New Nutritional Diet Approach for CKD Patients

Kayoko Adachi

REJ Clinical Nutrition Association
## Comparison of BMI between Thai and Japanese People

### I. Comparison of BMI between Thai and Japanese males and females (*)

<table>
<thead>
<tr>
<th>Sex</th>
<th>Lean (&lt;18.5)</th>
<th>Medium build (18.5-24.9)</th>
<th>Moderately obese (25.0-29.9)</th>
<th>Obese 30 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thai M</td>
<td>9.8</td>
<td>58.2</td>
<td>24.8</td>
<td>7.2</td>
</tr>
<tr>
<td>Jap. M</td>
<td>6.0</td>
<td>66.2</td>
<td>23.9</td>
<td>4.0</td>
</tr>
<tr>
<td>Thai F</td>
<td>12.7</td>
<td>69.7</td>
<td>14.0</td>
<td>3.6</td>
</tr>
<tr>
<td>Jap. F</td>
<td>10.7</td>
<td>68.7</td>
<td>16.9</td>
<td>3.6</td>
</tr>
</tbody>
</table>

*Thai National Health Examination Survey 2014
*The 2014 National Health and Nutrition Survey

### II. Comparison of BMI between Thai and Japanese males and females by age group

#### ◆ Thai males

<table>
<thead>
<tr>
<th>Age (yrs.)</th>
<th>Lean (&lt;18.5)</th>
<th>Medium build (18.5-24.9)</th>
<th>Moderately obese (25.0-29.9)</th>
<th>Obese 30 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-29</td>
<td>17.8</td>
<td>56.4</td>
<td>16.6</td>
<td>9.2</td>
</tr>
<tr>
<td>30-44</td>
<td>4.2</td>
<td>56.3</td>
<td>28.3</td>
<td>11.3</td>
</tr>
<tr>
<td>45-59</td>
<td>5.7</td>
<td>56.5</td>
<td>29.8</td>
<td>8.0</td>
</tr>
<tr>
<td>60-69</td>
<td>9.4</td>
<td>59.7</td>
<td>25.7</td>
<td>5.3</td>
</tr>
<tr>
<td>70-79</td>
<td>14.0</td>
<td>61.9</td>
<td>21.2</td>
<td>2.9</td>
</tr>
<tr>
<td>80 or older</td>
<td>23.9</td>
<td>64.8</td>
<td>10.1</td>
<td>1.2</td>
</tr>
</tbody>
</table>

#### ◆ Thai females

<table>
<thead>
<tr>
<th>Age (yrs.)</th>
<th>Lean (&lt;18.5)</th>
<th>Medium build (18.5-24.9)</th>
<th>Moderately obese (25.0-29.9)</th>
<th>Obese 30 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-29</td>
<td>19.3</td>
<td>77.1</td>
<td>2.9</td>
<td>0.7</td>
</tr>
<tr>
<td>30-44</td>
<td>15.6</td>
<td>68.6</td>
<td>11.0</td>
<td>4.8</td>
</tr>
<tr>
<td>45-59</td>
<td>10.9</td>
<td>72.1</td>
<td>13.0</td>
<td>4.0</td>
</tr>
<tr>
<td>60-69</td>
<td>9.1</td>
<td>66.9</td>
<td>20.5</td>
<td>3.5</td>
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<td>66.4</td>
<td>21.0</td>
<td>3.7</td>
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<td>23.6</td>
<td>54.8</td>
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<td>3.9</td>
</tr>
</tbody>
</table>

#### ◆ Japanese males

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<thead>
<tr>
<th>Age (yrs.)</th>
<th>Lean (&lt;18.5)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>15-29</td>
<td>18.6</td>
<td>65.5</td>
<td>11.7</td>
<td>4.2</td>
</tr>
<tr>
<td>30-44</td>
<td>5.0</td>
<td>67.8</td>
<td>21.7</td>
<td>5.6</td>
</tr>
<tr>
<td>45-59</td>
<td>2.8</td>
<td>66.2</td>
<td>24.7</td>
<td>6.2</td>
</tr>
<tr>
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<tr>
<td>15-29</td>
<td>9.5</td>
<td>68.1</td>
<td>22.0</td>
<td>0.4</td>
</tr>
</tbody>
</table>

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<tr>
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<th>Moderately obese (25.0-29.9)</th>
<th>Obese 30 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-29</td>
<td>18.1</td>
<td>74.1</td>
<td>5.4</td>
<td>2.4</td>
</tr>
<tr>
<td>30-44</td>
<td>15.6</td>
<td>68.6</td>
<td>11.0</td>
<td>4.8</td>
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</tr>
</tbody>
</table>
There are over 3,000,000 people with diabetes and over 10,000,000 people with hypertension in Thailand. Of them, 9,000,000 people are unaware that they have these diseases. The number of sufferers has risen fourfold in the last 15 years. The Ministry of Public Health intends to take immediate action (Thai Health Society Meeting on September 15, 2006).

The rate of diabetic patients accounts for 8% of the adult population, or more than 4,000,000 people (International Diabetes Federation (IDF), 2015).
International Comparison of Annual Sugar Consumption per Head

29.6 kg per year, 80 g per day (Thai Ministry of Public Health, 2013)

Notes:
1: Calendar-year-based figures after conversion into amount of unrefined sugar
2: Including sugar used for industrial use and others

ISO: International Sugar Organization
The dietetic association of each prefecture should take action.

2015 Diabetes Death Rate Ranking by Prefecture (per 100,000 people)
2025 Issues Regarding Medical Expenses

- The annual medical expenses for the latter-stage elderly are about 920,000 yen, which is three times more than the average.
- In 2025, the entire baby-boomer generation (born from 1947 to 1949), Japan's largest demographic group, will become latter-stage elderly, or 75 years old and over.
- How we should handle the issues from the viewpoint of a sustainable universal healthcare system?
- Medical expenses and nursing costs will rise sharply.

Dialysis costs about 4,800,000 yen for outpatient-based hemodialysis and about 3,600,000 to 6,000,000 yen for continuous ambulatory peritoneal dialysis (CAPD) per patient per year (average annual income of private citizens: 3,600,000 yen).

Improve daily diet and lifestyle to extend healthy life expectancy and reduce medical expenses.
The number patients with end-stage kidney disease (ESKD*1) requiring dialysis and/or transplantation has continued to increase notably worldwide (increased about five times in the 20 years from 1990 to 2010: 2,100,000).

ESKD*1: End-Stage Kidney Disease

Fig.1: Number of patients with ESKD worldwide

What is CKD?

◆ CKD has drawn attention as a precursor of end-stage kidney disease (ESKD).

◆ Definition of CKD

- Findings showing renal diseases such as urine protein*1
  or
  - Three continuous months or more of decreased renal function [glomerular filtration rate (GFR*2): less than 60 ml/min/1.73 m²]

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*1: Abnormalities in urine, renal disorder confirmed by imaging/blood test/pathological test, in particular, urine protein is important
*2: GFR: Glomerular Filtration Rate
### CKD Staging and Number of Patients in Japan

- The number of adult patients with CKD in Japan is 13,300,000 (12.7%).
- The number of patients requiring a protein intake restriction diet is 10,980,000 (10.4%) in the patients from CKD Stages 3 to 5.*

#### Number of patients with CKD (%) (20 years and over) and dietary cure standards in Japan

<table>
<thead>
<tr>
<th>GFR</th>
<th>GFR (mL/min/1.73m²)</th>
<th>Urine protein – to ±</th>
<th>Urine protein 1+ or higher</th>
<th>Estimated number of patients</th>
<th>Dietary cure standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>≥90</td>
<td>28,030,000</td>
<td>610,000 (0.6%)</td>
<td>610,000 (0.6%)</td>
<td>In the case of hypertension/plethora</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G2</td>
<td>60-89</td>
<td>61,870,000</td>
<td>1,710,000 (1.7%)</td>
<td>1,710,000 (1.7%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G3a</td>
<td>45-59</td>
<td>8,860,000 (8.6%)</td>
<td>580,000 (0.6%)</td>
<td>9,440,000 (9.2%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G3b</td>
<td>30-44</td>
<td>1,060,000 (1.0%)</td>
<td>240,000 (0.2%)</td>
<td>1,300,000 (1.2%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G4</td>
<td>15-29</td>
<td>100,000 (0.1%)</td>
<td>90,000 (0.1%)</td>
<td>190,000 (0.2%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G5</td>
<td>&lt;15</td>
<td>10,000 (0.01%)</td>
<td>40,000 (0.03%)</td>
<td>50,000 (0.04%)</td>
<td></td>
</tr>
</tbody>
</table>

*The number of adult patients with CKD in Japan is 13,300,000 (12.7%).

(The 2011 MHLW study group concerning early detection, prophylaxis, treatment standardization, and development prevention of CKD)
Number of Patients with CKD in Thailand

◆ The rate of patients with Stages 3 to 5 CKD is 8.45% of the adult population aged 15 and over (approx. 4,800,000). (Total population: 68,800,000; population aged 15 and over: 82.4%; source: CIA - The World Factbook)
Dialysis is introduced most frequently in diabetic nephropathy (43.7%) as a primary disease, followed by chronic glomerulonephritis and then nephrosclerosis.
As a cause of dialysis, diabetes affects an increasing number of people around the world. The diabetic population worldwide was 410,000,000 in 2015. It is expected to increase to 640,000,000 by 2040 (Asia-Pacific region: 210,000,000).

Actual State and Medical Expenses for Diabetic Patients Around the World

- The age of onset ranges from 40 to 59. The number of patients is increasing in both developed and developing countries.

- The rates of sufferers who die from untreated hyperglycemia from among those who die from diabetes mellitus are 32.2% in males and 14.3% in females in developed countries. On the other hand, the corresponding rates are higher in developing countries where people have low incomes: 56.3% in males and 47.5% in females.

- One in two (46.5%) diabetic patients do not undergo medical checks, so they are not diagnosed with diabetes. Most cases with Type 2 diabetes mellitus are detected five to ten years after the onset. Many of them already have complications at the time of diagnosis.

- According to the survey undertaken in 2015, diabetes accounts for 12% (71 trillion yen or 673 billion dollars) of medical expenses in adults. The rate is trending upward. If there are any complications, medical expenses increase drastically. Accordingly, the prevention of diabetes and the prevention and improvement of complications will lead to the reduction of medical expenses.

World Health Day 2016: (World Health Organization, April 6, 2016)
Global Report On Diabetes (World Health Organization)
Cost of diabetes hits 825 billion dollars a year, according to new study (Imperial College London, April 6, 2016)
Worldwide trends in diabetes since 1980: (Lancet, April 9, 2016)
**Efforts in Japan**

**Background:** Renal diseases have become increasingly prevalent, causing a significant impact on public health.

Measures by MHLW (the report by the meeting to consider future countermeasures to kidney diseases published in 2008)

**Countermeasures:** Implement CKD awareness activity to the public and strengthen measures to prevent the development and progress of kidney diseases.

<table>
<thead>
<tr>
<th>Education and promotion</th>
<th>Cooperation system in healthcare</th>
<th>Upgrading of level of medical care</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Disseminate the importance of countermeasures to CKD and preventive methods.</td>
<td>- Promote cooperation between home doctors and specialized medical institutes.</td>
<td>- Prepare a CKD medical care guideline. Distribute it to home doctors.</td>
</tr>
<tr>
<td>- Use all opportunities such as the media, Internet, and health guidance.</td>
<td>- Promote health and nutrition guidance.</td>
<td>- Improve guidance and management skills.</td>
</tr>
<tr>
<td></td>
<td>- Promote the establishment of a medical cooperation system in the community.</td>
<td>- Link with treatment of diabetes, CV diseases and others.</td>
</tr>
</tbody>
</table>

**Personnel development**
- Train kidney specialists.
- Improve the credentials of specialists and home doctors.
- Train health guidance providers such as public health nurses, nurses and nutritionists.

**Promotion of research**
- Research to establish evidence of medical care and on practice
- Research to clarify pathology and develop therapies
Awareness Activity in Nationals
March 10, 2011

Host:
Ministry of Health, Labour and Welfare

Sponsors: 10 organizations
The Japan Dietetic Association
Japanese Society of Nephrology
Japan Association of Chronic Kidney Diseases Initiative
The Kidney Foundation
Japan Association of Kidney Disease Patients
The Japan Society for Transplantation
Japanese Society for Clinical Renal Transplantation
Japan Medical Association
International Kidney Evaluation Association
Japan Kidney Support Association

*Twelve organizations in 2016, newly including:
The Japanese Society for Pediatric Nephrology
Japan Pharmaceutical Association
Introduction of the criteria for referral and the system in 2009

1) Advanced albuminuria: UP/CR: 0.50 g/g Cr or more: or 2+ or more

2) Both urine protein and hematuria are present: 1+ or more

3) eGFR: less than 50 mL/min/1.73 m²
   (For patients younger than 40: eGFR of < 60; for those aged 70 and over whose renal function is stable: eGFR of < 40)

Source: CKD Medical Care Guide 2012
Community Medical Facilities Cooperation and Strategic Research for Prevention of a Severe Condition of CKD (FROM-J)

Group comparison of renal function as a result of non-pharmaceutical intervention in FROM-J, the strategic study

Group A: standard intervention group; Group B: proactive intervention group

Changes in frequency of use of drugs in groups during the study period

<table>
<thead>
<tr>
<th>Study period</th>
<th>anti-hypertensives (%)</th>
<th>oral anti-DM (%)</th>
<th>anti-hyperuricemia (%)</th>
<th>Statin (%)</th>
<th>ESA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>87.07</td>
<td>88.29</td>
<td>46.49</td>
<td>45.74</td>
<td>21.19</td>
</tr>
<tr>
<td>0.5</td>
<td>89.62</td>
<td>90.59</td>
<td>46.35</td>
<td>45.79</td>
<td>22.96</td>
</tr>
<tr>
<td>1.0</td>
<td>91.22</td>
<td>90.73</td>
<td>46.16</td>
<td>45.69</td>
<td>24.86</td>
</tr>
<tr>
<td>1.5</td>
<td>91.81</td>
<td>91.54</td>
<td>46.14</td>
<td>45.82</td>
<td>25.80</td>
</tr>
<tr>
<td>2.0</td>
<td>90.50</td>
<td>91.05</td>
<td>46.72</td>
<td>45.73</td>
<td>27.13</td>
</tr>
<tr>
<td>2.5</td>
<td>88.13</td>
<td>88.31</td>
<td>47.19</td>
<td>46.05</td>
<td>27.43</td>
</tr>
<tr>
<td>3.0</td>
<td>87.96</td>
<td>87.43</td>
<td>47.08</td>
<td>45.12</td>
<td>27.25</td>
</tr>
</tbody>
</table>

DM: diabetes mellitus

No significant differences in use of drugs between groups
In FY2015, the Association began to accredit experienced national registered dietitians with broad knowledge and skills regarding kidney diseases as national registered dietitians specializing in pathology of and nutrition for kidney diseases, jointly with other academic societies.
Rate of presence of albuminuria by CKD stage/age

Over 70% of CKD may be overlooked with a urine protein test alone. In particular, it is important

By CKD stage

By age

Table 2 Distribution of GFR category and proteinuria in subjects with CKD

<table>
<thead>
<tr>
<th>CKD</th>
<th>Proteinuria</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negative or trace</td>
<td>1+ or more</td>
</tr>
<tr>
<td>G1</td>
<td>4,164 (100)</td>
<td>4,164</td>
</tr>
<tr>
<td>G2</td>
<td>15,489 (100)</td>
<td>15,489</td>
</tr>
<tr>
<td>G3a</td>
<td>63,279 (91.8)</td>
<td>68,906</td>
</tr>
<tr>
<td>G3b</td>
<td>5,627 (8.17)</td>
<td>7,320</td>
</tr>
<tr>
<td>G4</td>
<td>404 (40.6)</td>
<td>996</td>
</tr>
<tr>
<td>G5</td>
<td>186 (44.2)</td>
<td>421</td>
</tr>
<tr>
<td>G3a–G5</td>
<td>69,506 (89.5)</td>
<td>77,643</td>
</tr>
<tr>
<td>Total</td>
<td>69,506 (71.4)</td>
<td>27,790 (28.6)</td>
</tr>
</tbody>
</table>

CKD chronic kidney disease

Changes in Number of Patients Undergoing Chronic Dialysis Until 2013

Increased by about 10,000 per year until around 2005

In 2013, the increase was less than that in the previous year
Countermeasures against CKD aim at suppressing the development and progress of end-stage renal failure and CVD. Dietary cure plays a very important role in the treatment of CKD from the early stages.

**Countermeasures against CKD**

- Dietary guidance
  - Better lifestyle
  - Countermeasures against uremic toxins
  - Countermeasures against potassium shift and acidosis
  - Countermeasures for bones and minerals
  - Anemia management
  - Blood pressure control
  - Control of blood sugar
  - Lipid control

Extracted from the diet and lifestyle guidance manual for CKD (2015, Japanese Society of Nephrology)
Prevention of Development of CKD

1) Appropriately start and continue treatment of lifestyle-related diseases such as diabetes, hypertension, hyperlipidemia, and hyperuricemia.

2) Maintain an ideal body weight.

3) Alter lifestyle habits that can cause CKD (avoid excessive salt intake, heavy drinking, smoking, and habitual use of analgesics).

The Health Service Bureau of the Ministry of Health, Labour and Welfare advised that each medical insurer should review the characteristics of each group, consider the health issues found as a result of the reviews, and add test items such as serum creatinine as an additional examination item when a plan is made for the second-term special health check-ups that were commenced in FY2013.
BMI and new onset of albuminuria

Odds of presence of albuminuria (≥1+) by level of BMI (multivariate logistic regression)

Lean people (with a low BMI) have a risk of albuminuria, as do obese people.

Adjusted for age, waist circumference, eGFR, SBP, FPG, TG, LDL cholesterol, use of antihypertensive, antidiabetic, or antihyperlipidemic medication, and lifestyle factors (drinking, smoking).


The two-year longitudinal observation also found a U-shaped curve in the relationship between BMI and the presence of albuminuria.
Salt intake is basically 3 g or more but less than 6 g/day.

Protein intake is to be reduced down to the effective amount for suppressing renal function deterioration (0.6-0.8 g/kg/day).

The suggested energy amount ranges from 25 to 35 kcal/kg/day. Sufficient energy should be taken from carbohydrates and lipids.

The amino acid score for food as a whole should be close to 100.

1) Replace staple foods (i.e. rice, bread and noodles) with starch products or protein-controlled foods (the amino acid score of refined rice is 65).

2) Sources of protein should be at least 60% animal-source foods.

Source: CKD Medical Care Guide 2013 (edited by the Japanese Society of Nephrology)
If you depend on an ordinary staple food:

The amount of dishes will decrease.

- If the amount of dishes is small:
  - Your appetite will decline, and
  - You will lack energy.
  - You will supplement energy with sugar or oil (sweet/greasy).
  - You will not continue the dietary cure.
  - Your renal function will deteriorate.
Points in Meal Planning for Patients with CKD

1. Reduce the amount of protein in a staple food.
   → Select low protein rice according to dietary restrictions.

2. Use meat/fish/eggs for main dishes so that good-quality protein can be ingested.
   Good-quality protein: make the amino acid score 100.

3. Use less salt for seasoning. Use broth and spices effectively.

4. Ensure sufficient energy.
   → Use flour-formulated candy or oil and fat (medium chain fatty acid).
   Or use commercially available low protein energy replenishing food.

It is difficult to continue a dietary cure unless special food for treatment is used!
Use of Special Food for Treatment

- **MCT powder**
- **Low protein**
- **Reduced salt/potassium/phosphorus**
  - Soy sauce

**Special food for treatment**
- **Energy replenishing food**
  - Flour-formulated candy: Carolina - dissolve starch, sugar with less sweetness
  - Starch: Rice, rice cakes, flour and noodles
  - Medium chain fatty acid food: Oil-form, powder, jelly, and confection

- **Low protein food**
  - Food intended to reduce protein in staple food: Rice, noodles and bread

- **Food for salt control**
  - Reduced salt seasonings: e.g. soy sauce, miso sauce, dip and ketchup

- **Food for reducing phosphorus**
  - Used for hyperphosphatemia: e.g. low phosphorus milk

If you use special food for treatment as your staple food, you can reduce the units in Table 1 and in turn, increase the amount of high-quality protein in Table 4. The foods facilitate supplementation in the case of energy deficiency.
Use of Low Protein Staple Food 1)

If you use a staple food with less protein:
You can increase the amount of dishes.

If the amount of dishes is increased:
Your appetite will increase,
You can replenish your diet with energy, and
With good-quality protein.

Your dietary cure will continue.
Your renal function will be maintained.
Use of Low Protein Staple Food 2)

Low Protein (1/10) Khao Hom Rice

Low Protein (1/10) Khao Hom Cooked Rice

Nutritional comparison of Normal and Low Protein Khao Hom Rice

Nutritional comparison of Normal Cooked Rice and Low Protein Khao Hom Retort Rice
If patients with Stages 3-5 CKD eat normal cooked rice three times a day, the amount of protein will be about 15 g or the recommended daily protein intake, and the amount of rice will be too much for the amount of the dishes.

If the rice is replaced with low protein rice (1/10), the amount of protein will be as little as only 4% of the recommended daily protein amount. (In the case of a body weight of 60 kg, a calorie intake of 2000 kcal and a protein intake of 40 g.)

<table>
<thead>
<tr>
<th></th>
<th>Renal disease diet based on normal rice</th>
<th>Renal disease diet based on low protein rice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount (g)</td>
<td>Energy</td>
</tr>
<tr>
<td>Rice</td>
<td>600</td>
<td>1002</td>
</tr>
<tr>
<td>Potato</td>
<td>50</td>
<td>3.8</td>
</tr>
<tr>
<td>Fruit</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Seasoning</td>
<td>As appropriate</td>
<td>20</td>
</tr>
<tr>
<td>Vegetable</td>
<td>200</td>
<td>53</td>
</tr>
<tr>
<td>Oil and fat</td>
<td>60</td>
<td>540</td>
</tr>
<tr>
<td>Sugar</td>
<td>30</td>
<td>120</td>
</tr>
<tr>
<td>Egg</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fish</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Meat</td>
<td>70</td>
<td>184</td>
</tr>
<tr>
<td>Fine-textured tofu</td>
<td>50</td>
<td>29</td>
</tr>
<tr>
<td>Milk</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>2001</td>
<td>39</td>
</tr>
</tbody>
</table>
In the case of protein of 40 g and a calorie intake of 2000 kcal:

- If the protein intake in a staple food is reduced to 1/10:

  - You can increase the amount of protein in dishes by 13.5 g!
    (The protein intake can be increased, i.e. 40 g fish/one egg/vegetables.)

Source: Jinzobyo no Hito no Kondate Calendar (meal plan for patients with kidney diseases (the publication department of Kagawa Nutrition University))
Effects of Suppressing Renal Function Deterioration by Dietary Cure (external information)

Two cases experiencing reductions in the speed of the exacerbation of renal function (GFR) after the start of dietary cure

Data on dietary cure

Case 1:
- Daily protein intake: 39 g (0.54 g/kg)
- Salt: 5.5 g

He was on a dietary cure with a daily protein intake of 39 g and a daily salt intake of 5.5 g. The renal function exacerbation speed had been 29 mL/min a year before the dietary cure. After the start of the dietary cure, the speed improved to 2.9 mL/min.

Fig. 1) Results of dietary cure (Case 1)  CKD classification: G4

Fig. 2) Results of dietary cure (Case 2)  CKD classification: G3b

68-year-old male weighing 72 kg with diabetes mellitus

75-year-old male weighing 75.9 kg with nephrosclerosis

The renal function exacerbation speed improved from 21 mL/min a year to 0.3 mL/min after the start of the dietary cure. Good results were obtained even with a daily protein intake of 55 g and a daily salt intake of 8.0 g because his renal function had had reserve capacity at the time of the start of the dietary cure.

Data on dietary cure

Case 2:
- Daily protein intake: 55 g (0.72 g/kg)
- Salt: 8.0 g

Fig. 1) Results of dietary cure (Case 1)  CKD classification: G4

Fig. 2) Results of dietary cure (Case 2)  CKD classification: G3b

Extracted from Tanpakushitsu 40g no Kondateshu (menu containing 40 g protein) the publication department of Kagawa Nutrition University
Over 48% of patients with Stages 4-5 CKD and over 75% of patients with ESRD suffer from Protein Energy Wasting (PEW)/malnutrition. United States Renal Data System (USRDS), 2009
Structure of MCT as Energy Replenishing Food

Medium Chain Triglyceride

LCT
General oil and fat

MCT

- The length of fatty acids of MCT is about half of LCT (= low molecular weight).

Different characteristics from ordinary oil and fat

LCT
Long chain fatty acid
12 or more carbon molecules

MCT
Medium chain fatty acid
8 to 10 carbon molecules

C: carbon
HO: hydroxyl group
O: oxygen
The decomposition of medium chain fatty acids was maximized in three hours. Most of them were decomposed within ten hours.

The amount of fatty acids decomposed was measured after medium or long chain fatty acids were administered to human subjects.

Source: Furman, R. H., Medium Chain Triglycerides, University Pa Press (1968)
General Food Including MCT

◆ Fat content of breast milk: About 3%

◆ Fat content of milk and other dairy food: 3%-5%

◆ Coconut oil and palm kernel oil: 7%-14%

No concerns
Outline of MCT Consumption Study in Elderly Patients with Malnutrition

**Purpose**
Comparison of the nutrition-improving effect between long chain triglyceride (LCT) and medium chain triglyceride (MCT) in the elderly

**Subjects**
Elderly people residing in long-term care hospitals (mean Alb: 3.4g/dL, BMI: 17.5kg/m²)

**Methods**
Nutrition replenishment with emulsified beverage (with supplementary food)
The intake of LCT/MCT is 6 g/day.
Usual diet + approx. 180 kcal energy + approx. 6 g protein

**Completion of enrollment**
From 4 weeks in advance

**Study period**
12 weeks

**Evaluation**
Body weight, serum albumin, prealbumin, total cholesterol and others

Daily nutritional intake:
Energy: 1300 kcal
Protein: 56 g
Lipid: 28 g
Carbohydrate: 195 g

Results of MCT Consumption Study in Elderly Patients with Malnutrition - 1

The MCT group showed a significant elevation compared with before use. There was a significant difference from the LCT group.

Data: mean + SD, LCT: n=11 (M=2, F=9), MCT: n=11 (M=3, F=8)

* A significant difference between the two groups.  A significant difference from before the start of use (p<0.05).
The MCT group showed a significant difference compared with before use. The LCT group didn’t show any significant difference. The MCT group showed a significant elevation compared with before use, showing a significant difference from the LCT group.

Data: mean ± SD, LCT: n=11 (M=2, F=9), MCT: n=11 (M=3, F=8)

* A significant difference between the two groups. † A significant difference from before the start of use (p<0.05).
Mechanism Involved in Improvement of Albumin by MCT

Sufficient energy by rapid digestion, absorption, and metabolism

Reduce the state of starving

Suppress catabolism of protein

Promote synthesis of protein

Improve the nutritional state (albumin)
MCT powder becomes cloudy when it is dissolved. It is therefore recommended for making potage soup and white stew that contain milk. Mix MCT powder with egg dishes or minced meat. Dishes will be richly flavored, although they will look the same as usual. MCT powder replenishes dishes with energy, while general cooking oil usually ends up making food too greasy.

Mix with milk.  
Suggested quantity  
One teaspoonful Nisshin MCT oil or one tablespoonful Nisshin MCT powder for 100 cc milk

Mix with egg.  
Suggested quantity  
One teaspoonful Nisshin MCT oil or one tablespoonful Nisshin MCT powder for one egg

Cook together with rice.  
Suggested quantity  
Two teaspoonful of Nisshin MCT oil or two tablespoonful Nisshin MCT powder for 1 go (approx. 180 cc)

Add to porridge.  
Suggested quantity  
One teaspoonful Nisshin MCT oil or one tablespoonful Nisshin MCT powder for 250 g porridge

Nisshin MCT powder

<table>
<thead>
<tr>
<th>Tablespoonful (15 mL)</th>
<th>Individual package (13 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 tablespoonful (4.5 g)</td>
<td>1.5 tablespoonful (6.8 g)</td>
</tr>
<tr>
<td>Increase by 35 kcal</td>
<td>Increase by 50 kcal</td>
</tr>
<tr>
<td>1 sachet (13 g)</td>
<td>Increase by 100 kcal</td>
</tr>
</tbody>
</table>
Uses of MCT Oil

● MCT oil is light-flavored oil with less taste and odor. You can easily boost your energy intake by sprinkling it over food or beverages without causing greasiness.

● MTC oil goes well with cooked rice, porridge, egg dishes, seasonings (e.g. mayonnaise and dressing), soup, miso soup and yoghurt.

Mix with mayonnaise.
Suggested quantity
One teaspoonful Nisshin MCT oil for one tablespoonful mayonnaise

Mix with dressing.
Suggested quantity
One teaspoonful Nisshin MCT oil for one tablespoonful dressing

Add to tom yam kung.
Suggested quantity
One teaspoonful Nisshin MCT oil for one bowl of tom yam kung (160 cc)

Dress noodles with MCT oil after turning off the heat!
MCT Products

- MCT Oil
- MCT Powder
- MCT Rice Porridge
- MCT Side Dish
- MCT TOFU
- MCT Pudding
- MCT Jelly
Elderly Woman with Lacunar Dementia Living on Her Own:

- May: 38 kg (BMI: 18.1)
- June: 32 kg (BMI: 15.2, pain from stress fracture)
- December: 36 kg (BMI: 17.1, cognitive function improved to the level as of May)
- 92Y January: 38 kg (BMI: 18.1)

Height: 145 cm; body weight: 43 kg at the age of 80, 38 kg at the age of 90 in May (BMI: 18.1, healthy body weight)

MCT intake target: 15 g
The number of patients with diabetes/hypertension is increasing in Thailand. An increase in CKD patients is expected.

It is important to commence a dietary cure in the early stages as a countermeasure against CKD.

Over 48% of patients with CKD of Stages 4-5 and over 75% of patients with ESDR suffer from PEW/malnutrition.

In a dietary cure, protein intake should be restricted and sufficient energy should be ensured at the same time. Otherwise, it will result in malnutrition and/or renal function deterioration.

1) Use low protein crops. Add good quality protein to dishes instead.

2) MCT is easier to turn into energy than LCT, preventing malnutrition. MCT improves malnutrition in the elderly.
Thank you very much for your attention