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Acceptability Of Soft Cookies Made From a Combination Of Catfish Flour and Soybean Filling

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ABSTRACT

Background: Wasting is a form of acute malnutrition that negatively affects the growth and development of toddlers. Locally based, protein-rich supplementary food (*Pemberian Makanan Tambahan*/PMT) may help address this problem. Catfish provides high-quality animal protein, whereas soybeans are rich in plant-based protein and healthy fats. Their combination in soft cookies may offer a nutritious supplementary food alternative for wasting toddlers.
Objective: This study aimed to determine the acceptability and nutritional content of soft cookies made with catfish flour and soybean filling as supplementary food for wasting toddlers.
Methods: This study employed a non-factorial Completely Randomized Design with three formulations: F1 (18 g catfish flour and 72 g wheat flour), F2 (45 g catfish flour and 45 g wheat flour), and F3 (63 g catfish flour and 27 g wheat flour). Acceptability was assessed through organoleptic testing involving 50 untrained panelists. Data were analyzed using the Friedman and Wilcoxon tests. Proximate analysis was conducted in an accredited laboratory.
Results: Formula F1 was the most preferred across all acceptability criteria. Per 100 g, F1 contained 23.15% moisture, 1.57% ash, 382.5 kcal of energy, 12.48 g protein, 16.29 g fat, and 46.54 g carbohydrates.
Conclusions: Formula F1 showed the highest acceptability and potential as a locally based supplementary food alternative for wasting toddlers.
Keywords: Catfish flour; soft cookies; soybeans; supplementary food; toddlers; wasting.

Cite this Article

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INTRODUCTION

Chronic kidney disease (CKD) is a global health problem, with its prevalence increasing every year. Globally, CKD is one of the leading causes of mortality and contributes substantially to the burden of non-communicable diseases. Evidence indicates that both the incidence and mortality rates of CKD have continued to rise over time, in parallel with the increasing prevalence of major risk factors such as hypertension, diabetes mellitus, and unhealthy lifestyles. (1)

In Indonesia, the prevalence of CKD has also shown an increasing trend. According to the 2023 Indonesian Health Survey (Survei Kesehatan Indonesia/SKI), the national prevalence of CKD was 0.18%, while the prevalence in Bali Province was slightly higher at 0.19%. This increasing trend indicates that CKD remains a major public health concern, particularly because of its adverse impact on patients' quality of life and its contribution to increased morbidity and mortality.(2)

Patients with advanced-stage CKD generally require kidney replacement therapy, one of the most common modalities being hemodialysis. Hemodialysis is the most widely used treatment to maintain patients' physiological functions by replacing part of the kidneys' function in removing metabolic waste products (3).

Malnutrition remains a common problem among patients with CKD undergoing hemodialysis, with a reported prevalence ranging from 16% to 54%. This condition is attributed to several factors, including nutrient losses during the hemodialysis process, decreased appetite, and dietary restrictions. Protein is one of the essential nutrients, as it plays a vital role in maintaining metabolic homeostasis, promoting tissue repair, and preventing malnutrition.

Wangaya Regional General Hospital, Denpasar, is one of the referral hospitals providing hemodialysis services, with a relatively large and steadily increasing number of patients each year. This makes the hospital an appropriate setting for investigating factors associated with the nutritional status of patients with CKD, particularly protein intake and the duration of hemodialysis.

Based on the above considerations, this study aimed to analyze the association between protein intake and the duration of hemodialysis with the nutritional status of patients with chronic kidney disease at Wangaya Regional General Hospital, Denpasar.

METHOD

This study employed an analytical observational design with a cross-sectional approach to examine the association between protein intake, duration of hemodialysis, and the nutritional status of patients with chronic kidney disease. The study was conducted at the Hemodialysis Unit of Wangaya Regional General Hospital, Denpasar, from December 2025 to April 2026.

The study population consisted of all patients with chronic kidney disease undergoing routine hemodialysis at Wangaya Regional General Hospital. A total of 36 participants were selected using a consecutive sampling technique. The inclusion criteria were patients aged 19–70 years, undergoing routine hemodialysis two to three times per week, having normal consciousness, being able to communicate effectively, and willing to participate in the study. Patients with severe comorbidities were excluded.

The independent variables were protein intake and duration of hemodialysis, while the dependent variable was the nutritional status of patients with chronic kidney disease. Protein intake was assessed using two 24-hour dietary recalls (2 × 24-hour food recall), whereas the duration of hemodialysis was obtained through direct interviews with the participants. Nutritional status was evaluated using the Dialysis Malnutrition Score (DMS) (6)**.** Data processing was performed through editing, coding, and data entry. Univariate analysis was used to describe the distribution of participants' characteristics and the study variables. Bivariate analysis was performed using Spearman's rank correlation test to determine the association between the independent variables and the dependent variable, with a significance level of $\alpha = 0.05$.

This study complied with the ethical principles of human research by obtaining informed consent from all participants, ensuring the confidentiality of respondents' data, and obtaining ethical approval before the commencement of the study

RESULT

A total of 36 participants were included in this study. The distribution of participants based on their demographic and clinical characteristics is presented in Table 1.

Table 1
Distribution of Participants by Characteristics

Characteristics	f	%
Sex		
Male	28	77,8
Female	8	22,2
Total	36	100
Age		
19-29 years	1	2,8
30-49 years	10	27,8
50-64 years	14	38,9
65-70 years	11	30,6
Total	36	100
Education Level		
Primary School	6	16,7
Juinior High School	1	2,8
Senior/Vocational High School	20	55,6
Diploma	2	5,6
Bachelor's Degree	5	13,9
Master's Degree	1	2,8
Doctoral Degree	1	2,8
Total	36	100
Employment Status		
Employed	22	61,1
Unemplyoed	14	38,9
Total	36	100

As shown in Table 1, the majority of the participants were male, accounting for 28 participants (77.8%). Based on age, most participants were between 50 and 64 years old, comprising 14 participants (38.9%). Regarding educational level, the largest proportion of participants had completed senior high school or vocational high school education, with 20 participants (55.6%). In terms of employment status, most participants were employed, accounting for 22 participants (61.1%).

The distribution of participants according to the study variables is presented in Table 2.

Table 2
Distribution of Participants According to the Study Variables

Characteristics	F	%
Protein Intake		
Inadequate	27	75
Adequate	7	19,4
Excessive	2	5,6
Total	36	100
Duration of Hemodialysis		
<1 year	10	27,8
1-3 years	19	52,8
>3 years	7	19,4
Total	36	100
Nutritional Status		
Normal Nutritional Status	21	58,3
Malnutrition (Undernutrition)	15	41,7
Total	36	100

As presented in Table 2, of the 36 participants, the majority (27 participants, 75.0%) had inadequate protein intake, while 7 participants (19.4%) had adequate protein intake and 2 participants (5.6%) had excessive protein intake. Regarding the duration of hemodialysis, 10 participants (27.8%) had undergone hemodialysis for less than 1 year, 19 participants (52.8%) for 1–3 years, and 7 participants (19.4%) for more than 3 years. With respect to nutritional status, most participants (21 participants, 58.3%) had normal nutritional status, whereas 15 participants (41.7%) were classified as having malnutrition (undernutrition).

The association between protein intake and the nutritional status of the participants is presented in Table 3.

Table 3
Association Between Protein Intake and Nutritional Status

Protein Intake	Nutritional Status						*p-Value*
	Normal		Malnutrition		Total		
	n	%	N	%	n	%	
Inadequate	12	57,1	15	100	27	75	0,003
Adequate	7	33,3	0	0	7	19,4	
Excessive	2	9,5	0	0	2	5,6	
Total	21	100	15	100	36	100	

As shown in Table 3, all 15 participants (100%) who were classified as malnourished had inadequate protein intake. Among participants with normal nutritional status, the majority (12 participants, 57.1%) also had inadequate protein intake, while 7 participants (33.3%) had adequate protein intake and 2 participants (9.5%) had excessive protein intake. Spearman's rank correlation test showed a p-value of 0.003. Since the p-value was less than 0.05, it was concluded that there was a statistically significant association between protein intake and the nutritional status of the participants.

The association between the duration of hemodialysis and the nutritional status of the participants is presented in Table 4.

Table 4
Association Between Duration of Hemodialysis and Nutritional Status

Duration of Hemodialysis	Nutritional Status						*p-Value*
	Normal		Malnutrition		Total		
	n	%	N	%	n	%	
< 1 year	6	28,6	4	26,7	10	27,8	0,904
1-3 years	11	52,4	8	53,3	19	52,8	
>3 years	4	19,0	3	20,0	7	19,4	
Total	21	100	15	100	36	100	

As shown in Table 4, among the 15 participants who were classified as malnourished, the majority (8 participants, 53.3%) had undergone hemodialysis for 1–3 years, while 4 participants (26.7%) had received hemodialysis for less than 1 year and 3 participants (20.0%) for more than 3 years. Similarly, among participants with normal nutritional status, most (11 participants, 52.4%) had undergone hemodialysis for 1–3 years, whereas 6 participants (28.6%) had received hemodialysis for less than 1 year and 4 participants (19.0%) for more than 3 years. Spearman's rank correlation test yielded a p-value of 0.904. Since the p-value was greater than 0.05, it was concluded that there was no statistically significant association between the duration of hemodialysis and nutritional status.

DISCUSSIONS

The findings of this study demonstrated a significant association between protein intake and the nutritional status of patients with chronic kidney disease undergoing hemodialysis at Wangaya Regional General Hospital, Denpasar ($p < 0.05$). These results indicate that protein intake plays an important role in determining the nutritional status of patients with CKD. Most participants with inadequate protein intake tended to have poor nutritional status. Protein is an essential nutrient that plays a crucial role in maintaining muscle mass, promoting tissue repair, and supporting normal metabolic functions (7). In patients undergoing hemodialysis, protein requirements are increased because amino acids are lost during the dialysis process. Consequently, inadequate protein intake may contribute to the development of malnutrition.

The findings of this study are consistent with those of previous studies reporting a significant association between protein intake and the nutritional status of patients with chronic kidney disease undergoing hemodialysis. (8). Other studies have also demonstrated that inadequate protein intake is associated with an increased risk of malnutrition in patients receiving hemodialysis. This is attributed to the increased protein catabolism and nutrient losses that occur during the hemodialysis process. If these losses are not compensated for by adequate dietary intake, patients are at greater risk of nutritional deterioration and malnutrition. (9)

In contrast, this study found no significant association between the duration of hemodialysis and patients' nutritional status ($p > 0.05$). This finding suggests that the duration of hemodialysis is not the primary factor influencing the nutritional status of patients with chronic kidney disease. The lack of association may be explained by the influence of other, more dominant factors, such as nutrient intake, adherence to dietary recommendations, patients' clinical condition, and the nutritional education received during treatment. Furthermore, most participants had undergone hemodialysis for a relatively similar duration, resulting in limited variability in the data. (10)

The findings of this study are consistent with those of several previous studies reporting that the duration of hemodialysis is not significantly associated with the nutritional status of patients with chronic kidney disease (11). This may be explained by the fact that, despite prolonged hemodialysis treatment, patients' nutritional status can be maintained if they receive adequate nutritional intake along with appropriate nutritional monitoring and counseling. In other words, behavioral factors and nutritional

management appear to have a greater influence on nutritional status than the duration of hemodialysis itself. (12)

Overall, the findings of this study indicate that the nutritional status of patients with chronic kidney disease is more strongly influenced by protein intake than by the duration of hemodialysis. These results underscore the importance of nutritional interventions, particularly ensuring adequate protein intake, for patients with chronic kidney disease undergoing hemodialysis to prevent malnutrition and improve their quality of life.

CONCLUSIONS

Based on the findings of this study, it can be concluded that there was a significant association between protein intake and the nutritional status of patients with chronic kidney disease undergoing hemodialysis at Wangaya Regional General Hospital, Denpasar. In contrast, the duration of hemodialysis was not significantly associated with patients' nutritional status. These findings indicate that protein intake plays a more important role in determining nutritional status than the duration of hemodialysis. Therefore, patients are encouraged to maintain adequate protein intake according to their individual nutritional requirements to prevent malnutrition. Hospitals are recommended to strengthen routine nutritional education and monitoring for patients undergoing hemodialysis. Future studies are encouraged to investigate other factors that may influence nutritional status by including larger sample sizes and a broader range of variables.

CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

AUTOR CONTRIBUTIONS

DCD contributed to the study conceptualization, literature review, data collection, data analysis, interpretation of the results, and preparation of the initial manuscript. PPSS contributed to study supervision, methodological guidance, interpretation of the results, and critical revision of the manuscript. NKW contributed to study supervision, methodological guidance, interpretation of the results, and critical revision of the manuscript. All authors reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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DECLARATION OF ARTIFICIAL INTELLIGENCE USE

The authors used ChatGPT (OpenAI, GPT -5.6) to assist with English translation, language editing, grammar correction, and improvement of the clarity and readability of the manuscript. ChatGPT was not used for research design, data collection, statistical analysis, interpretation of research findings, or formulation of the conclusions. All AI-assisted text was reviewed, verified, and revised by the authors. The authors take full responsibility for the accuracy, scientific integrity, and final content of the manuscript.

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