

Dietary intake of patients with chronic kidney disease on hemodialysis at 108 Military Central Hospital

Nguyen Thi Huyen, Doan Huy Cuong,
Nguyen Thi Van Anh, Dang Bien Cuong

108 Military Central Hospital

Summary

Objective: To describe the actual dietary intake in patients with end-stage chronic kidney disease on hemodialysis. **Subject and method:** Using the 24-hour recording method and comparing with the level that meets the recommended nutritional requirements. A cross-sectional descriptive study was conducted in 103 patients with end-stage chronic kidney disease on hemodialysis at the Department of Nephrology - Hemodialysis at 108 Military Central Hospital. **Result:** The average energy intake was 1257 ± 294.5 kcal/day. The average protein intake was 57.9 ± 21.5 g/day. The percentage of energy-generating substances P:L:G was 18.4%:20.8%:60.8%, and most of the energy provided was from glucid. The ratio of animal protein/total protein was 57.2%, and plant lipid/total lipid was 32.3%. The calcium /phosphorus ratio was 0.4. **Conclusion:** The actual dietary intake of patients with chronic kidney disease on hemodialysis did not meet the recommended requirements for energy, protein and some nutrients. Therefore, it is necessary to strengthen nutrition counseling for patients.

Keywords: Dietary, end-stage chronic kidney disease, hemodialysis.

1. Background

Chronic kidney disease (CKD) is becoming a common disease today with an increasing incidence due to many different causes, difficult and expensive treatment, and an inevitable consequence of the constantly increasing diabetes and hypertension.

Malnutrition is quite common in chronic kidney disease patients on hemodialysis. Nutritional and metabolic changes often coexist and lead to a gradual loss of protein and energy stores in the body (muscle mass and body fat), resulting in a waste of energy and protein (PEW).

Nutrition and diet play a very important role in supporting the treatment and prevention of complications of the disease. Eating less salt and reduced protein in the diet are the optimal kidney

protection measures in the treatment of slowing the progression of CKD to end-stage renal disease. An adequate diet for hemodialysis patients with enough energy, protein, vitamins and minerals...is the first issue to ensure a good nutritional status for the patients. However, the results of one study showed that the dietary energy of patients with CKD only reached 72.2% of the recommended requirement [6].

From that fact, we conducted this study with the following objectives: *To describe the actual dietary intake of patients with end-stage chronic kidney disease on hemodialysis at 108 Military Central Hospital.*

2. Subject and method

2.1. Subject

Selection criteria: (1) Patients diagnosed with end-stage chronic kidney disease undergoing hemodialysis (2) ≥ 18 years of age and (3) consent to participate.

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Correspondence to: Nguyen Thi Huyen, Department of Nutrition, 108 Military Central Hospital

Email: nthuyen410@gmail.com

Exclusion criteria

Patients on emergency hemodialysis due to acute renal failure, and severe comorbidities (severe infections, heart failure, respiratory failure).

Patients with limited hearing, speech, mental illness, and severe conditions could not participate in the interview.

Patients did not consent to participate in the study.

2.2. Method

Study design: A cross-sectional descriptive study.

Sample size: 103 eligible patients. The research sample was selected by convenience sampling method.

Data collection: Energy and nutrient intake of patients were assessed by way of 24-hour dietary recall method for non-hemodialysis days. Food intake was recorded using household measurements that were converted into weight (g). The trained investigators asked to record all the food (including drinks) consumed by the patient within the previous 24 hours from that time or in the whole previous day after waking up in the morning until going to bed at night. Using the photobook of 500 common dishes for Vietnamese adults to investigate the portion sizes, made it easier for patients to describe the sizes of food used.

2.3. Statistical analysis

The dietary intake was assessed by the 24-hour questionnaire. From there to determine the consumption of food, dietary energy, the structure and the balance of the diet, value of nutrients. In addition, the intake of each nutrient was compared to the recommended nutrient reference value, based on the 2020 update to the KDOQI Clinical Practice Guideline for Nutrition in CKD [11] and Hospital Diet Guideline of the National Institute of Nutrition (NIN) 2016 [4]. The characteristics of the study patients were expressed as mean or median, as appropriate for categorical variables, percentages and variables with continuity.

Independent samples T-test and one-way ANOVA tests were used for comparing parametric variables. For all statistical analyses, p-value <0.05 was considered significant. Data were analyzed using the IBM SPSS version 20.0 software.

3. Result

Table 1. General characteristics of patients

Variables	n = 103	%
Gender		
Male	71	68.9
Female	32	31.1
Age Mean $\pm$ SD (Min-Max)	63.9 $\pm$ 14.3 (20-89)	
$\leq$ 40 years old	11	10.7
40-59 years old	23	22.3
$\geq$ 60 years old	69	67
Ethnic group		
Kinh	101	98.1
Others	2	1.9
Hemodialysis frequency a week		
Once	5	4.9
Twice	22	21.4
Thrice	76	73.8
Years of hemodialysis		
< 1	33	32
1-2	15	14.6
2-4	19	18.4
> 4	36	35
Comorbidity		
Hypertension	95	96.0
Diabetes mellitus	48	48.5

In our study, a total of 103 subjects were included in this study, and their baseline characteristics are shown in Table 1. Male patients were mainly (68.9%). Included patients had a mean age of 63.9 $\pm$ 14.3 years old, the oldest age was 89 years old, and the youngest age was 20 years old. Most of the patients had hemodialysis 3 times/week (73.8%). Hemodialysis time over 4 years accounted for the highest rate of 35%. The highest proportion of patients with comorbidities was hypertension at 96%, and diabetes at 48.5%.

Table 2. Dietary energy and nutrient values of patients

Nutrients	Mean $\pm$ SD
Energy (kcal)	1257.0 $\pm$ 294.5
Protein	
Total (g)	57.9 $\pm$ 21.5
Animal (g)	33.1 $\pm$ 19.1
Lipid	
Total (g)	29.0 $\pm$ 8.8
Plant (g)	9.3 $\pm$ 5.4
Glucid (g)	191.0 $\pm$ 50.3
Fiber (g)	6.2 $\pm$ 3.7
Minerals	
Calcium (mg)	238.4 $\pm$ 83.0
Phosphorus (mg)	587.1 $\pm$ 185.0
Sodium (mg)	179.0 (41.8-864.5)*
Potassium (mg)	1250.1 $\pm$ 388.7
Iron (mg)	7.5 $\pm$ 2.3
Zinc (mg)	6.8 $\pm$ 2.4
Vitamins	
Vitamin A (μ g)	106.2 (0.0-833.0) *
Vitamin D (μ g)	0.0 (0.0-9.38) *
Vitamin C (mg)	61.9 $\pm$ 46.7
Vitamin B1 (mg)	1.2 $\pm$ 0.6
Vitamin B2 (mg)	0.4 $\pm$ 0.2

* Median (Min-Max)

The result in Table 2 shows that the average energy intake of patients was 1257 $\pm$ 294.5kcal/day. The average total protein intake of patients was 57.9 $\pm$ 21.5 g/day.

Table 3. Average of energy and nutrient values in dietary by hemodialysis frequency and gender

Nutrients in day	Hemodialysis frequency per week			p*	Gender		p**
	Once	Twice	Thrice		Male	Female	
Energy (kcal)	1335.7	1253.4	1252.9	0.832	1268.5	1231.6	0.558
Protein (g)	65.0	61.6	56.4	0.457	60.5	52.0	0.053
Lipid (g)	28.1	31.4	28.4	0.361	29.9	26.9	0.109
Glucid (g)	205.4	181.0	192.9	0.504	189.2	195.1	0.583
Fiber (g)	9.9	6.7	5.9	0.057	6.2	6.4	0.831
Calcium (mg)	252.5	238.9	237.4	0.926	240.2	234.5	0.746
Phosphorus (mg)	600.1	605.9	580.8	0.847	607.5	541.7	0.095

Postassium (mg)	1387.9	1327.9	1218.5	0.369	1271.9	1201.7	0.399
Iron (mg)	8.8	7.5	7.4	0.481	7.6	7.3	0.597
Zinc (mg)	8.3	7.2	6.6	0.201	6.9	6.5	0.378
Vitamin C (mg)	82.7	69.7	58.3	0.365	62.0	62.7	0.975
Vitamin B1 (mg)	1.3	1.2	1.1	0.638	1.2	1.0	0.214
Vitamin B2 (mg)	0.47	0.47	0.44	0.815	0.47	0.41	0.158

*ANOVA test; **t test

The results of Table 3 show that the consumption of energy and some nutrients in the diet gradually decreased in patients with more hemodialysis frequency. Energy and some nutrients in the diet were consumed higher in males than in females, but the difference was not considered significant ($p>0.05$).

Table 4. The balance of dietary

Dietary	Ratio
P:L:G (n = 103)	18.4%:20.8%:60.8%
P:L:G with diabetes (n = 48)	18.2%:20.7%:61.1%
Protein (animal/total)	57.2%
Lipid (plant/total)	32.3%
Calcium /Phosphorus	0.4
Vitamin B1/1000kcal	0.9
Vitamin B2/1000kcal	0.4

Table 3 shows the results, the ratio of energy-generating substances in the diet (P:L:G) was 18.4%:20.8%:60.8%. The ratio of animal/total protein was 57.2%, and plant/total lipid was 32.3%. Calcium/Phosphorus ratio was 0.4. Vitamin B1/1000kcal was 0.9mg. Vitamin B2/1000kcal was 0.4mg.

Table 5. Percentage of response compared to recommended requirements by KDOQI and NIN

Nutritional value	Recommended Requirement	Hemodialysis frequency per week		
		Once (n = 5)	Twice (n = 22)	Thrice (n = 76)
Energy (kcal/kg/day)	25-35	72.3%	65.3%	67.0%
Protein (g/kg/day)	1.0-1.2	✓	85.6%	71.7%
Animal/total protein (%)	≥60	98.0%	✓	92.2%
Lipid (%)	20-30	74.8%	✓	90.2%
Fiber (g/day)	20-25	44.0%	29.8%	26.2%
Posstasium (mg/day)	1000-2750	✓	55.9%	51.3%
Calcium (mg/day)	800-1000	28.1%	26.5%	26.4%
Phosphorus (mg/day)	< 1200	✓	✓	✓
Iron (mg/day)	10-18	55.0%	46.9%	46.3%
Vitamin C (mg/day)	70-75	✓	96.1%	80.4%
Vitamin B1 (mg/day)	0.9-1.2	✓	✓	✓
Vitamin B2 (mg/day)	1.3-1.8	30.3%	30.3%	28.4%

✓ : Meet recommended requirement.

The results of Table 5 show that the percentage of response compared to the recommended requirement of the study subjects decreased gradually with the frequency of hemodialysis. Energy intake, fiber, calcium, iron, and vitamin B2 consumed were lower than the recommended requirement in all 3 groups.

4. Discussion

A study on 103 hemodialysis patients showed that 71 patients were male, accounting for 68.9% and 32 patients were female, accounting for 31.1%. The average age of the study subjects was 63.9 ± 14.3 years old, which is similar when compared with the results of author Bui Trung Hieu at E Hospital in 2020 [1]. The highest rate was the group of patients who had 3 times hemodialysis per week 73.8%, 2 times hemodialysis per week was 21.4%, and 1 time hemodialysis per week was 4.9%.

Energy intake: The results show that the average energy intake of patients was 1257 ± 294.5 kcal/day, similar to the results of author Chau Thi Thao Nguyen in 2022 at Thong Nhat Hospital, which was 1235.2 kcal/day [3], research by author Tran Thi Yen in 2018 was 1291.6 ± 442.7 kcal/day [7]. The energy consumption of our study subjects was lower than the study results in Korea 1547.4 ± 380.8 kcal/day [9]. The difference in average energy consumption between studies can be explained by customs, economic conditions, education level, etc. between different countries. However, the actual dietary energy of the patient was lower than the recommended requirement of NKF-KDOQI, reaching about 65-72%. There is a statistically significant difference between actual dietary intake and recommended requirement in all 3 groups of hemodialysis frequency with $p < 0.05$ using t-test.

Protein: The average protein intake of patients was 57.9 ± 21.5 g/day, studies on dietary intake of patients with chronic kidney disease on hemodialysis also gave similar results [3], [6]. The results of our study are similar to the study of author AM Martins in 2015 when it was observed that the amount of protein in the diet was only about 0.9-1.0 g/kg body weight/day [8]. According to the NKF-KDOQI clinical practice guidelines, the recommended amount of protein for patients with chronic kidney disease on

hemodialysis depends on the frequency of hemodialysis during the week because a certain amount of protein was lost during each hemodialysis session [11]. Protein intake of patients was reached enough compared to the recommended requirement of NKF-KDOQI in the hemodialysis group once/week, 85.6% twice/week and 71.7% thrice/week.

Lipid: The average amount of lipid in the diet was 29.0 ± 8.8 g/day, reaching over 74% of the recommended requirement. Men tend to consume more dietary lipids than recommended. This result is higher than the study at Thai Binh Provincial General Hospital (22.5 ± 15.3 g/day) [5]. The significance of lipid restriction in the diet is to control dyslipidemia and reduce cardiovascular risk in patients with chronic kidney disease.

Glucid: Our study results showed that the amount of glucid consumed in the diet of the study subjects was 191.0 ± 50.3 g/day, similar to the study at Thai Nguyen Central Hospital of 192.0 ± 69.1 g/day [6]. For patients with chronic kidney disease on hemodialysis, the need for glucid must also be maintained at a balanced level to prevent nutritional deficiencies, but not to increase blood sugar.

Fiber: The results of the study showed that the average fiber intake was 6.2 ± 3.7 g/day, only about 26-44%, much lower than the recommended requirement of NKF-KDOQI. The average fiber consumption is quite similar to the research results of Cap Minh Duc at 5.9 ± 2.8 g/day [2].

Vitamins: The average consumption of vitamin C was 61.9 ± 46.7 g/day and vitamin B1 was 1.2 ± 0.6 g/day, reaching over 80% of the recommended requirement of NKF-KDOQI. Particularly, the average consumption of vitamin B2 content of 0.4 ± 0.2 g/day only reached about 30% of the recommended requirement.

Minerals: The average phosphorus consumption was 587.1 ± 185.0 g/day, which was enough compared to the recommended requirement. The average iron was 7.5 ± 2.3 g/day (55% in the hemodialysis group once/week, 46% twice/week and thrice/week). Potassium consumption in the diet averaged 1250.1 ± 388.7 g/day, meeting the needs of the once-weekly hemodialysis group, reaching 55.9% in the twice-weekly hemodialysis group and the

lowest was 51.3% in the group 3 times/week. The average calcium consumption was 238.4 ± 83.0 g/day, about 26-28% of the recommended requirement of NKF-KDOQI.

The average consumption of minerals such as calcium, iron, potassium, and vitamins such as C, B1, and B2 in the dietary of our study subjects not only did not meet the recommended requirement but was also lower than the results of some studies on the diets of hemodialysis patients [6], [2]. The difference can be explained by the higher age of the patients in our study compared to the previous studies.

The balance of dietary: The rate of energy-generating substances in the diet (P:L:G) was 18.4%:20.8%:60.8%, respectively. With diabetes mellitus, P:L:G was 18.2%:20.7%:61.1%. The ratio of animal protein/total protein was 57.2%, quite similar to the research of author Tran Thi Yen in 2018 was 59.1% [7], The ratio of vegetable lipid/total lipid was 32.3%. The results of our study showed that the Ca/P ratio in the diet was 0.4, similar to the study of author Lim Hee Sook in Korea was 0.34 [10], lower than the study at Hai Phong Medical Hospital was 0.67 [2]. The ratio of vitamin B1/1000kcal and B2/1000kcal respectively 0.9 and 0.4 our results are quite similar to the study of author Cap Minh Duc [2]. Thus, the ratio of vitamin B2/1000kcal had not reached the recommended requirement of the Institute of Nutrition in 2016 [4].

5. Conclusion

In general, the energy, protein and some nutrients in the actual diet of our study patients did not reached the recommended requirement. Energy intake was 65-72% recommended requirement and the protein intake of the group of patients on hemodialysis 3 times a week reached 71% of the recommended requirement. It is necessary to ensure early nutritional care for patients with chronic kidney disease on hemodialysis.

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