The Relationship Between the Knowledge Level of Balanced Nutrition and Body Mass Index

A Case Study of Indonesian School Students in Kuala Lumpur

[1]Gabriele Stefhany Teesen, [1]Anita Yuliani, [1]Sitti Syabariyah*, [1]Perla Yualita, [1]Aef Herosandiana

Corresponding Author: * sittisyabariyah@gmail.com

[1] Universitas 'Aisyiyah Bandung, Indonesia

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ABSTRACT

Nutrition is a critical issue in any country as it can impact the growth and development of children. To ensure that children have a balanced diet, education on nutrition should begin at a young age, ideally when they enter school. With good nutrition knowledge, children are more likely to have a healthy body proportionate to their age. This study aimed to determine the link between elementary school students' knowledge level in Sekolah Indonesia Kuala Lumpur (SIKL) about nutrition and their Body Mass Index. The research used a cross-sectional approach with a correlation method, and the total population was 220 students. The sampling technique used was purposive sampling, and 96 students were selected based on inclusion and exclusion criteria. Data collection was through a questionnaire, which was then analyzed using univariate and bivariate analysis, including chi-square statistical tests. The study found a relationship between the level of nutrition knowledge and Body Mass Index in SIKL students, with a p-value of $0.000 < \alpha\ 0.05$. To improve the level of knowledge of primary school children, it is highly recommended to provide education on balanced nutrition.

Keywords

Introduction

Inadequate nutrition and unbalanced nutritional intake lead to nutritional problems, either undernutrition or overnutrition. Nutritional issues are one of the unfinished problems in Indonesia, one of which is excess nutrition can cause overweight, and many are found to cause death. Therefore overweight is a serious nutritional problem that needs intensive attention because it can cause many risks of diseases such as heart disease and diabetes mellitus and can interfere with a person's mental health and cognitive function [1]. The successful development of a nation is determined by quality human resources (HR), namely HR, who have strong physical and mental strength, excellent health, and a good level of achievement. The development of quality human resources is best started early [2].

Statistical data states that the number of Indonesian citizens abroad is 3,011,202; one of Indonesia's neighboring countries, Malaysia, has the largest population of Indonesian citizens, totaling 1,330,303 people [3]. With Malaysia's enormous population of Indonesian citizens, it is the leading destination for Indonesian migrant workers (IMW) to find their livelihoods. As many as 58,468 become IMW, based on the gender of female IMW more than 61% with a total of 122,147 compared to men 39% as many as 78,614 [4]. Because of the large number of women who become migrant workers, this is one of the factors for the increase in Indonesian children living in Malaysia. Until now, the exact number of Indonesian migrant children data is unknown. Still, the Ministry of Home Affairs data [5] stated that at least 43,445 children or young people under 21 are categorized as stateless in Malaysia. Based on data from the Indonesian Consulate in 2012 [6], around 21,627 children of migrant workers in one place in Malaysia, namely Sabah, have not received educational facilities, and around 8,000 children can enjoy non-formal education. The impact of Indonesian migrant workers and Indonesian migrant children who do not have personal documents to become illegal migrants is a severe obstacle; some of the rights that are difficult to fulfill for unlawful migrant workers include Limited access to health services is a common issue faced by those who lack legal status. This leads to delays in seeking medical attention, even in cases where immediate attention is required. Another problem faced by illegal migrant workers is the lack of legal protection, which makes them vulnerable to abuse, exploitation, and harassment. Reporting abuses is a challenging task for them. Additionally, the children of illegal migrant workers often face difficulty in accessing formal education services, which can negatively impact their education and overall development.

According to Ref. [8], nutritional knowledge is knowledge related to food and nutrients, sources of nutrients in food, and foods that are safe for consumption so as not to cause disease and how to process them. According to WHO, the importance of nutrition is the study of food and its relationship with body health. Nutrition is the study of the processes that occur in living

organisms. This process involves processing nutrients from food for growth, energy production, and tissue maintenance [9]. In another study, primary school-aged children are at significant risk of problems related to nutrition, development, and growth. The process of child growth is influenced by good nutrition, the benefits of sound and balanced nutrition, which is to increase children's concentration, intelligence, and intellectual power to support child growth and development during school age [10]. Lack of knowledge about foods that have good nutrition will lead to wrong food choices and low nutrition contained in these foods and will cause the child's nutritional status to be poor and lacking [11].

Based on the results of government data, the prevalence of nutritional status (IMT/U) in Indonesian children aged 5-12 years includes very thin (2.4%), thin (6.8%), fat (10.8%), and obese (9.2%). Nutrition dramatically affects the health status of an individual. Diet is the leading cause of nutritional problems by consuming large amounts of food, foods high in energy, fat, simple carbohydrates (sugar), and high in sodium and fiber. School children's eating habits include snacks high in calories and low in protein, vitamins, minerals, and fiber, making them prone to obesity. Schoolchildren often consume junk food, including light snacks, frequently added to BTM (Food Additives) [12]. As for the side effects of lack of knowledge of nutrition, according to research in line [13] states that there are physical disorders that occur due to lack of balanced nutritional intake that can cause malnutrition, such as slow growth, swollen abdomen, thin body, loss of appetite, loss of energy, pale (anemia). In addition to physical disorders, there are also psychological disorders that occur in children, such as emotional, learning, social, psychiatric, and special disorders—efforts to overcome these problems by delivering balanced nutrition guidelines through nutrition counseling. Health promotion can be done using various methods and media tailored to the target. In the lecture and discussion method, the process of changing behavior towards the expected direction can occur through the active role of the target and the exchange of experiences among targets [14].

Based on the results of a survey conducted in the Kuala Lumpur Indonesian School area, Indonesian migrant children in Malaysia spend their time attending school so that their parents do not control the nutritional intake consumed; the majority of parents of students in Kuala Lumpur Indonesian schools are workers so that food intake is not monitored, a total of 220 primary school students in SIKL. The primary school has been encouraged to bring their food from home by SIKL, but not all students get food from home because parents are busy working and do not have time to prepare their children's meals, so they are only equipped with money to buy their food. It can be seen from the diverse body shapes of SIKL students, so this is the reason for knowing the proportions of SIKL elementary school students by measuring body mass index to assess the nutritional status categories of students at SIKL. This study was

conducted in elementary school because individuals experience diverse growth during elementary school, allowing the emergence of various categories of nutritional status. With the lecture method and leaflet media provided, it is hoped to increase the knowledge of SIKL students about balanced nutrition. So, this study aims to determine the relationship between the level of student knowledge and Body Mass Index in SIKL elementary school students because students' knowledge about nutritious food will affect their food intake and ideal body weight.

Methods

The research was conducted in two ways: for the knowledge variable by distributing questionnaires and measuring body mass index. This type of research uses correlation with a cross-sectional approach. The variables used in the study include independent variables, including the level of knowledge, and dependent variables, including body mass index in children. The sample in the survey was elementary school students with a population of 220 students.

The sampling technique in this study was purposive sampling. Purposive sampling is a sampling technique based on researchers' considerations of the population's characteristics or properties already known beforehand. The number of samples in this study were 96 students who were grade 2,3,4 students of Indonesian Primary School Kuala Lumpur. This research was conducted at the Indonesian School in Kuala Lumpur, Malaysia, in August 2023. The sampling technique used non-probability sampling with purposive sampling, where the sampling technique is based on inclusion and exclusion criteria (Table 1).

Table 1. Inclusion and Exclusion Criteria

Inclusion criteria	Exclusion criteria
Primary school students in grades 2, 3, and 4	Not willing to take anthropometric measurements
Take Anthropometric measurements	Not present during the study
Willing to be a respondent	

The primary data for this study were collected through various methods. Sample characteristics were gathered using a personal identity questionnaire, while student nutritional knowledge was assessed through a questionnaire containing questions related to 10 balanced nutrition messages. The data collection process involved pre and post-test forms to measure changes in student knowledge. Additionally, nutritional status data were obtained through anthropometric measurements, including the use of Camry brand digital stepping scales (with an accuracy of 0.1 kg) for Body Weight (BW) and GEA SH-2A brand Microtoise (with an accuracy of 0.1 cm) for Body Height (BH). Secondary data about the SIKL school, such

as its location, building area, number of teaching staff, number of students, and school facilities, were also included in the study.

The balanced nutrition knowledge instrument from previous researchers [15] with a multiple choice test consisting of 35 statements but only ten questions were applied in this study, which was divided into four factors: understanding nutrition, nutritious food, balanced nutritious food, and factors that affect nutrition. With a value of r count> r table (0.966) from 30 respondents at the 5% significance level, it can be concluded that all questions on the questionnaire are valid. The instrument is reliable based on the trial results; the reliability coefficient was 0.967.

Data processing using a questionnaire was then processed and analyzed using univariate and bivariate analyses. Univariate analysis is a statistical analysis used to analyze a single variable. In this analysis, only one variable is observed or measured, and the aim is to understand the pattern, characteristics, or nature of the variable without considering the relationship with other variables. Meanwhile, bivariate analysis aims to see the relationship between variables. Statistical tests were carried out to see the relationship of each variable studied. The statistical test used is Chi-Square, which assesses or compares the magnitude of the difference between the observed and expected frequencies.

Results

A. Characteristics of respondents

Table 2 shows the respondent characteristics based on the age and gender categories.

Table 2. Respondent Characteristics

Characteristics	Category	N	%
Age	7 year	36	37.5
	8 year	30	31.3
	9 year	28	29.2
	10 year	2	2.1
Gender	Male	54	56.3
	Female	42	43.8

Based on Table 2 of 96 respondents, 36 people, or 37.5%, were the smallest age characteristics. In the gender category, the majority of respondents were male; the number of male subjects was 54 people or (56.3%), and the number of female subjects was 42 people or 43.8%.

B. Univariate Analysis

Univariate analysis is a statistical method that focuses on understanding and presenting data from a single variable in a dataset. This analysis aims to describe and

summarise the characteristics of the variable without regard to relationships or interactions with other variables. Table 3 shows the distribution of the knowledge level.

Table 3. Knowledge Level

Characteristics	Category	N	%
Knowledge	Less	27	28.1
	Enough	21	21.9
	Good	48	50.0

Based on Table 3 of the total 96 respondents. Based on the level of knowledge, half of the respondents (50%) had good nutritional knowledge, as many as 48 respondents.

Table 4. Body Mass Index (BMI)

| Characteristics	Category	N	%	Mean	Median	SD
BMI	Severely Underweight	5	5.2	TB: 129.46 cm BB: 31.968 kg	TB: 128.00 cm BB: 31 kg	8.499
	Underweight	2	2.1			
	Normal	45	46.9			
	Overweight	19	19.8			
	Obese	25	26.0			

Based on Table 4 of 96 respondents, almost half of the respondents (46.9%) had normal BMI, with as many as 45 respondents with an average height of 129.46 cm and weight of 31.968 Kg.

C. Bivariate Analysis

Bivariate analysis examines the relationship or association between two variables in a dataset. The main objective is understanding how changes in one variable relate to changes in the other. The bivariate analysis in this study performed the Chi-square test. See Table 5 for the relationship between balanced nutrition knowledge level and body mass index. Fig. shows the distribtution of the body mass index among participants.

Table 5. Relationship between Balanced Nutrition Knowledge Level and Body Mass Index

Factor		Body Mass Index						p-value
		Severely Underweight	Underweight	Normal	Overweight	Obese	Total	
Knowledge Level	Less	2	0	2	5	18	27	0.000
	Enough	2	1	4	11	3	21	
	Good	1	1	39	3	4	48	
	Total	5	2	45	19	25	96	
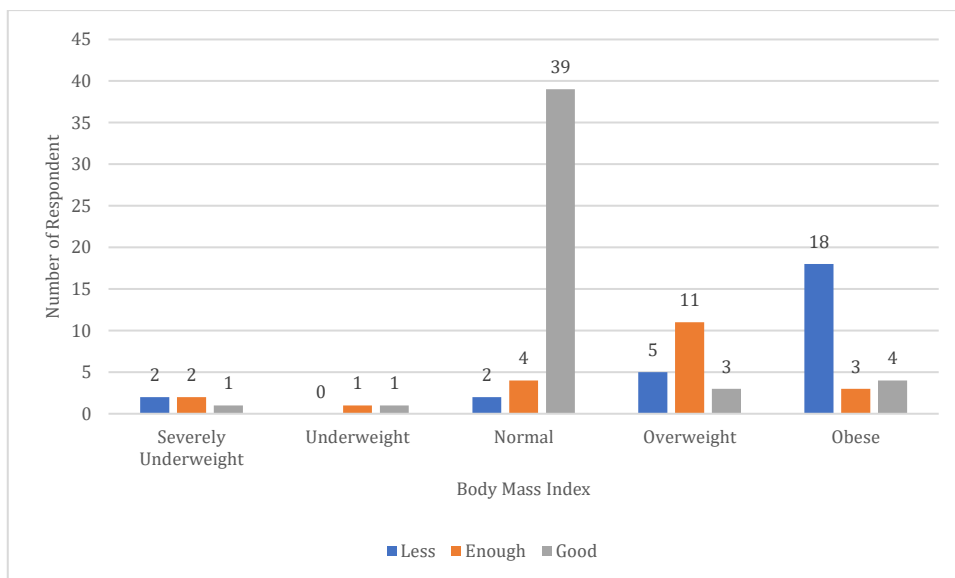
Fig. 1. The distribtution of the body mass index

Based on Table 5, the relationship between the level of knowledge of balanced nutrition with body mass index in students of SIKL, the results of statistical tests of this study using chi-square obtained the results of the p-value value in this study is 0.000, if interpreted based on the formulation above p-Value 0.000 <α 0.05 then Ha is accepted Ho is rejected, which means there is a relationship between the level of knowledge of balanced nutrition with body mass index in students of SIKL. It states that a good level of knowledge will affect the state of good nutrition in children.

Discussion

Based on the Bivariate statistical test results, there is a relationship between good knowledge level and body mass index. The chi-square test found that children whose body mass index was in the normal category had good knowledge, and most respondents (50%) had good knowledge.

This study is in line with previous research, which states that there is a relationship between nutritional knowledge, physical activity, and nutritional status. According to Ref. [16], knowledge is essential in open behavior and in shaping available behavior. In line with the research of Ref. [17], knowledge is a critical domain for forming one's actions. Student knowledge is essential in underlying the formation of behavior that supports knowledge and will make it easier for a person to absorb information and implement it in their daily behavior and lifestyle. Factors that influence knowledge are age, education, and experience. The more age, the level of maturity and strength of a person will be more mature in thinking, learning, and working so that knowledge will increase. Knowledge results from curiosity, especially by

the sensory process of the eyes and ears to a particular object. Knowledge results from cooperation between a subject aware of human knowledge and a known object. Behavior based on knowledge of a specific object [18] will last longer. Nutritional knowledge is categorized as less, moderate, or reasonable based on the number of correct answers given by the subject. Nutritional knowledge is a cognitive aspect that shows an understanding of the science of nutrition, types of nutrients, and their interactions with nutritional and health status. Nutrition knowledge is one of the things that affects nutritional status indirectly and is the basis for determining food consumption [19].

In this study, in addition to the level of knowledge measured, a body mass index is calculated to determine whether or not the respondent's weight and height are proportional; one way to monitor the level of nutritional status in children is to use a measuring instrument (IMT). According to Ref. [20], body mass index (BMI) is the ratio of body weight (kg) to height (meters) squared, and BMI between the ages of 2 and 20 is divided into four categories, namely: underweight, normal, overweight, and obese. Each activity requires a different amount of energy, depending on the intensity and duration of muscle work. Body mass index (BMI) and level of knowledge are highly correlated because the higher the level of knowledge, the better the nutritional status of a person, so the food selection is balanced.

It is in line with the theory that nutritional problems in children are the result of an imbalance between intake and output of nutrients (nutritional imbalance), namely intake that exceeds output or vice versa, in addition to errors in choosing food ingredients to eat [21]. According to Ref. [22], nutritional status in children is influenced by many factors, including socio-economic content, parental education, parental employment, and knowledge of applied parenting. The results of this study are also by the theoretical review that food nutrition is very beneficial for the body in helping the process of growth and development of children and preventing diseases due to lack of nutrients in the body such as lack of energy and protein, anemia, iodine deficiency, zinc deficiency, vitamin A deficiency which inhibits the process of child growth and development [23]. Another factor affecting children's nutritional status is providing parents with adequate nutrition knowledge. In this regard, a person's level of nutritional knowledge affects the selection of nutritional content available in food. Lack of understanding about the contribution of nutrition and various types of food can affect nutrition, intelligence, and productivity problems [24].

The research has shown that children's nutritional status can be determined by measuring two variables - the level of knowledge and the body mass index. The p-value obtained from the study is 0.000, less than the standard alpha value of 0.05. This indicates that increasing one's knowledge through health education or counseling can positively influence

children's behavior and encourage them to choose a balanced diet. This, in turn, helps them consume foods that contain the right nutrients and maintain a healthy weight. According to research [25], action or behavior is a person's activity or activity. Meanwhile, in terms of the importance of the analysis framework, action is what a person does. The formation of a person's behavior and actions starts from a stimulus that causes knowledge; in supporting factors, if the benefits are known through the information obtained, someone will have a positive attitude and intend to take action through social support. Another study conducted by Ref. [26] stated that there was a real difference in the behavior of elementary school students in choosing healthy snacks before and after being given health education.

Therefore, this study's knowledge level is strongly related to body mass index because a good level of knowledge results in a sound body mass index, which is called normal nutritional status. Efforts to improve knowledge of balanced nutrition can be made by providing balanced nutrition health education to elementary school children. To optimize the results of this study, further research is needed to provide health education on balanced nutrition that increases knowledge among elementary school children.

Conclusion

After researching the relationship between the level of knowledge and body mass index of Indonesian school students in Kuala Lumpur, it was concluded that there is a relationship between the two. The p-value of $0.000 < \alpha\ 0.05$ indicates statistical significance. The majority of respondents had good knowledge levels and a normal body mass index. In total, 48 respondents (50%) fit this category. While the research is not perfect, it suggests that health workers should provide nutritional health education early on to reduce the number of cases of disproportionate nutritional status in children. Teachers and health workers should collaborate to promote balanced nutrition education among elementary school students.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Authors

Gabriele Stefhany Teesen is an undergraduate midwifery student at 'Aisyiyah University Bandung, Jalan KH. Ahmad Dahlan No. 6, Bandung City 40264, Indonesia. She really wants to be a midwife since she was a child. She is the first child in her family. Her hobbies include singing and playing music. She enjoys trying new things, especially research, and she is frequently involved in lecturer research and community service. (email: biellestefhany@gmail.com).

Anita Yuliani, S.S.T., M.K.M., Bdn is a lecturer at the Faculty of Health Sciences, Aisyiyah University Bandung. She has completed her master's degree at Padjajaran University, working as a lecturer in midwifery. She has published many journal articles related to midwifery in national and international scope. She has also written one of the health books with the Poltekkes Kemenkes. (email: yulianianita@gmail.com).

Dr. Sitty Syabariyah, S.Kp., MS. Biomed is a senior lecturer at Faculty of Health Sciences of Aisyiyah University of Bandung. Doctoral degree obtained from the University of Indonesia. Her expertise is in nursing, health, hospital, and risk management. She has published many articles in international journals. She also works as a visiting senior lecturer at the Universiti Teknologi Mara (UiTM) Malaysia. She is the Reviewer of the Journal of Health Sciences and Medical Development. (email: sittisyabariyah@unisabandung.ac.id).

Perla Yualita, S.Pd., M.Pd. is a senior lecturer at Aisyiyah University Bandung. She has been active in education and health for 21 years. Her expertise in Education and the Indonesian Language has led her to carry out research and community service in the fields of Health Education and the Indonesian Language. She has published several research results and community service in education and health vocabulary. With her expertise in writing scientific papers, she also collaborates with health sector lecturers to publish research and community service results in national and international journals. (email: perlayualita3@gmail.com).

Aef Herosandiana, S.T., M.Kom., specializes in Information Systems and Technology. He is an alumnus of the Master's Program in Information Systems at the University of Computer Indonesia. He is actively involved as the Manager and Managing Editor of the Jurnal Keperawatan 'Aisyiyah and the Jurnal Asuhan Ibu dan Anak at the Universitas 'Aisyiyah Bandung. In addition, he also manages the Intellectual Property Center and Publisher at the Universitas 'Aisyiyah Bandung. (email: herosandiana@gmail.com).