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THE RELATIONSHIP OF NUTRITIONAL STATUS WITH THE QUALITY OF LIFE OF SCHOOL-AGE CHILDREN (10-12 YEARS)

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ABSTRACT

Background: Quality of life is an individual's perception of life satisfaction and happiness, which involves multidimensional aspects of physical health and psychological and social functioning. Many factors influence quality of life, including nutritional status. Good nutritional status optimizes growth and development and influences quality of life.

Objective: To determine the relationship between nutritional status and quality of life as assessed using *the Pediatric Quality of Life Inventory* (PedsQL).

Method: Analytical observational research with a cross-sectional design involving three elementary schools in Jimbaran, Bali. Nutritional status was assessed using the CDC 2000 curve and then categorized based on Waterlow. The child's quality of life was assessed by filling out the PedsQL questionnaire by the child and parents. Statistical analysis regarding associations used the Chi-Square test followed by the *Mann-Whitney test* to see trends.

Results: There were 189 children with a median age of 11 years (range 11-12 years). From the *Chi-Square test* results, a p-value of 0.008 was obtained, indicating significant results between the nutritional status groups and quality of life, so the *Mann-Whitney test was carried out* to see the trend. The average rank *(mean rank*) of impaired quality of life is higher than normal quality of life (107.61 vs 87.24), which reflects that the more children who are overweight or obese, the greater the impaired quality of life. Physical function was found to be significantly impaired by both child and parent PedsQL reports.

Conclusion: There is a significant relationship between the nutritional status group and PedsQL, with a tendency that the more overweight/obese, the lower the quality of life.

Keywords: nutritional status., quality of life., PedsQL

BACKGROUND

Malnutrition refers to insufficient or excess nutritional intake, imbalance of essential nutrients or impaired nutrient utilization. The term malnutrition addresses three large groups. The first group is conditions of malnutrition, which include *wasting* (low body weight for height), *stunting* (low height for age) and thinness (low body weight for age). The second group is micronutrient-related malnutrition, which includes micronutrient deficiencies (lack of essential vitamins and minerals) or excess micronutrients. The last group includes overweight and obesity. [1]

Malnutrition (both deficiency and excess) can cause mortality and morbidity in children. The impact of malnutrition on children includes disrupting the child's growth and development, decreasing the immune system, making them susceptible to disease, disrupting brain development, and also causing behavioral and emotional problems in children. At the local to national level, malnutrition causes problems for families regarding health, social, and economic aspects. [2,3]

Quality of life is an individual's perception of satisfaction and happiness. A reduced ability of an individual to interact with the environment and with other individuals can limit his or her potential to live a healthy, happy and productive life. Quality of life is also a multidimensional construct seen by individuals involving aspects of physical health and psychological and social functioning.[4] Quality of life consists of two components. The first component is the physical aspect, which includes general health, diet, body growth, mental health, and pain. The second component is the psychological aspect, including stress, worry, satisfaction, positive and negative emotional conditions. Quality of life measurements provide indicators the burden of health and disease, which can be used to sort therapies and evaluate outcomes. Because quality of life is a subjective concept, so it should be evaluated from the patient's perspective whenever possible.[5,6] *The Pediatric*

Quality of Life Inventory (*PedsQL*) is an instrument developed to assess children's quality of life based on age, maturity and cognitive development. Quality of life assessed using PedsQL includes four assessment categories, namely: physical function, emotional function, social function and school function. In recent decades, quality of life assessment has begun to consider the individual from an integral perspective, measuring the impact of disease from the perspective of the patient or his family.[5.7]

Millions of Indonesian children and adolescents remain threatened by high rates of stunting and wasting as well as the double burden of malnutrition, where there is both undernutrition and overnutrition. Indonesian Basic Health Research (RISKESDAS) 2018 reported that the average national prevalence for stunting, wasting and overweight was 30.8%, 10.2% and 8.0%, respectively.[8] Bali is one of the provinces in Indonesia with a significant number of young residents. As many as 1.2 million people, or 29 per cent of the total population in this province, are children. More than six in 10 children live in urban areas. The prevalence of malnutrition is relatively high in rural and urban areas. Based on RISKESDAS 2018, the nutritional status of children aged 5-12 years based on Body Mass Index (BMI) according to age, the incidence of thin children in Bali province is 4.99 per cent, overweight is 13 per cent, and obesity is 10.57 per cent.[9]

Based on these data, the author is interested in researching the relationship between malnutrition and the quality of life of elementary school children in Badung Regency. This research aims to determine the nutritional status and quality of life of school-age children (10-12 years) in the Jimbaran area, Badung and the relationship between nutritional status and quality of life of school children using PedsQL.

RESEARCH METHODS

This research is an analytical observational study using a cross-sectional design. Sampling consecutively used a non-probability sampling technique. The research was conducted in the Academic Center room at Udayana University Hospital in July 2022. This research involved several elementary school students from three elementary schools in the Jimbaran, Badung, Bali area. The research was conducted with Community Service activities organized by Udayana University Hospital to celebrate National Children's Day 2022. The three elementary schools include two state and one private elementary school. The number of samples uses *total sampling*. Inclusion criteria were elementary school patients aged 10-12 years with exclusion criteria including children who did not receive permission to participate in research activities from their parents after explaining informed consent. A detailed explanation regarding the context and how to fill out the PedsQL form was given to students and their parents. Students and parents fill out the PedsQL form in separate rooms.

Children must remove thick clothing such as jackets, accessories and shoes to measure body weight. The child was put on the digital scale, and then the researcher recorded the weighing results. Height measurements were taken by the child standing barefoot, with the subject's head, back and heels pressed against the wall.

The tools and materials used in this research include the *Onehealth Electronic Personal Scale EB5633* digital scale for measuring body weight, the GEA stature meter for measuring body height, and the CDC 2000 curve.

Assessment of children's quality of life using PedsQL version 4.0. The PedsQL instrument assesses health status in four functioning domains: physical (8 *items*), emotional (5 *items*), social (5 *items*), and school (5 items). The PedsQL questionnaire used is the Indonesian version. The total score is calculated as the average score of the four domains. Each *item* reflects a problem, for example, “difficulty walking > 100 meters”, during the past month. Responses varied from never (score = 0) to almost always (score = 4) on a 5-point Likert scale. The assessment of each answer is reversed, and the scale is changed to a scale of 0-100 (score 0 = 100, score 4 = 0). Total score ranges from 0-100; Higher scores reflect better health status. The interpretation of the PedsQL questionnaire is that if one of the functional domains from the child's and parent's reports scores <70, it is said to be impaired.

The outcome observed was the relationship between nutritional status and the PedsQL score, which describes the child's quality of life. All data was collected and recorded, then processed and analyzed statistically using the SPSS version 22 program for *Windows*, which was displayed in the form of proportion (percentage), number, mean (standard deviation), and median (range, minimum-maximum). The relationship between nutritional status trends and PedsQL was assessed using *linear-to-linear association analysis chi-square* and continued *post hoc* using the *Mann-Whitney test* if significant results were found ($p<0.05$). This research has been approved by the Research Ethics Commission of the Faculty of Medicine, Udayana University with number 1994/UN14.2.2.VII.14/LT/2023.

RESULTS

The research subjects comprised students in grades 4, 5, and 6 aged 11 to 12. Of the 250 potential respondents, 189 subjects met the inclusion and exclusion criteria. Table 1 shows the demographic data of the research subjects.

The median age of research subjects was 11.4 years, with an age range of 11 to 13 years. The lowest body weight was 23 kilograms, while the highest was 82.2 kilograms, with an average of 40.3 kilograms. The average height of the subjects was 147.5 cm, with the lowest range being 128 cm and the highest being 170 cm. Body weight and height were plotted on the CDC 2000 curve to obtain the ideal body weight. The nutritional status was grouped based on the Waterlow formula into severe protein energy malnutrition (PEM), moderate PEM, mild PEM, normal, overweight, obese and super obese.

The PedsQL questionnaire, which children and parents have filled in, determines the quality of life. Table 2 shows the

conclusions of the PedsQL results based on child and parent reports.

Table 1. Demographic characteristics

Characteristics	n (%)
Age	
11 years old	116 (61.4)
12 years old	71 (37.6)
13 years old	2 (1,1)
Gender	
Man	106 (56.1)
Woman	83 (43.9)
School origin	
Country	101 (53.4)
Private	88 (46.6)
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	27 (14.3)
Super obese	9 (4.8)

Table 2. Conclusion of PedsQL results based on child and parent reports

Nutritional status	Peds-QL Conclusion		p*
	Disturbed n(%)	Normal n (%)	
Severe PEM	0 (0.0)	1 (100.0)	
Moderate PEM	4 (23.5)	13 (76.5)	
Mild PEM	19 (38.0)	31 (62.0)	
Normal	21 (31.3)	46 (68.7)	0.008
Overweight	7 (38.9)	11 (61.1)	
Obese	15 (55.6)	12 (44.4)	
Super obese	6 (66.7)	3 (33.3)	
Total	72 (12.7%)	117 (87.3)	

* *linear to linear association* test

Table 2 shows that 72 children (12.7%) of the subjects experienced impaired quality of life. Based on nutritional status, those with the highest quality of life problems were super obese, namely around 66.7%, followed by obesity at 55.6% and *overweight* at 38.9%. The percentage of children without an impaired quality of life, starting from the highest, is severe PEM, moderate PEM and normal, with 100%, 76.5% and 68.7%, respectively.

A chi-square analysis of nutritional status groups was conducted on the quality of life outcomes based on PedsQL. There was a significant relationship between nutritional status groups and quality of life (p=0.008).

Significant results were obtained between the nutritional status and quality of life groups, so the Mann-Whitney test was continued to see trends. Table 3 below shows that the Mean rank for impaired quality of life is higher than normal quality of life (107.61 vs 87.24).

Table 3. Results of *the Mann-Whitney* test for groups of nutritional status and quality of life

	Quality of Life (PedsQL)				P value
	Disturbed		Normal		
	n	%	n	%	
Good nutrition	21	31.3	46	68.7	
Heavy PEM	0	0	1	100	
PEM Moderate	4	23.5	13	76.5	
PEM is light	19	38	31	62	0.01
Overweight	7	38.9	11	61.1	
Obesity	15	55.6	12	44.4	
Super obesity	6	66.7	3	33.3	
Total	72	38.1	117	61.9	

*Mean rank for impaired quality of life 107.61, normal quality of life 53.40

The relationship between nutritional status and the four functional domains in PedsQL is described in Tables 4 and 5. Based on child and parent reports, this was done to assess which of the four domains of the child's quality of life was impaired.

Table 4. Subgroup analysis of nutritional status trends with quality of life function domains (child report PedsQL)

Nutritional status	Child report PedsQL Function Domain, n (%)			
	Impaired Physical Function*	Impaired Emotional Function**	Impaired Social Functioning**	Impaired School Functions **
Normal	1 (0.5)	17 (9)	7 (3.7)	15 (7.9)
Severe PEM	0 (0)	0 (0)	0 (0)	0 (0)
Moderate PEM	1 (0.5)	3 (1.6)	0 (0)	6 (3,2)
Mild PEM	5 (2.6)	10 (5.3)	5 (2.6)	14 (7.4)
Overweight	1 (0.5)	3 (1.6)	0 (0)	6 (3,2)
Obese	6 (3,2)	8 (4.2)	2 (1,1)	7 (3.7)
Super obese	1 (0.5)	3 (1.6)	2 (1,1)	4 (2,1)
Total	15 (7.9)	44 (23.3)	16 (8.5)	52 (27.5)

* p value = 0.004 (*linear-by-linear association*) followed by posthoc analysis using the Mann-Whitney test, it was found that the mean rating of impaired physical function was 133, normal physical function was 91.72 (p=0.004)

** *Linear-by-linear association analysis* is not significant (p-value > 0.05)

DISCUSSION

This research aims to determine whether there is a relationship between nutritional status and a child's quality of life. Determination of nutritional status is carried out based on body weight (BB) according to body length (PB) or height (TB) (BB/PB or BB/TB). The growth chart used as a reference is the CDC 2000 chart because the subject is over 5 years old. Followed by determining nutritional status using the ideal body weight percentage according to the *Waterlow criteria* for children over 5 years. [10,11]

Table 5. Subgroup analysis of nutritional status trends with quality of life function domains (PedsQL parents report)

Nutritional status	PedsQL Function Domain parent report, n (%)			
	Impaired Physical Function*	Impaired Emotional Function**	Impaired Social Functioning**	Impaired School Functions **
Normal	3 (1.6)	13 (6.9)	4 (2,1)	16 (8.5)
Severe PEM	0 (0)	0 (0)	0 (0)	0 (0)
Moderate PEM	1 (0.5)	4 (2,1)	0 (0)	6 (3,2)
Mild PEM	2 (1,1)	12 (6.3)	3 (1.6)	18 (9.5)
Overweight	2 (1,1)	3 (1.6)	0 (0)	4 (2,1)
Obese	7 (3.7)	10 (5.3)	4 (2,1)	11 (5.8)
Super obese	1 (0.5)	0 (0)	0 (0)	3 (1.6)
Total	16 (8.5)	42 (22.2)	11 (5.8)	58 (30.7)

* p value = 0.012 (*linear-by-linear association*)

posthoc analysis using the Mann-Whitney test, it was found that the mean physical function rating was 127.68; normal physical function was 91.98 (p=0.01)

** *Linear-by-linear association analysis* is not significant (p-value > 0.05)

Based on Table 2, there is a significant relationship between nutritional status and the quality of life of school children. This is in line with research conducted by De Grandis et al., where this research looked for a relationship between a history of severe malnutrition and the quality of life of elementary school-aged children. The results stated that elementary school children with a history of severe malnutrition showed significantly lower HRQOL scores, based on the history of severe malnutrition before the age of 2 years, causing long-term effects, especially learning and psychosocial disorders.[12] Malnutrition and weight loss are known to cause muscle mass loss and weakening, thereby leading to fatigue. As a result, children who are malnourished lack the energy and muscle strength to carry out physical activities and reduce their quality of life.[13] Other research conducted by Kusmiyati et al. also stated that malnutrition affects a child's quality of life in all domains, namely physical, emotional and social function in children aged 2 to 4 years. [14] This is different from the results of research by Harsono et al. and Karenina et al., which stated that there was no significant relationship between parenting patterns and nutritional status on the quality of life of elementary school-age children.[15,16]

Table 3 show Mann-Whitney test, the mean rank of impaired quality of life is higher than normal quality of life (107.61 vs 87.24), which can reflect the more children getting overweight or obese, the more impaired quality of life. In line with research conducted by Frontini et al. and Heijden et al., results showed a significant relationship between *overweight* and obesity and the quality of life of children and adolescents.[6.17]

Obesity is one of the most common chronic diseases suffered by children, and its prevalence continues to increase.[18] Obesity in children can have an impact on physical and psychological health. Children with obesity have a higher chance of developing cardiovascular disease, glucose intolerance, asthma, fatty liver disease, and joint disorders. Obesity and being overweight can have psychological effects that significantly impair healthy functioning. Childhood obesity is a major health problem that is associated with poor psychosocial adjustment in children and adolescents, as well as families.[17] It has been demonstrated that a significant mechanism linking obesity and low quality of life in adolescents is dissatisfaction with body image. Additionally, there are significant problems associated with childhood obesity and overweight, including bullying and social stigma. Once again, low self-esteem, body dissatisfaction, inadequate psychosocial adjustment, depression, eating disorders, and low quality of life are interrelated. [6]

Tables 4 and 5 describe the subgroup analysis of nutritional status trends with quality of life function domains based on child and parent PedsQL reports. There appears to be a trend in nutritional status influencing physical function in the PedsQL function domain, both in child and parent reports. The average rating can illustrate that the nutritional status of children who are increasingly over-nourished or obese have more impaired physical function than good nutritional status or PEM. In line with research conducted by Heijden et al., childhood obesity has a negative impact on quality of life, especially on the physical aspect. [6] Another study in California by Schwimmer et al. also obtained similar results in almost all domains, namely physical, social and psychosocial function. *Overweight and obese* subjects with *obstructive sleep apnea* reported significantly lower quality of life scores than obese subjects without *obstructive sleep apnea*. [19] Based on parent reports, physical function in obese children is impaired because some parents with overweight and obese children believe that their children cannot do as much physical activity as their peers, so this can lead to low ratings in the physical activity assessment. [20]

Conclusion

Malnutrition impacts a child's health and affects the quality of life. This research shows a significant relationship between nutritional status and children's quality of life. It is hoped that the results of this research will become a reference for the community, health workers and the government to focus more on improving health so that the incidence of malnutrition in children, especially during the golden period of growth, can be reduced, and can also improve children's quality of life in the future.

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