's brain development, leading to a decline in their overall quality of life and well-being.⁸ This study aims to investigate the comparison between the nutritional status of children and the Pediatric Symptoms Checklist 17. The study was conducted in elementary schools located in the Cihérang Village.

Material and Method

1. Study Methodology and Participant Selection

This research was a cross-sectional analytical observational study and was conducted between February and March 2024 at five primary schools in Cihérang Village. This study specifically targets the demographic of elementary school pupils in grades 5 and 6. The study requires a minimum sample size of 97 respondents, with a type I error rate of 5% and a research power of 20%. The participants in this study were elementary school children grade 5 and 6 who attended five different schools. The eligibility requirements for this study required individuals to be at least ten years old. The study's exclusion criteria encompassed children who exhibited uncooperative behaviour, faced challenges in engaging in effective two-way communication, lacked comprehension of the Indonesian language, and were disapproved of by their parents.

2. Study Methodology and Factors

The research was conducted by initially submitting a research proposal, examining research ethics, collaborating with the research vehicle supervisor, collecting, organising, analysing, and presenting the findings. The research variable comprises nutritional status and physical activity. The nutritional status of children and adolescents is evaluated by utilising the CDC curve for the Body Mass Index for the Age Percentiles category. This technique calculates the body mass index (BMI) by dividing weight to square-height ($\text{weight}/\text{height}^2$) and then plotting the result into CDC growth chart. This BMI percentile curve for age allows for comparing an individual's nutritional status to that of the general population of the same age. When analysing the CDC curve, BMI percentiles are interpreted as follows: a percentile below 5 indicates underweight, a percentile between 5 and less than 85

indicates normal nutritional status, a percentile between 85 and less than 95 indicates overweight, and a 95 or above indicates obesity.

The study assessed the child's emotional disturbance as the dependent variable, utilising the Pediatric Symptom Checklist 17 (PSC-17). The Pediatric Symptom Checklist 17 (PSC-17) is a concise questionnaire with 17 questions. Its purpose is to detect and evaluate alterations in emotional and behavioural problem in children. PSC-17 is not intended for diagnostic purposes but serves as a screening tool to identify and address children's early emotional and behavioural problems, enabling timely intervention and treatment. The PSC-17 is divided into three distinct subscales: the internalisation subscale, the externalisation subscale, and the attention subscale. Suppose any of the following four criteria are met, it is advisable to be cautious about the presence of behavioural, emotional, and psychological disorders if there was 1) A score of 5 or higher on the total internalisation subscale; 2) A score of 7 or higher on the total externalisation subscale; 3) A score of 7 or higher on the total attention subscale; 4) A total score of 15 or higher.

3. Quantitative data analysis

This research presents descriptive statistics encompassing proportion data expressed as percentages and centralised data distribution. The statistical analysis in this work employed the Kruskal-Wallis test, assuming that the data distribution deviated from normality based on the results of the Kolmogorov-Smirnov and Shapiro-Wilk tests. The study has established a type I error threshold of 5%.

Results

This study included 246 research respondents who met the inclusion criteria. The demographic characteristics of respondents in terms of age, gender, nutritional status based on the Body Mass Index for Age Percentiles, emotional disturbance based on three subscales and overall emotional and behavioural disturbance scores are depicted in Table 1.

Table 1. Demographic Characteristics of Research Respondents

Parameter	N (%)	Mean (SD)	Med (Min-Max)
Gender			
• Male	116 (47,2)		
• Female	130 (52,8)		
Age, years		11,83 (0,82)	12 (10-14)
• 10	7 (2,8)		
• 11	83 (33,7)		
• 12	103 (41,9)		
• 13	50 (20,3)		
• 14	3 (1,2)		
Body Mass Index for Age Percentiles			
• < 5 Percentile	34 (13,8)		
• 5th to < 85th percentile	184 (74,8)		
• 85th to < 95th percentile	17 (6,9)		
• ≥ 95th percentile	11 (4,5)		
The value of internalising disorders		4,3 (2,06)	4 (0 – 10)
The value of attentional distraction		4,26 (1,68)	4 (0 – 9)
The value of externalising disorders		3,37 (2,28)	3 (0 – 11)
Pediatric Symptoms Checklist-17 total score		11,93 (4,81)	11 (2 – 27)

The comparison between nutritional status and emotional, behavioural and psychosocial disorders was assessed using the Kruskal-Wallis statistical test because the data values were not normally distributed according to the Kolmogorov Smirnov Test. The Kruskal Wallis, statistical test results, revealed a significant mean difference between the nutritional status of the total PSC-17 value (p -value < 0.05). The results of epidemiological investigations showed that groups of children with normal nutritional status and obesity did have lower PSC-17 scores with three derived subscales when compared with groups of underweight and overweight children. (Table 2; Figure 1-4)

Table 2. Differences in Median Values of Pediatric Symptoms Checklist-17 Items between Nutritional Status Groups based on Body Mass Index per Age (BMI/Age)

Variable	Body Mass Index per Age (BMI/Age)				p-value
	Underweight	Normal weight	Overweight	Obesity	
Internalising Score	5 (2 – 7)	4 (0 – 9)	5 (3 – 9)	4 (2 – 10)	0,126
Attentional Score	4,5 (3 – 9)	4 (0 – 9)	4 (0 – 8)	4 (1 – 7)	0,059
Externalising Score	4 (0 – 11)	3 (0 – 9)	4 (1 – 10)	2 (0 – 7)	0,072
Pediatric Symptoms Checklist-17 Total Score	13,5 (7 – 24)	10,5 (2 – 25)	13 (6 – 27)	10 (3 – 23)	0,026

a. Kruskal Wallis Test

b. Grouping Variable: Body Mass Index for Age Percentile

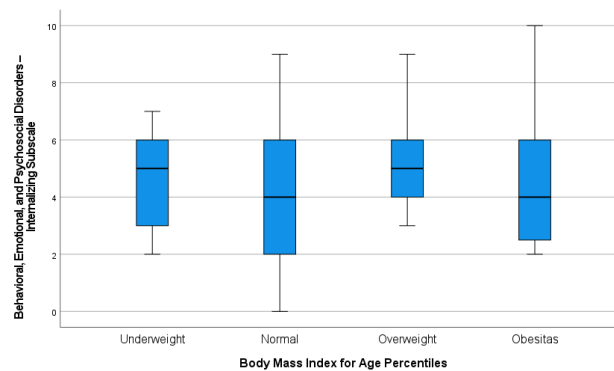


Figure 1. Relationship between Body Mass Index for Age Percentiles and the Internalization Sub-Scale of Behavioral, Emotional and Psychosocial Disorders

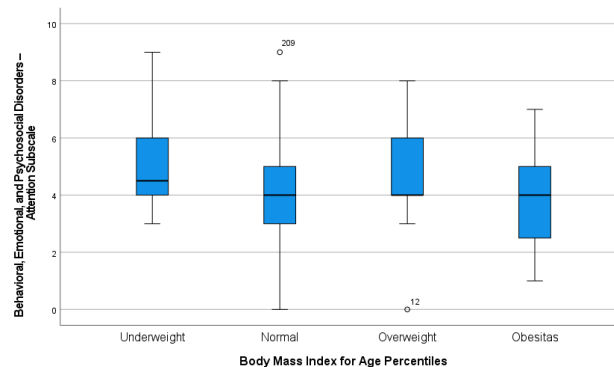


Figure 2. Relationship between Body Mass Index for Age Percentiles and Attention Sub-Scale for Behavioral, Emotional and Psychosocial Disorders

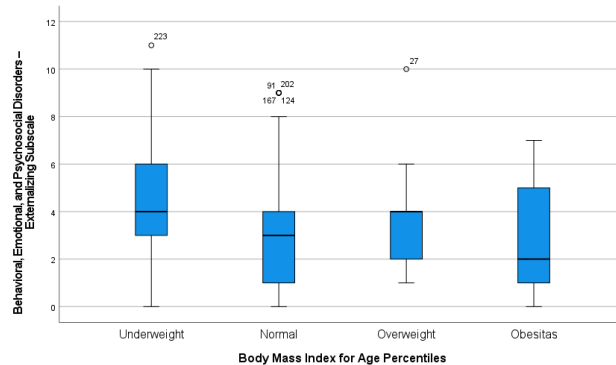


Figure 3. Relationship between Body Mass Index for Age Percentiles and the Externalization Sub-Scale of Behavioral, Emotional and Psychosocial Disorders

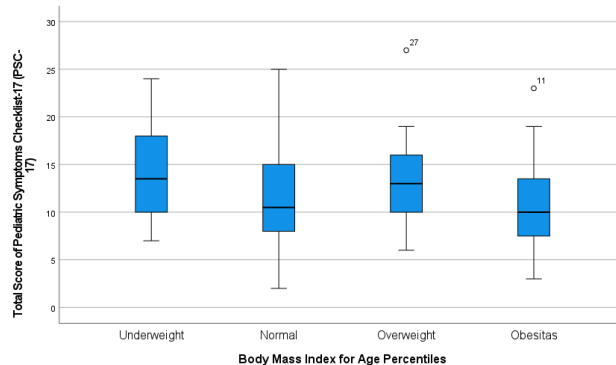


Figure 4. Relationship between Body Mass Index for Age Percentiles and Behavioral, Emotional and Psychosocial Disorders (Total Score from PSC-17)

Discussion

Malnutrition, as defined by the World Health Organization, includes all kinds of undernutrition (wasting, stunting, and underweight), a lack of vitamins or minerals, or being overweight/ obese. Malnutrition is a global issue with double burden in the form of malnutrition and obesity, was estimated, 20.2 million children under the age of five was stunted as a result of inadequate nutrition, whereas 53% of women, 43% of men, and 8% of school-aged children and adolescents were overweight or obese.^{9,10}

Malnutrition has a complicated etiology that includes a variety of health, social, economic, and cultural aspects. The etiology of dietary deficits in children can be separated into two categories: disease-related or disease-free. The environment, behaviour, and socioeconomic impact non-disease-related nutritional deficits. Disease-related nutritional deficits are classified as acute (less than three months) or chronic (more than three months). The reasons of malnutrition in this case include 40% neurological disease, 34.5% infection, 33.3% cystic fibrosis, 28.6% cardiovascular disease, 27% malignancy, and 23.6% gastrointestinal disorders.^{4,11,12}

Nutritional deficiencies can be caused by a lack of intake, nutrient loss owing to diarrhea/vomiting, reduced absorption/ malabsorption, or increased dietary needs/ hypermetabolism/hypercatabolism. Many causes contribute to children's lack of nutritional intake, including limiting food or fluid consumption, children who become overly full, anorexia related to gastrointestinal disorders, delays in promotor development, and drug usage side effects. According to WHO, vomiting and diarrhea account for up to 10% of all fatalities in children under the age of five, and they are the leading causes of malnutrition in children. Prolonged nausea and vomiting in children

might result in nutritional deficits. Chronic disorders, on the other hand, such as congenital heart disease, heart failure, and infections, cause increased heart work, basal temperature, nervous system activity, muscular work, and metabolic demands. If it cannot be met, the body will undergo a catabolism process, breaking muscle mass down to become an energy source. Malabsorption can result in acidosis, which is common in people with chronic renal failure. Chronic metabolic acidosis leads to muscle loss, stunted growth, and hypoalbuminemia.^{4,11,12}

This study examines the comparison between nutritional status and emotional and behavioural problem in children. The most effective assessment method is the measurement of body mass index adjusted for age (BMI/Age). This study revealed a prevalence of malnutrition in 34 children (13.8%). Malnutrition was linked to inadequate nutrition, resulting in delayed brain development and potential brain damage. Additionally, it led to a lack of energy for social interaction and acquiring knowledge and increased vulnerability to minimal parental stimulation. This is linked to the potential for experiencing symptoms of anxiety, despair, and reduced self-esteem.^{13,14}

There is evidence to support a link between malnutrition in children, whether it is due to undernutrition or overnutrition, and the development of behavioural and emotional problems. Additionally, anemia has also been shown to be connected to these diseases, although the relationship is not consistently linear. Children with cerebral palsy are susceptible to malnutrition, which has a detrimental impact on their overall development. Research has demonstrated that children who suffer from stunting, which refers to chronic nutritional problem, experience significant delays in both cognitive and motor development.¹⁵

A study conducted by Heuvel et al. on developmental and behavioural problem in children with acute malnutrition in Malawi revealed that these children exhibited impairments in gross and fine motor skills, language abilities, and social skills. These findings are corroborated by a comprehensive analysis conducted in 2022, which identified 11 papers demonstrating a correlation between starvation and cognitive impairments and seven studies indicating a link between malnutrition and behavioural problem. This study revealed a correlation between malnutrition in children and the occurrence of neurodevelopmental abnormalities, academic underachievement, as well as cognitive and behavioural problem. Nevertheless, researchers have indicated that this level of evidence remains within the moderate range, necessitating additional clinical trial trials.^{8,15,16}

Multiple research studies examine the correlation between BMI and emotional and behavioural problem in children. Regardless of whether they experience sadness or happiness, children with limited emotional regulation skills are linked to a higher body mass index (BMI). In addition, children with greater nutritional status, particularly those between the ages of 8 and 9, exhibit diminished social interactions with their classmates. This pertains to the ridicule and negative perception of youngsters with excessive nutritional status. Indeed, this phenomenon has emerged among children aged three and above, where a prevalent social bias dictates that children of this age should possess a slender physique.^{17,18}

A parallel investigation discovered that there was no correlation between psychiatric problem in children aged 5-6 years who were overweight and obese. This study elucidated that children who are underweight or have a body mass index (BMI) that is close to being underweight are correlated with psychiatric illnesses. Certain youngsters exhibit anti-obesity behaviour between the ages of 3 and 5. Malnourished children are prone to psychological problem due to their tiny stature and low muscle mass, which makes them susceptible to becoming the target of ridicule among their peers. Underweight children are typically less physically strong and more susceptible, making them more prone to being bullied in the preschool years.¹⁹

Several research studies have examined the relationship between BMI and mental health, especially in adolescent. Lingling et al studied the correlation between body image and emotional and behavioural disorders in 3841 Chinese teenagers. It was found that overweight teenagers exhibited

symptoms of depression and anxiety in contrast to their normal-weight counterparts. However, no significant association was observed between actual body weight and symptoms of depression and anxiety. An intriguing aspect of this study was not the state of being overweight or obese that directly leads to mental health problems but rather the discontentment with one's weight, which was associated with feelings of sadness and anxiety. The causes that arise can be attributed to social media and cultural factors. Conversely, parents in many regions of China believed that weight was a better indicator of health and prosperity, and they found it amusing. But in other areas, especially in urban areas who consider that the ideal physical shape is a thin shape even though the shape is not realistic.¹⁸

The intriguing aspect of research on physical activity in individuals with emotional and behavioural problems lies in the lack of consistent findings. The causes behind this phenomenon remain uncertain, although various potential explanations exist. Discrepancies in research methods and reporting can lead to variations in outcomes, particularly when comparing findings reported by parents to those obtained directly from the child. It is important to remember that numerous elements impact youngsters' nutritional status and mental well-being.²⁰

This study was plagued by several limitations in its design and methodology. An inherent flaw lies in using questionnaires completed solely by kids, lacking validation from external sources such as teachers or parents. This approach poses a potential danger of generating less precise data due to possible factors such as students' limited comprehension of the question or their lack of honesty in responding, whether deliberate or accidental, driven by a desire to present a positive image or a lack of awareness of their health status. Furthermore, due to the utilisation of a cross-sectional design in this study, data was only collected at a single instance, restricting the capacity to establish causal connections between nutritional status and the outcomes of the Pediatric Symptom Checklist 17 questionnaire. Additional significant elements that could impact students' mental and physical well-being, such as environmental influences, social support, or other health concerns, may not be fully regulated.

Conclusion

This study identified a correlation between the disparity in average nutritional status and the overall PSC-17 score. This study revealed that both undernutrition and overnutrition increase the likelihood of emotional and behavioural problem in children. It is crucial to periodically evaluate the growth of youngsters and ensure they follow a healthy lifestyle and maintain a balanced nutrition. Further research is required to investigate this topic, considering extra variables such as maternal characteristics, socioeconomic status, food quality, and child intellect. Those studies aim to elucidate the relationship between dietary status and children's mental health in the future.

References

- [1] Govender I, Rangiah S, Kaswa R, Nzaumvila D. Malnutrition in children under the age of 5 years in a primary health care setting. *South African Fam Pract.* 2021 Sep;63(1).
- [2] Perkumpulan Endokrinologi Indonesia. Pedoman Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 Dewasa di Indonesia. Soelistijo SA, editor. Jakarta: PB Perkeni; 2021.
- [3] Dipasquale V, Cucinotta U, Romano C. Acute Malnutrition in Children: Pathophysiology, Clinical Effects and Treatment. *Nutrients.* 2020 Aug;12(8):2413.
- [4] Beer SS, Juarez MD, Vega MW, Canada NL. Pediatric Malnutrition. *Nutr Clin Pract.* 2015 Oct;30(5):609–24.
- [5] Abd Rahim MH, Ibrahim MI, Ab Rahman A, Yaacob NM, Hashim NSF. Emotional and Behavioural Problems among Preschool Children in Northeast Peninsular Malaysia: Parent Report Version. *Healthcare.* 2023 Jun;11(13):1828.
- [6] Ogundele MO. Behavioural and emotional disorders in childhood: A brief overview for paediatricians. *World J Clin Pediatr.* 2018 Feb;7(1):9–26.
- [7] Bach S de L, Molina ML, Amaral PL do, Reyes AN, Jansen K, Silva RA da, et al. Emotional and behavioral problems: a school-based study in southern Brazil. *Trends Psychiatry Psychother.* 2019 Sep;41(3):211–7.
- [8] Kirolos A, Goyheneix M, Kalmus Elias M, Chisala M, Lissauer S, Gladstone M, et al. Neurodevelopmental, cognitive, behavioural and mental health impairments following childhood malnutrition: a systematic review. *BMJ Glob Heal.* 2022 Jul;7(7):e009330.
- [9] WHO. Nutrition: Malnutrition. Malnutrition in All Its Forms. 2021.
- [10] The Lancet. A future direction for tackling malnutrition. *Lancet.* 2020 Jan;395(10217):2.
- [11] Mehta NM, Corkins MR, Lyman B, Malone A, Goday PS, Carney L (Nieman), et al. Defining Pediatric Malnutrition. *J Parenter Enter Nutr.* 2013 Jul;37(4):460–81.
- [12] Corkins MR. Why Is Diagnosing Pediatric Malnutrition Important? *Nutr Clin Pract.* 2017 Feb;32(1):15–8.
- [13] Choi Y, Hong J. Association between Weight Status and Mental Health among Korean Adolescents: A Nationwide Cross-Sectional Study. *Children.* 2023 Mar;10(4):620.
- [14] Sanou AS, Diallo AH, Holding P, Nankabirwa V, Engebretsen IMS, Ndeezi G, et al. Association between stunting and neuro-psychological outcomes among children in Burkina Faso, West Africa. *Child Adolesc Psychiatry Ment Health.* 2018 Dec;12(1):30.
- [15] van den Heuvel M, Voskuil W, Chidzalo K, Kerac M, Reijneveld SA, Bandsma R, et al. Developmental and behavioural problems in children with severe acute malnutrition in Malawi: A cross-sectional study. *J Glob Health.* 2017;7(2).
- [16] Förster LJ, Vogel M, Stein R, Hilbert A, Breinker JL, Böttcher M, et al. Mental health in children and adolescents with overweight or obesity. *BMC Public Health.* 2023 Jan;23(1):135.
- [17] Rezapour M, Ferraro FR, Alsubaiei S. Behavioral and emotional adaptations of obese and underweight students in response to the COVID-19 pandemic. *Humanit Soc Sci Commun.* 2022 Sep;9(1):326.
- [18] Ren L, Xu Y, Guo X, Zhang J, Wang H, Lou X, et al. Body image as risk factor for emotional and behavioral problems among Chinese adolescents. *BMC Public Health.* 2018 Dec;18(1):1179.
- [19] Donkor HM, Toxe H, Hurum J, Bjercknes R, Eide GE, Juliusson P, et al. Psychological health in preschool children with underweight, overweight or obesity: a regional cohort study. *BMJ Paediatr Open.* 2021 Mar;5(1):e000881.
- [20] Gunstad J, Spitznagel MB, Paul RH, Cohen RA, Kohn M, Luyster FS, et al. Body mass index and neuropsychological function in healthy children and adolescents. *Appetite.* 2008 Mar;50(2–3):246–51.

