Original

Comparison of Nutrient Intake in Vietnamese Children Calculated by Three Different Food Composition Tables

Nguyen Huong Giang[1], Nguyen Mai Phuong[1], Nguyen Van Diep[1], Yamamoto Shigeru[1]

[1]*Nutrition and Food Culture Research Center, Jumonji University, Saitama, Japan*

ABSTRACT *Background and purpose.* Food Composition table is an indispensable tool in dietary study. Vietnamese food composition table is published based on domestic researches and foreign references. However, data are not up to date, which could lead to inaccurate nutrient intake estimates and are not comparable with data from other countries. Therefore, this study was conducted to calculate the nutrient intakes of Vietnamese children using different food composition tables from Vietnam, Japan and Thailand and to clarify the influence of these differences on calculated nutrient intakes. *Methods.* Dietary survey was conducted by 24-hour recall method, at a primary school in suburban of Hanoi city, Vietnam on 3 non-consecutive days (2 school days and 1 weekend day). The subjects were 10 year old children, 21 boys, and 15 girls. Energy and nutrient intakes was calculated using Vietnamese food composition table (FCT), Japanese FCT and Thai FCT. *Results.* Dietary fiber intake was significantly lower when Vietnamese FCT was used for calculation than Japanese and Thai FCT. The difference could be due to the different analysis of dietary fiber in each country. There were no significant differences between FCTs in energy, protein, fat, and carbohydrate intake. *Conclusion*. This study suggests that the low dietary fiber intake of Vietnamese children may be due to the problem of Vietnamese FCT. Further research is needed to develop internationally comparable national FCT.

Keywords: Food composition table, Vietnamese children, nutrient intake, low fiber intake

INTRODUCTION

Food composition tables (FCTs) are an essential resource for nutrition research, public health policy, and clinical practice. FCTs are used to estimate nutrient intakes in dietary surveys, assess dietary adequacy, and develop evidence-based recommendations for healthy diets. They are also used to examine the relationship between diet and health outcomes, such as chronic diseases. Many countries have a national or regional FCT, but on the other hand, there are still many developing and some developed countries without such tables. These countries rely on data from other sources such as the United States Department of Agriculture or FCTs from neighboring countries. The Vietnamese FCT was published based on domestic research and analysis and with reference to a number of international ingredient databases (1). The Vietnamese FCT was first published in 1972 and has been revised three time. The latest version as of 2023 was published in 2017. However, there is very little updated data, and the reference documents are very old such as Southeast Asia FCT 1972 – Food composition for international use, ASEAN FCT 2000. "Inadequate food composition data and their use may then lead to erroneous research results, wrong policy decisions (particularly in nutrition, agriculture and health), misleading food labels, false health claims and inadequate food choices" (2).

FCTs vary from country to country due to technical differences such as food descriptions, nutrient definitions, and analytical methods. A comparable FCT is critical for accurate international comparison of energy and nutrient intakes. Unfortunately, when comparing dietary data across countries, the importance of FCTs is often overlooked and people focus solely on survey methods, which can lead to various errors. For instance, we found that 10-year-old Vietnamese children consumed significantly less dietary fiber compared with Japanese children (about 4 g and 12 g, respectively) without considering the comparability of FCTs (3,4). However, when examining the FCTs, we found that the fiber content of the same food was very different in the two countries. For example, the Vietnamese FCT specifies 0.3 g of dietary fiber in 100 g of flour, whereas the Japanese FCT specifies 2.7 g. This discrepancy highlights the lack of comparability in fiber intake of children in these two countries.

Japan and Thailand are the Asian countries that generate and disseminate their own food composition tables. It is possible that the foods in Vietnam, Japan, and Thailand are quite similar. Therefore, this study was conducted to calculate the nutrient intake of Vietnamese children using different food composition tables from Vietnam, Japan, and Thailand and to

*To whom correspondence should be addressed: giang3900@gmail.com

clarify the influence of these differences on the calculated nutrient intake.

MATERIALS AND METHODS

Dietary survey

Dietary survey was conducted by 24-hour recall method, at a primary school in suburban of Hanoi city, Vietnam on 3 non-consecutive days (2 school days and 1 weekend day). The subjects were 10 year old children, 21 boys, and 15 girls. Researchers interview each child using standard food measures and a food photobook published by the Vietnamese National Institute of Nutrition to estimate portion size. When children did not remember exactly what they ate, we contacted their parents to reconfirm.

The protocol had been approved by the Hanoi Medical University ethics committee. Before we conducted the survey, all the parents and children were introduced to the nature of the project, and signed a consent form.

Food composition tables

Vietnamese Food Composition Table 2017 (1), Japanese Food Composition Table 2020 (5) and Thai Food Composition Table 2015 (6) were used to calculate energy, protein, lipid, carbohydrate and fiber intake.

Statistical analysis

Mean, standard deviation were calculated and the differences of means were tested by ANOVA and Tukey-Kramer post-hoc. The Spearman correlation analyses were performed to estimate the association between the FCTs. p-value smaller than 0.05 was considered to be statistically significant. Statistical analyses were performed using IBM SPSS statistics 26.

RESULTS

Table 1 shows the comparison of energy and nutrient intake of Vietnamese children calculated by 3 different FCTs. Energy, protein, lipid and carbohydrate intakes have no significantly difference. Fiber intakes was significantly lower when calculated by Vietnamese FCT. Moreover, Spearman's correlation coefficient. All nutrients were significantly correlated between each FCT.

Table 1: Comparison of energy and nutrient intake of Vietnamese children (n=36) calculated by Vietnamese FCT, Japanese FCT and Thai FCT

	Vietnamese FCT		Japanese FCT		Thai FCT		p value[1]	p value[2]	Spearman's correlation coefficient[3]		
	Mean	SD	Mean	SD	Mean	SD			V-J	V-T	J-T
Energy (kcal)	1851	400	1838	399	1918	424	>0.05		0.97	0.96	0.98
Protein (g)	76.9	18.8	72.7	20.0	71.1	19.9	>0.05		0.90	0.92	0.98
Lipid (g)	58.6	22.7	53.4	19.0	58.1	22.6	>0.05		0.78	0.71	0.92
Carbohydrate (g)	260.1	52.6	274.3	54.6	272.6	58.3	>0.05		0.98	0.96	0.98
Fiber (g)	4.1	1.8	7.9	4.3	9.6	4.1	<0.0001	<0.0001 VJ,VT,JT	0.72	0.73	0.82

[1]ANOVA; [2]Tukey-Kramer;

V: Vietnamese food composition table, J: Japanese food composition table, T: Thai food composition table ;

[3]all p values of correlation coefficients are <0.001

DISCUSSION

In this study, we used the food composition table from Vietnam, Thailand, and Japan to analyze the dietary intake of Vietnamese children. We found that, when calculated by Vietnamese FCT, fiber intake of children is lower than when calculated by other FCTs suggests that low fiber intake of Vietnamese children may be caused by problem of Vietnamese FCT. Moreover, energy and nutrient intake correlated strongly across all FCTs.

Fiber intake calculate by 3 FCTs was very different. Several factors may contribute to this difference.

First, the reason for this could be the disparities in measurement methods and the inclusion of specific fiber types. Fiber is commonly classified as soluble or insoluble. The fiber content listed in the Vietnamese FCT is actually crude fiber – insoluble fiber. Initially, fiber was considered an indigestible component and referred to as "crude fiber." They were determined by measuring the residues in plant foods that remained after extraction with solvent, dilute acid, and dilute alkali (7). However, this method of measuring crude fiber content has been found to grossly underestimate the actual fiber content of human foods (8). The error in the crude fiber method arises from the sequential extraction process, which dissolves 50 to 90% of the lignin, 85% of the hemicellulose, and 0 to 50% of the cellulose. This error through loss can be as high as 700%, depending on the proportions of lignin, cellulose, and hemicellulose in the fiber (9). On the other hand, fiber in Thailand and Japanese FCT includes both soluble and insoluble fiber and follows Association of Official Analytical Chemists (AOAC) Official Method to analyze. Thailand used enzymatic-gravimetric method to analyze fiber composition. The method provides a measure of total dietary fiber (insoluble dietary fiber; high molecular weight soluble dietary fiber) by enzymatic removal of available starch and solubilization and extraction of a portion of the protein; the remaining residue is dried, weighed, and corrected for crude protein and ash contents (10). In Japan, in addition to the enzymatic-gravimetric method, people also use the Liquid Chromatography method to determine low molecular weight soluble dietary fiber (11). Due to significant variations in analytical methods and type of fiber, comparison of fiber consumption results among the three countries may not be possible. Further research is needed to establish harmonized definitions and measurement methods for dietary fiber to ensure accurate assessment and comparison of fiber intake across countries.

Second, environmental, genetic, and processing differences such as feed, soil, climate, genetic resources, storage conditions, processing, and fortification could be one of the factors. However since protein, lipid and carbohydrate intake had no significant differences between countries and they were analyzed by the same method, suggesting that the food sources are relatively similar. Minatsu Kobayashi et al. also found that protein and carbohydrate intake were similar and fiber intake was different when calculated by Thailand and Japanese FCT. Nevertheless, the reason of differences was not pointed out (12).

When using Vietnamese FCT to calculate, the amount of fiber intake was underestimated. This may lead to inaccuracies in providing dietary guidelines and nutrition interventions. Although children's fiber intake was higher when calculated using Japanese and Thai FCTs, it is still below the Vietnamese recommended intake of 20-22g (13) and compared with Japanese children's intakes of 11.9 in boys and 12.6 in girls (4). This highlights the need for additional strategies to increase fiber intake in children. One viable method is to intervene in school meals. To give you an idea, Diep et al. were able to increase the fiber intake of 10-year-old children in school lunch from 1.1g to 1.9g (calculated by Vietnamese FCT) by increasing the number of materials and changing the cooking method without increasing the cost (14).

Vietnamese FCT still lacks information, and the data are not up-to-date. When comparing nutrient intakes between countries, it is better to use the better value of another country if the FCT completion rate of one country is low. In this study, intake levels of energy and all nutrients were highly correlated between different FCTs suggesting that the Thailand FCT or Japanese FCT can be used to calculate nutrient intakes of Vietnamese. However, Vietnamese FCT should be improved. It should be generated according to international guidelines so that it is comparable and reliable.

The study is limited by a relatively small sample size of 36 participants. In addition, the study did not compare the vitamin and mineral contents of the different food composition tables, which may differ significantly.

CONCLUSION

This study suggests that the low fiber intake of Vietnamese children may be caused by the problem of Vietnamese FCT. Differences in nutrient values in different food composition tables may affect the accuracy of nutrient intake assessments and make comparisons between different studies difficult. To ensure accurate and comparable nutrient intake assessments, additional research is needed to develop uniform techniques for nutrient analysis and to establish standardized food composition databases.

ACKNOWLEDGEMENTS

The authors would like to thank all participants for their valuable contribution to this research. We also wishes to thank Andrew Durkin, Prof. Emeritus of Indiana University, for editing our English.

REFERENCES

1. National Institue of Nutrition, Ministry of Heath. Vietnamese Food Composition Table, Common Nutrients. Hanoi, Vietnam: Medical Publishing House; 2017.
2. U. Ruth Charrondiere. Food composition challenges. [Internet]. 2022. Available from: http://www.fao.org/infoods/infoods/food-composition-challenges/en/
3. Phuong NM, Giang NH, Diep N Van, Thu TT, Yamamoto S. Low Physical Activity May Lead to Obesity Rather than High-Energy Intake in Vietnamese Children. Asian J Diet 4(4):77–82. 2022.
4. Giang NH, Phuong NM, Diep N Van, Sarukura N, Takeichi H, Sano A, et al. Energy and Nutrient Intakes and Recommendations from a Survey of Children in a Coastal City in Central Japan. Asian J Diet 3(3):95–103. 2021.
5. Ministry of Education, Culture, Sports, Science and Technology, Japan. Standard Tables of Food Composition in Japan 2020. Eighth Rev. 2020.
6. Puwastien P, Judprason K, Sridonpai P, Saiwan T. Thai Food composition Tables 2015. Institute of Nutrition, Mahidol University. 2015.
7. Dai FJ, Chau CF. Classification and regulatory perspectives of dietary fiber. J Food Drug Anal 1;25(1):37–42. 2017.
8. Dhingra D, Michael M, Rajput H, Patil RT. Dietary fibre in foods: a review. J Food Sci Technol 49(3):255. 2012
9. Van Soest PJ. Dietary fibers: their definition and nutritional properties. Am J Clin Nutr 31(10 Suppl). 1978.
10. McCleary B V. Measurement of Dietary Fiber: Which AOAC Official Method of AnalysisSM to Use. J AOAC Int 106(4):917–30. 2023.
11. Ministry of Education, Culture, Sports, Science and Technology J. Regarding changes in the analytical method for dietary fiber in the food

composition table. 2018.
12. Kobayashi M. Estimation of Nutrient Intake in Thailand: Influence of Differences in Food Composition Tables on Estimated Intake. J Nutr Med Diet Care 31;3(1). 2017.
13. National Institue of Nutrition, Ministry of health. Vietnam Recommended Dietary Allowances. Hanoi, Vietnam: Medical Publishing House; 2016.
14. Diep NV, Phuong NM, Giang NH, Ngoc TT, Hien NTT, Trang NT, et al. Improvement of the Vietnamese school lunch menu. Asian J Diet 5(1):5–9. 2023.