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Editorial

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Perspective of an Appropriate Amount of Energy Intake and Actual Meal for the Diabetic and/or Obesity

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Abstract

Adequate nutritional therapy and research have been crucial for diabetes and obesity. Recent topics include Calorie restriction (CR) and Low Carbohydrate Diet (LCD). It is rather difficult to calculate energy intake in person, and also to calculate the energy of the meal. There are some methods for investigating these factors, such as the total energy expenditure (TEE), physical-activity-related energy expenditure (PAEE), metabolic equivalent (MET) values, and the doubly-labeled water (DLW) method. Multi factors would be involved in the study. Further investigation would be expected for the determination of an appropriate amount of energy intake and meal energy in the future.

Keywords

Energy Intake, Total Energy Expenditure (TEE), Type 2 Diabetes Mellitus (T2DM), Calorie Restriction (CR), Low Carbohydrate Diet (LCD)

Diabetes has been a major medical problem in the world [1]. There are various different diabetic and obesity situations in the world. It is important to investigate the research in fundamental therapy including the aspects of medicine, energy intake (meal), and exercise. In nutritional energy intake or meal study, it is ideal to study the detailed difference in the medical diet (nutrition), population habit, and region in the world. In general, the continuing adequate and proper meal was used for an easier way of the fundamental therapy in diabetes and/or obesity than nutritional energy intake.

Regarding nutritional therapy for diabetes/obesity, the proper energy intake amount seems to be one of the fundamental principles. The standard formula has been used as follows: Energy intake per day = standard weight (kg) × physical activity level (kcal/kg), (light exertion 25 to 30, ordinary exertion 30 to 35, heavy exercise 35 and more). In general, it is 1,600 to 2,000 kcal / day for men and 1,400 to 1,800 kcal / day for women. However, this figure has been actually estimated to be remarkably lower than the meal intake standards of the Ministry of Health, Labor, and Welfare.

Recent topics about nutrition include the comparison between Calorie restriction (CR) and Low Carbohydrate Diet (LCD). There was a systematic review on CR and LCD meals for Japanese type 2

diabetic patients [2,3]. Furthermore, several reports were found concerning the efficacy of LCD [4]. Authors et al. reported the continuation of LCD for 2773 cases with clinical efficacy [5]. As to the basic aspect of CR and LCD, energy balance would be considered. There is a question in the light of theoretical evidence. Do diabetic patients have less requirement and/or consumption calorie a day than healthy subjects? There have not found such reports so far [2]. Recently, a report showed that the energy consumption of diabetic patients turned out to be exactly equivalent to healthy subjects by a detailed method called the double-labeled water method [2].

It is rather difficult to calculate and evaluate energy intake in the life study of normal subjects [6]. It is not a study of meals for laboratory animals, or not like space food. Furthermore, it is also difficult to calculate the energy of the meal of the people. The evaluation by the meal recording method can be checked by only about 80 ± 20% [7]. In order to assess the total energy expenditure (TEE) and physical-activity-related energy expenditure (PAEE), a respiratory chamber has been used more than 24 h period. A study on accelerometry showed metabolic equivalent (MET) values [8]. This method, however, has been not easy to study the detailed data because this apparatus needs large-scale facilities.

By using the doubly-labeled water (DLW) method, the relationship between obesity and daily physical activities has been investigated [9]. It showed the necessity of a discussion with not only BMI, but also the fat mass index (FMI, FM/height2), and body fat percentage (%BF) [10].

As a result, TEE was not significantly different between patients with Type 2 diabetes mellitus (T2DM) and healthy controls. Similar results were shown in the energy and macronutrient intakes. Consequently, when age and body mass index (BMI) are matched, both groups showed no significant difference in TEE and self-reported energy intake [2]. These findings suggest that the significance of providing CR meal on Japanese T2DM patients may be theoretically in doubt [2].

From actual medical practice, clinical effects between CR and LCD were compared as the randomized trials of dietary interventions. The results were that LCD showed a significant decrease of HbA1c and TG and a larger degree than those of CR [11].

In 2011, "clinical practice guidelines we can trust" was presented by the Committee on Standards for Developing Trustworthy Clinical Practice Guidelines; Institute of Medicine of the United States [12]. Among them, the committee stated that the results would be scientifically supported by systematic reviews. Successively, International Standards for Clinical Practice Guidelines were presented with a similar situation [13]. This has also informed broadly the necessity of scientific evidence by systematic review in the world. As a matter of fact, the registered medical guidelines have decreased to approximately half than before, where it was 2619 in 2014, and 1440 in 2018 [14].

On the other hand, in the United States, the guideline for diabetic nutrition therapy was reported by the study of the systematic review in 2012 [15]. This was influential to diabetic practice with evidence-based medicine [16]. Successively, recommendations, and guidelines for diabetic nutrition therapy were reported, which has been the standard treatment and management so far [17]. In the case of the European Diabetes Association, it has been clearly stated that control and management of energy intake are unnecessary for diabetic patients with BMI less than 25 [18]. Diabetes and nutritional therapy guidelines are different according to region and country. One of the reasons may be that the proportion of carbohydrate intake has been different for the actual meal contents in each country.

Here, reference data related to CR and LCD are shown. Authors and colleagues have continued comparative clinical studies of CR, LCD, and M value that is calculated from the fluctuation in blood glucose seven times per day. Diabetic patients were provided CR (carbohydrate 54%) on days 1, 2, and super-LCD (carbohydrate 12%) on days 3, 4. They were categorized into 3 groups (low, middle, high) according to the level of Morbus (M) value. The data of

HbA1c, blood glucose after 2 hours after of breakfast and M value were shown in day 2 vs day 4 as follows: i) Low group: 6.1%, 168 mg/dL vs 118 mg/dL, 26 vs 10, ii) Middle group: 7.9%, 218 mg/dL vs 142 mg/dL, 94 vs 19, iii) High group: 9.3%, 330 mg/dL vs 165 mg/dL, 343 vs 84, respectively. Thus, the LCD dramatically improved glycemic variability in only 2 days [19]. Current medical nutrition therapy recommendations have been found in the guideline of ADA, which would be the standard nutritional perspective [20].

In summary, it is not easy to estimate the nutritional energy intake and also to calculate the energy of the meal. Therefore, multi factors would be involved in the changes of glycemic response and variability in a comparative study of CR and LCD. Lots of studies would be expected for the determination of an appropriate amount of energy intake and actual meal energy for the diabetic and/or obesity in the future across the world.

References

[1] Association AD. 1. Improving Care and Promoting Health in Populations: *Standards of Medical Care in Diabetes-2020*. Diabetes Care. 2020 Jan;43(Suppl 1):S7-13. [**PMID**: 31862744]

[2] Yoshimura E, Ohkawara K, Ishikawa-Takata K, Yamada S, Tokui M, Funae O, Takimoto H, Katsukawa F. Assessment of energy expenditure using doubly labeled water, physical activity by accelerometer and reported dietary intake in Japanese men with type 2 diabetes: A preliminary study. J Diabetes Investig. 2019 Mar;10(2):318-21. [**PMID**: 30168293]

[3] Sato J, Kanazawa A, Makita S, Hatae C, Komiya K, Shimizu T, Ikeda F, Tamura Y, Ogihara T, Mita T, Goto H, Uchida T, Miyatsuka T, Takeno K, Shimada S, Ohmura C, Watanabe T, Kobayashi K, Miura Y, Iwaoka M, Hirashima N, Fujitani Y, Watada H. A randomized controlled trial of 130 g/day low-carbohydrate diet in type 2 diabetes with poor glycemic control. Clin Nutr. 2017 Aug;36(4):992-1000. [**PMID**: 27472929]

[4] Nanri A, Mizoue T, Kurotani K, Goto A, Oba S, Noda M, Sawada N, Tsugane S; Japan Public Health Center-Based Prospective Study Group. Low-carbohydrate diet and type 2 diabetes risk in Japanese men and women: the Japan Public Health Center-Based Prospective Study. PLoS One. 2015 Feb 19;10(2):e0118377. [**PMID**: 25695497]

[5] Nakamura T, Kawashima T, Dobashi M, Narita A, Bando H. Effective Nutritional Guidance for Obesity by Low Carbohydrate Diet (LCD). Asp Biomed Clin Case Rep. 2019 Jan 27;2(S1):16-21.

[6] Hill RJ, Davies PS. The validity of self-reported energy intake as determined using the doubly labelled water technique. Br J Nutr. 2001 Apr;85(4):415-30. [**PMID**: 11348556]

[7] Seale JL. Predicting total energy expenditure from self-reported dietary records and physical characteristics in adult and elderly men and women. Am J Clin Nutr. 2002 Sep;76(3):529-34. [**PMID**: 12197995]

[8] Kumahara H, Schutz Y, Ayabe M, Yoshioka M, Yoshitake Y, Shindo M, Ishii K, Tanaka H. The use of uniaxial accelerometry for the assessment of physical-activity-related energy expenditure: a validation study against whole-body indirect calorimetry. Br J Nutr. 2004 Feb;91(2):235-43. [**PMID**: 14756909]

[9] Park J, Ishikawa-Takata K, Tanaka S, Hikihara Y, Ohkawara K, Watanabe S, Miyachi M, Morita A, Aiba N, Tabata I. The relationship of body composition to daily physical activity in free-living Japanese adult men. Br J Nutr. 2014 Jan 14;111(1):182-88. [**PMID**: 23841965]

[10] Park J, Ishikawa-Takata K, Tanaka S, Hikihara Y, Ohkawara K, Watanabe S, Miyachi M, Morita A, Aiba N, Tabata I. Relation of body composition to daily physical activity in free-living Japanese adult women. Br J Nutr. 2011 Oct;106(7):1117-27. [**PMID**: 21736836]

[11] Yamada Y, Uchida J, Izumi H, Tsukamoto Y, Inoue G, Watanabe Y, Irie J, Yamada S. A non-calorie-restricted low-carbohydrate diet is effective as an alternative therapy for patients with type 2 diabetes. Intern Med. 2014;53(1):13-19. [**PMID**: 24390522]

[12] Institute of Medicine (US) Committee on Standards for Developing Trustworthy Clinical Practice Guidelines; Graham R, Mancher M, Miller Wolman D, Greenfield S, Steinberg E, editors. Clinical Practice Guidelines We Can Trust. Washington (DC): National Academies Press (US); 2011. Available from: https://www.ncbi.nlm.nih.gov/books/NBK209539/

[13] Qaseem A, Forland F, Macbeth F, Ollenschläger G, Phillips S, van der Wees P; Board of Trustees of the Guidelines International Network. Guidelines International Network: toward international standards

for clinical practice guidelines. Ann Intern Med. 2012 Apr 3;156(7):525-31. [**PMID**: 22473437]

[14] Shekelle PG. Clinical Practice Guidelines: What's Next? JAMA. 2018 Aug 28;320(8):757-58. [**PMID**: 30098168]

[15] Wheeler ML, Dunbar SA, Jaacks LM, Karmally W, Mayer-Davis EJ, Wylie-Rosett J, Yancy WS Jr. Macronutrients, food groups, and eating patterns in the management of diabetes: a systematic review of the literature, 2010. Diabetes Care. 2012 Feb;35(2):434-45. [**PMID**: 22275443]

[16] Esposito K, Giugliano D. Comment on: Wheeler et al. macronutrients, food groups, and eating patterns in the management of diabetes: a systematic review of the literature, 2010. Diabetes Care 2012;35:434-445. Diabetes Care. 2012 Jun;35(6):e51; author reply e52. [**PMID**: 22619303]

[17] Evert AB, Boucher JL, Cypress M, Dunbar SA, Franz MJ, Mayer-Davis EJ, Neumiller JJ, Nwankwo R, Verdi CL, Urbanski P, Yancy WS Jr; American Diabetes Association. Nutrition therapy recommendations for the management of adults with diabetes. Diabetes Care. 2013 Nov;36(11):3821-42. [**PMID**: 24107659]

[18] Mann JI, De Leeuw I, Hermansen K, Karamanos B, Karlström B, Katsilambros N, Riccardi G, Rivellese AA, Rizkalla S, Slama G, Toeller M, Uusitupa M, Vessby B; Diabetes and Nutrition Study Group (DNSG) of the European Association. Evidence-based nutritional approaches to the treatment and prevention of diabetes mellitus. Nutr Metab Cardiovasc Dis. 2004 Dec;14(6):373-94. [**PMID**: 15853122]

[19] Bando H, Muneta T, Bando M, Yonei Y. Effect of low carbohydrate diet on type 2 diabetic patients and usefulness of M-value. Diabetes Research: Open Journal. 2017 Feb 13;3(1):9-16.

[20] American Diabetes Association. 5. Facilitating Behavior Change and Well-being to Improve Health Outcomes: *Standards of Medical Care in Diabetes-2020*. Diabetes Care. 2020 Jan;43(Suppl 1):S48-65. [**PMID**: 31862748]

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