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Contents

Special Report: School Meal Program

History of Japanese School Lunch: A Perspective from Vietnamese Dietitians
No. 2 in a Series

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We are the first generation of dietitian in Vietnam, currently studying in a graduate program in Japan. When we were in university, through student exchange programs to Japan, we had opportunities to observe school lunches in Japan. Since then, we have been interested in this field, so we decided to study abroad in Japan to learn more about nutrition in schools, specifically school lunch. The most significant feature of the Japanese school lunch program is not only its concern with the management and nutritional aspects of the food served in schools but also its integration of the school meal into children's educational, social, and cultural experience. This integration is facilitated in a number of ways. Meals are served by children themselves in the setting of the classroom, making lunch part of the educational continuum of the day. More importantly, aspects of the meal are incorporated into instruction, for instance by having students investigate the origins, sources, and traditions of the food they are eating. Children are introduced directly or indirectly to the producers and preparers of their food, making them aware of the agricultural, economic, and social connections of their lunch. The links of their food with cultural traditions are also presented, with attention to distinctive Japanese foods and methods of preparation, regional and seasonal specialties, as well as the role food plays in festivals, traditional holidays, and so on.

Central to the Japanese school lunch is the role of the licensed school dietitian/nutrition teacher, a specialized profession that has developed in Japan. The nutritionist/nutrition teacher is concerned not only with the planning, procurement, and preparation of nutritionally adequate food for the children in a school but also with raising children's awareness of the nutritional aspects of their meal and of its social and cultural interconnections.

The purpose of this article is to introduce the history of Japanese school lunch and inspire the next generations of Vietnamese dietitians, thereby contributing to the development of school meals in Vietnam, thereby strengthening the health of Vietnamese children.

1. HISTORY

The modern Japanese school lunch program traces its origins to support in 1945 from the USA, UNICEF and other organizations in 1945 to save children from hunger after the Second World War. In 1951, a school meal law was established under the Ministry of Education. It was understood not only to encompass drop meals but also to be an extension of education. The program has developed gradually from one focusing on energy requirements, to energy and other nutrients, then to food culture and has at present led to nutrition education. Nutrition education is provided by professionals (licensed school dietitian/nutrition teachers as well as by the teachers of other subjects. They try to teach dietary habits, gratitude for food and its producers and the people involved in providing food. School lunch also serves as a topic for instruction in science, social studies, geography etc.

Photo 1: First generation nutrition students of HMU in front of a primary school

1) Initiation of school lunch in Japan

Providing lunch at schools began in Japan in 1889. Lunches were provided by a Buddhist confederation for poverty-stricken children in an elementary school in a city located in northern Japan. The simple lunches that were offered consisted of "onigiri" (rice balls), grilled fish, and pickled vegetables. A school lunch encouraged poorer children to come to school. Other children brought lunch boxes (bento) with food from home.

After World War I (1918), because of an economic depression more than a million children were suffering from malnutrition. Because of the issue of children's health, the importance of school lunch was recognized and lunch was expanded to a certain extent but the majority of school lunches were limited to impoverished children and had the purpose of encouraging them to attend school. During World War II (1939-45), healthy and strong young people were necessary for the war effort and school lunch was maintained until the final stages of the war in 1944.

2) After World War II

After the defeat in the Second World War (1945), the Japanese were suffering from severe hunger. The nutritional situation of Japanese children was deplorable. It is estimated that sixth grade students at the time had bodies equivalent to those of fourth grade students today due to stunted growth. The General Headquarters (GHQ) of the US occupying forces conducted a nutrition survey in Tokyo to estimate food needs and to arrange possible donations of food and

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suggested starting a school lunch program to the Japanese government in October 1945. GHQ and the Licensed Agencies for Relief in Asia (LARA: a U.S. non-governmental organization) actively provided food supplies for this purpose. Their assistance consisted mainly of canned foods (meat, fish, and vegetables), powdered skim milk, sugar, salt, raisins, wheat flour, soybean flour, soybean oil, and fish meal.

In 1946 this support was limited to the Tokyo metropolitan area, but the following year the effort was expanded to reach children throughout the country. In 1949, skimmed milk began to be supplied by UNICEF and was called UNICEF Milk. A clear effect on height was observed. This milk was very effective in improving the health of children.

At that time there were no school dietitians or cooks; therefore, students' parents came to school to prepare lunch. The government paid for the costs of personnel and facilities. Local governments also tried to cover other expenses for the improvement of meal quality.

3) Establishment of the school lunch law

Japan regained full independence through the San Francisco Peace Treaty in 1951, but this brought about the first crisis in school lunch services because Japan no longer received Government Appropriation for Relief in Occupied Areas (GARIOA) funding, which had financially supported school lunches but ended in 1952. The following year, support from LARA was also stopped. The cost of school lunch rose for families and it became difficult for many schools to provide meals.

The government argued for the termination of school lunch. However, Parent and Teacher Associations nation-wide had initiated a broad movement demanding that the government support meals in schools and opposition political parties jointly proposed legislation for school lunches and the School Meal Law was established in 1954. Under this law, Japanese school lunch has developed impressively. Initially, the law was aimed only at primary schools. However, beginning in 1953 several major natural calamities (typhoons and floods) struck Japan and malnutrition increased among children in the affected areas. Because of such problems the law was expanded in 1956 to cover all schools providing compulsory education as well as part-time high-school level night courses (1956) and special-needs pre-primary and upper secondary schools (1957). School lunch was recognized as a part of of education, teaching about nutrition, how foods are produced, how many people are involved by the time food is eaten, traditional foods and customs. Fresh cow's milk replaced powdered milk. Various breads such as rolls, fried bread and other forms of baked bread began to be used. Soft noodles also became a popular staple food.

4) School dietitian

Before 1964, the position of dietitian did not exist and appropriate job titles were not used. In this situation the main activity was cooking; schools struggled to satisfy dietary recommendations. Staff mainly cooked, and planning and preparation of nutrition education were done during the staff's free time. In 1964, the Ministry of Education started partial support for salaries at kitchens covering several schools in a given area.

In 1974, the Ministry of Education defined the title of school dietitian and the role of the dietitian and decided on the legally required number of dietitians working in kitchens at public schools and in kitchens covering several public schools and their salaries (paid half by the local government and half by the central government). This was gradually expanded to place at least one nutrition teacher or school dietitian in each school kitchen or satellite kitchen, which prepares meals for several schools in the same area.

5) Establishment of the Nutrition Teacher and the Shokuiku Basic Act

Since the 1990s, the social environment, including the family, has changed considerably and nutrition-related health problems have become more prevalent. In this situation, nutrition education has become important at school, too. To meet this need, the school dietitian was required to have mastered highly specialized knowledge and education techniques and a License of Nutrition Teacher was established in 2005. In 2014 there were 12,143 school dietitians and among them 5,021 were diet and nutrition teachers (2014).

Shokuiku is a Japanese word meaning food and nutrition education. The "Shokuiku Basic Act" was adopted in 2005. Under this act, school lunch plays an important role. In 2008, curriculum guidelines were revised and provisions relating to "the promotion of Shokuiku" were included. From the standpoint of Shokuiku, the School Meal Law, school lunch dietary reference intakes were revised and additional school lunch safety regulations were added. The guidelines clearly indicate that school lunch should provide a good model of a daily meal. By eating school lunch frequently, children establish desirable food habits and develop practical skills in choosing appropriate foods.

2. MENUS

Daily school lunch menus, totaling about 200 a year, are drawn up by the diet and nutrition teacher/school dietitians in the kitchen of each school or the area kitchen covering several schools in a given area. Menu charts are also delivered to every student's family a month in advance so that family members know what their children are eating. It is also recommended that the menu chart, along with the food items and their weights, be posted in the home so that everyone in the family can easily refer to it. Knowing the menus is useful so that parents can avoid serving the same items for dinner. The menus are also useful in preventing food allergy problems. Many schools also post the lunch of the day on line on the internet together with comments about it by children. The fact that everyone knows what the menus are means that parents can ask and find out whether children enjoyed lunch or not. It is also an interesting and common topic for family conversation at home.

The cost of the school lunch is also reflected in menu planning. The diet and nutrition teacher/school dietitian creates menus that take into consideration the recommended school lunch allowances and costs. The cost that parents/guardians pay is only the cost of food materials, with no labor costs. According to a nation-wide survey of children by the Ministry of Education, Culture, Sports, Science and Technology in 2013, the average cost of each meal was about 240 yen (about $2) and about 280 yen (about $2.50) for elementary and junior high school students, respectively.

Photo 2. Lunch time
in a class room

Photo 3. Vegetables used in today's lunch displayed
where it is easy for students to see them.

Photo 4. School lunches at a school

Table 1. Menus in Feb at a public school

Date	Menus
1 Feb	Rice flour bread with pumpkin filling, Milk, Udon, Small sardines tempura, Ponkan, Setsubun beans
4 Feb	Rice flour bread, Reduced sugar jam, Milk, Pork and beans, Salad with mayonnaise
5 Feb	Bibimbap, Milk, Wakame soup
6 Feb	Rice, Milk, Braised Meat, Vegetable, Vegetable with sesame sauce, Small piece of cheese
7 Feb	Rice, Milk, Deep-fried tofu, Clear soup, Rice sprinkle
8 Feb	Rice flour bread with apple filling, Milk, Mushroom spaghetti, Seaweed salad with sesame dressing
12 Feb	Rice, Milk, Sauteed pork and burdock root, Thick vegetable omelet , Yukari pickles, Mixed nuts
13 Feb	Rice, Milk, Simmered lemon chicken, Satsuma soup
14 Feb	Curry rice, Milk, Almond jelly, Fukujinzuke
15 Feb	Sandwich, Milk, Shell fish, Shrimp and Mizuna soup
18 Feb	Fried bread sprinkled with roasted soybean powder, Milk, Pumpkin potage, Omelet
19 Feb	Rice , Milk , Mackerel simmered with miso, Braised dry radish, Hijiki seaweed
20 Feb	Rice, Milk, Simmered Chinese-style tofu, Bangbang chicken with dressing, Cream stew
21 Feb	Rice, Milk, Grilled Miso Marinated Fish, Fushimen soup
22 Feb	Rice flour bread with chocolate filling, Milk, Borscht, Japanese style salad
25 Feb	Rice, Milk, Grilled mackerel, Chinese cabbage garnish with ponzu soy sauce, Braised lotus root
26 Feb	Rice, Milk , Two-color fried chikuwa, Miso soup, Bonito flakes
27 Feb	Rice, Milk, Simmered deep-fried tofu, Vinegared cucumber and wakame
28 Feb	Kimchi Donburi, Milk, Lotus root-filled dumplings, Boiled broccoli with Mayonnaise

Above is some information about Japan school lunch that we have learned from our studies. We are now serving internships at Japanese primary school kitchens. The more we learn about the school lunch program, the more interested we become. We recognize the value and significance of the program that the Japanese have developed as a society for their children. The knowledge and habits formed by the school lunch program play an important role for children.

The school meal program in Japan started very early, right after World War II, with simple meals to save children from hunger; not long after that the School Meal Law was adopted and now school lunch has special qualities. In Vietnam, although school lunch was begun some time ago, the present situation may be similar to the initial period in Japan, with simple meals to provide energy and nutrients and a School Meal Law has not yet been adopted. Therefore, we want to learn about the school lunch model in Japan and to consider some aspects of it for possible emulation in our own country.

Review

Development of Competency Framework on Clinical Nutrition in the Philippines

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ABSTRACT A competency framework designed for practicing clinical dietitians and educators was developed to help strengthen human resource capacity in the Philippine healthcare system. The framework consists of competency domain areas categorised as core and technical competencies specific to clinical dietitians. Competencies were identified from interviews of key persons practicing clinical nutrition. Additional data were collected from the existing literature and curricular programs on clinical nutrition. The framework can serve as valuable tool for developing curriculum program in the higher education; assessing ability and performance of clinical dietitians; and designing competency based training programs on clinical nutrition. The framework is recommended to be used by the dietary services/departments, healthcare institutions, and higher education institutions.
Keywords: clinical nutrition, competency, healthcare system, Philippines

INTRODUCTION

The Philippines is one of the many countries burdened by both communicable and non-communicable diseases. There is an increasing trend in the morbidity and mortality of non-communicable diseases which are preventable. The high cost of health care including nutrition care, poor health outcomes and low interaction with the healthcare system are contributing to the increasing prevalence of morbidity and mortality. The need to strengthen healthcare system to protect Filipinos especially the poor, marginalized, and vulnerable from high cost of health care; attain the best possible health outcomes with no disparity; and improve interactions with the healthcare system as respected, valued and empowered remains a priority (1).

Poor diet, unhealthy lifestyle and risky behaviours are known determinants of chronic degenerative diseases. The pronounced effects of chronic diseases in most organ systems on food intake and metabolism which caused nutrition-related health problems are associated to morbidity leading to death (2). Nutrition has a vital role in life and in the prevention, control, and management of diseases. Studies have shown that proper diet and best nutrition practices have improved patient outcomes and reduced health care costs (3-5). Moreover, it has been recognized that nutrition care is valuable before, during, and after hospitalization to help prevent and treat malnutrition, avert hospital-acquired conditions, reduce hospital readmissions, lower infection and complications rates, and shorten hospital stays (6).

Clinical nutrition has emerged as a relevant discipline in medicine (7). It deals with the application of nutrition strategies to prevent and manage nutritional and metabolic changes related to acute and chronic diseases and conditions caused by a lack or excess of energy and nutrients (2,7). It can be guided by other biological sciences such as biochemistry, pharmacology and physiology; and its scientific principles and theories are applied through nutrition care process to address nutrition-related problems and provide safe and effective quality nutrition care (8).

Academic institutions can contribute to the improvement of health and nutrition situation through nutrition education either formal or non-formal strategies. However, for more than five decades since the nutrition and dietetics profession was established in the Philippines, there were only few universities that offer advanced program on clinical nutrition that strengthen the skills and competencies of Registered Nutritionist-Dietitians (RNDs). Though the practice of clinical nutrition is not totally new, there is no nationally recognized competency framework on clinical nutrition despite the rising demand for this specialization. The professional development of RNDs in clinical nutrition requires competency based education to increase their ability in the scope of the patient-health care provider interaction (8). Hence, this study aimed to identify the gaps in the competencies of RNDs on clinical nutrition; determine if there is a demand for higher education on clinical nutrition; and develop a competency framework on clinical nutrition. The framework is expected to serve as a reference for developing standards required for clinical nutritionists to competently undertake their roles in providing nutrition care in the healthcare system. The proposed framework can also serve as tool for developing curricular program in the higher education; assessing ability and performance of employees; and designing training programs as part of continuing professional development program to enhance human resource capacity, producing competent professionals that will contribute in improving the health and well-being of Filipinos.

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METHODOLOGY

Data collection

A mix of data collection methods, namely, survey and desk review, was used to identify the competencies on clinical nutrition and develop the competency framework on clinical nutrition.

Three separate surveys were done on different groups of respondents, namely, new graduates of Bachelor of Science in Nutrition and Dietetics (BSND) from different universities nationwide; practicing RNDs in private and government hospitals; and existing employers of RNDs in various sectors such as private and government hospitals, academe, government agencies and food industries using a cross sectional study design and a purposive sampling technique. A total of 509 participants responded in the three surveys. Majority of the respondents answered the survey face to face and online through google link sent via email. Meanwhile, existing employers of RNDs from various sectors were all interviewed through a scheduled phone interview. These participants were purposely chosen for their relevant inputs in the identification of competencies on clinical nutrition.

A desk review regarding curricular programs on clinical nutrition in selected universities in the Philippines and other countries was made. Sixty (60) universities from various countries offering a total of 66 clinical nutrition and other related masteral degree programs were reviewed. These universities were from the Philippines, Asia, US, Canada, Europe, and Australia. Features of courses offered, including the number of credits/units, and requirement of thesis and/or practicum were also noted. Other relevant policies in developing competency framework on clinical nutrition such as guidelines for implementation of Nutrition Care Process in hospitals (Administrative Order: 2019- 0033) and the ASEAN University Network framework, regionalization and standardization of professional qualifications in the region were also checked.

Data analysis

Descriptive statistics was used to summarize and analyse the survey results. Gaps in competencies as identified by graduates and employers were also identified. The results of the desk review were summarized according to themes. On the other hand, the competency framework was developed from the analysis of data collected. The review of existing competency framework related to clinical nutrition, existing curricula on clinical nutrition from different universities, and conducted surveys were used in constructing a proposed structure for clinical nutrition competency framework. Key features of reviewed competency framework related to clinical nutrition were identified and adapted (9-12). The identified competencies were categorised as competencies common to all members of the healthcare team, and core and technical competencies on clinical nutrition designed for practicing RNDs. Core competencies are the basic knowledge, skills, judgment and attitudes required for a clinical dietitian to function effectively in the healthcare system as work environment. On the other hand, technical competencies are the knowledge, skills, judgement and attitudes needed for a specialized role of clinical dietitian.

RESULTS

Profile of Respondents

The respondents' age ranged from 20 to 29 years old; were mostly female; and with bachelor's degree as highest educational attainment (Table 1). Some respondents who are interested to pursue a graduate program on clinical nutrition are practicing or currently employed RNDs. There were also 22 interviewed employers from government and private hospitals, academe, fitness centres, government agencies, food service and food manufacturing companies.

Table 1. Profile of respondents

Classification	New Graduates	BSND	Practicing RNDs in Various Sectors		Total	
	n =165	%	n =344	%	N = 509	%
Age (years)						
20 – 29	164	99	213	62	377	74
30 – 39	1	1	68	19	69	14
40 – 49	-	-	33	10	33	6
50 and above	-	-	21	6	21	4
*not indicated	-	-	9	3	9	2
Sex						
Male	27	16	54	16	81	16
Female	138	84	290	84	428	84
Educational Attainment						
Bachelor degree	165	100	279	81	444	87
Masteral degree	-	-	56	16	56	11
Doctoral degree	-	-	9	3	9	2

Gaps and Demands for Clinical Nutrition Course

The gaps in clinical nutrition are limited up-to-date evidence-based clinical nutrition knowledge; deficient skills and strategies in providing effective nutrition care for optimum patient outcomes; few clinical nutrition course offerings in the higher education; and limited competency-based trainings needed for continuous professional development among the practicing clinical dietitians and educators.

There is a demand for a specialization on clinical nutrition amid the increasing prevalence of nutrition-related health problems and growing conflict of information on nutrition making nutrition practice

more complex for healthcare providers (7). The increasing number of healthcare facilities in the Philippines to cater the increasing need for health services escalates opportunities for clinical dietitians. The Nutrition and Dietetics Law of 2016 regulates the practice of the profession requiring hospitals to hire a minimum of one RND in every 25 to 75 bed capacity (Republic Act No. 10862). There is a demand for continuing professional education on clinical nutrition. This is in accordance to the government's movement towards promotion of human capacity development mandating an act strengthening the continuing professional development (CPD) program requiring all regulated professions in the Philippines to continually gain advanced knowledge, skills and ethical values in a post-licensure specialization or in an inter-or multidisciplinary field of study, for assimilation into professional practice, self-directed research and/or lifelong learning in the Philippines (Republic Act No. 10912).

The gap between the demand for highly trained clinical nutritionists and supply of clinical nutritionists needs competency-based trainings or/and clinical nutrition course offerings in the higher education program in order to continue to produce competent clinical nutritionist. Results of the survey showed that majority (80%) of the respondents exhibited interest to enroll for a graduate program on clinical nutrition. Most of the respondents preferred a program with practicum to gain upgraded knowledge and skills in clinical nutrition and to further hone personal development. Majority were interested to gain up-dated knowledge on medical nutrition therapy on specific diseases, enhance skills in diet counseling, enhance communication and become equally competent as other members of the healthcare team (Table 2).

Table 2. Expected knowledge, skills and attitude to be gained by the prospective students from a graduate program on clinical nutrition

	New BSND Graduates		Practicing RNDs in Various Sectors		Total	
Knowledge	n = 119	%	n = 193	%	N = 312	%
1. Medical Nutrition Therapy for Renal Diseases	92	77	151	78	243	78
2. Medical Nutrition Therapy for Cardiovascular Diseases	86	72	135	70	221	71
3. Medical Nutrition Therapy for Cancer	86	72	140	73	226	72
4. Medical Nutrition Therapy for Chronic Obstructive	62	52	116	60	178	57
5. Pulmonary Diseases						
6. Medical Nutrition Therapy for Gastro-Intestinal Diseases	66	55	136	70	202	65
7. Nutrient-Drug Interaction	79	66	140	73	219	70
8. Nutrition Support	69	58	142	74	211	68
9. Management of Dietary Services	73	61	118	61	191	61
10. Pharmaconutrition	82	69	123	64	205	66
11. Sport nutrition/Wellness	90	76	133	69	223	71
12. Nutrition Care Process	66	55	119	62	185	59
13. Medico-Legal Matters	60	50	85	44	145	46
14. Nutrigenetics	37	31	90	47	127	41
15. Others	3	3	10	5	13	4
Skills						
1. Diet Counseling	91	76	143	74	234	75
2. Conduct Research	76	64	99	51	175	56
3. Administering Nutrition Support	72	61	141	73	213	68
4. Administrative Clinical Management	79	66	138	72	217	70
5. Dietary Calculations	79	66	123	64	202	65
6. Diet Prescriptions	74	62	124	64	198	63
7. Management of Sports Nutrition	84	71	117	61	201	64
8. Meal Planning	70	59	114	59	184	59
9. Nutrition Assessment in Hospitals	80	67	136	70	216	69
10. Others	0	0	2	1	2	0
Attitudes/values						
1. Leadership	98	82	148	77	246	79
2. Communication	106	89	161	83	267	86
3. Networking/linkaging	92	77	122	63	214	69
4. Ethics	90	76	130	67	220	71
5. Service Oriented	95	80	131	68	226	72
6. Equally Competent as Other 7. Members of the Healthcare Team	100	84	155	80	255	82

*multiple answer

The competencies needed are composed of interdisciplinary competencies to be developed to strengthen the knowledge and skills of RNDs in clinical nutrition (Table 3). There are competencies on human nutrition sciences and medicine that are related and relevant to development of competencies on clinical nutrition for RNDs (8).

Masteral Degree Program on Clinical Nutrition in the Philippines and Other Countries

Majority of the programs included in the review focused on clinical nutrition, nutrition, and nutrition and dietetics. Some focused on nutritional sciences and public health nutrition. Most of the programs required thesis instead of practicum. The range of equivalent units was from 12 to 60 units or 150 to 180 in terms of equivalent credits.

Table 3. Competency domains identified from reviewed course curricula and literature, and interviewed prospective students and employer.

Competency domain	Course curricula	Interviewed employer	Prospective students
Core Healthcare Professional Competencies			
Communication and Coordination	✓	✓	✓
Ethics and Professionalism	✓	✓	✓
Safety and Risk Management	✓		
Core Clinical Nutrition Competencies			
Nutritional Biochemistry	✓		✓
Nutritional Physiology and Metabolism	✓		✓
Nutrient-Drug Interaction	✓	✓	✓
Nutrition Care Process	✓	✓	✓
Nutrition Counseling and Education	✓		✓
Technical Clinical Nutrition Competencies			
Medical Nutrition Therapy for Diabetes	✓	✓	✓
Medical Nutrition Therapy for Cancer	✓	✓	✓
Medical Nutrition Therapy for Renal Diseases	✓	✓	✓
Medical Nutrition Therapy for Cardiovascular Diseases	✓	✓	✓
Medical Nutrition Therapy for Gastro-Intestinal Diseases	✓	✓	✓
Medical Nutrition Therapy for Chronic Obstructive Pulmonary Diseases	✓	✓	✓
Weight Management	✓		✓
Management of Malnutrition	✓	✓	✓
Sports Nutrition	✓	✓	✓
Nutrition Support	✓	✓	✓
Pediatric Nutrition	✓		
Nutrition in Aging	✓		

In the Philippines, only one university offers a masteral degree program on clinical nutrition (13). The rest of the universities are offering masteral degree programs in Nutrition, Applied Nutrition, Nutrition and Dietetics, and Public Health Nutrition (14-17). The MSc in Nutrition and MSc in Applied Nutrition were designed to prepare professionals for more advance work by providing in depth knowledge and research skills in nutrition in general; and to broaden perspective and increase effectiveness in the application of scientific knowledge and enhance competencies in applied research in food and nutrition and related fields, respectively. A masteral program on nutrition and dietetics has been drafted by the Technical Committee on Nutrition and Dietetics Education in the Commission on Higher Education, but public consultation has been put on hold. The said curriculum is a vertical articulation of the BSc Nutrition and Dietetics curriculum and will set the minimum standards for a masteral program.

Filipino RNDs can also pursue education on clinical nutrition in other countries. About 66 masteral degree programs on clinical nutrition and other related fields identified are being offered in various universities abroad. Majority of the programs offering masteral degree on clinical nutrition are in Europe and North America specifically in United Kingdom and US. The review showed that a masteral degree program on Nutrition

and Dietetics focuses on preparing students for a wide range of careers as dietitians in health care, community, and private settings; as food industry specialist in public health relations and media; and as nutrition educators in health care, community or corporate health programs (18,19). A masteral program on Clinical Nutrition is similar to that of Nutrition and Dietetics Program. On the other hand, a Public Health Nutrition Program includes approaches at community level. A masteral degree program in Nutritional Sciences is focused in broadening knowledge on nutrition sciences specifically on understanding nutrients and their relationship to metabolic pathways and physiological function to clinical nutrition practice and nutrition research.

Courses under Masteral Degree Program on Clinical Nutrition

A total of 13 masteral programs on clinical nutrition with complete details on curriculum were reviewed. These masteral programs were from Philippine Women University, New York University, University of Wisconsin-Madison, University of Hohenheim, University of Texas Southwestern Medical Center, Life University, University of Nottingham, University of College London, University of Nicosia, University of Aberdeen, University of Roehampton London, and University of Glasgow (13,18-29). The courses under the said programs were grouped according to similarity and category such as either to be taken as core/compulsory or as elective/optional. Core/compulsory courses are required courses in the curriculum. On the other hand, in the elective/optional courses, students have prerogative to select courses of interest at a specified number of units. Other programs required components were thesis and/or practicum; residency; internship; or culminating experience.

Top most required courses under core/compulsory course category were medical nutrition therapy; research; nutrition and biochemistry; nutrition and metabolism; clinical nutrition in general; and other clinical nutrition-related topics such as nutritional assessment; and communication, counselling and education. Majority of the courses grouped under medical nutrition therapy includes medical nutrition therapy in acute and chronic diseases; disease related malnutrition; and principles of diet therapy and life cycle nutrition. Generally, these courses aim to deepen knowledge in pathophysiological mechanism of nutrition related disease and its therapeutic and preventive interventions (21). On the other hand, top most elective or optional courses were research; communication, counseling and education; sports nutrition and wellness; clinical nutrition and dietetics; weight management; and pediatric nutrition. Students have the prerogative to select courses under this category. Aside from core/compulsory courses, other supporting topics relevant to clinical nutrition are placed under this category as part of courses for selection. Masteral degree program on clinical nutrition from different universities varies, depending on the demand and how university strategize and value certain topics. Hence, there were some courses placed either under core/compulsory or elective/optional category. Some of these courses were research; sports nutrition and wellness; and communication, counseling and education.

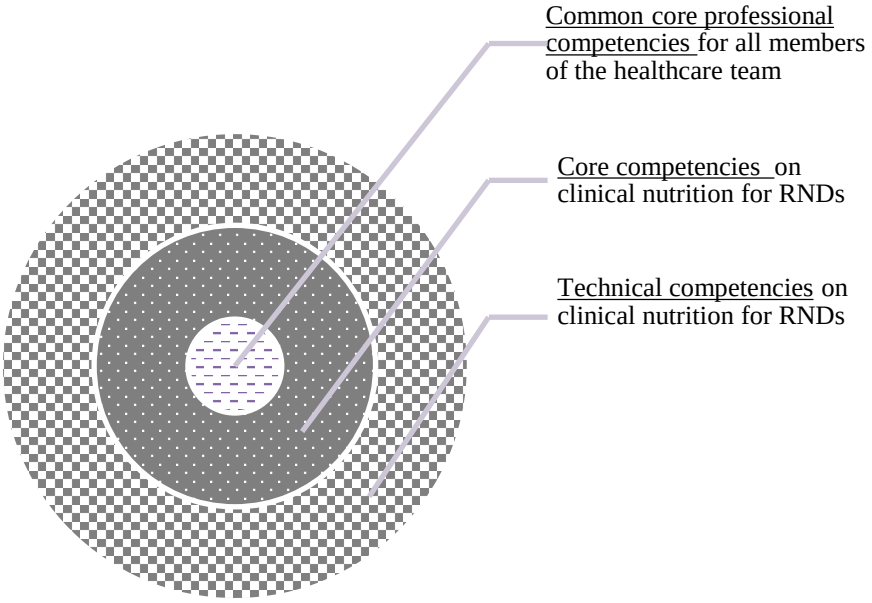
Practicum aims to provide students supervised experience in clinical dietetics through observation, practice and research in food service systems; in-patient and ambulatory nutrition care; and specialty practice settings (18,19). Students apply their academic training, furthering their competency in clinical nutrition to develop an understanding of the role of the clinical dietitian and integrate theoretical learnings in clinical nutrition as part of the healthcare team. On the other hand, thesis aims to impart knowledge on understanding applying the procedures and practices of scientific literature review and writing of a research thesis; and to provide opportunity to students to conduct a research project related to clinical nutrition (26). Majority of the programs required thesis. Thesis course normally has higher equivalent units compare to courses under core/compulsory and elective/optional because of the load of work and time needed for this course.

Competency Framework on Clinical Nutrition

Four competency framework related to clinical nutrition were reviewed and used in the development of the competency framework for Filipino RNDs (9-12). Key features of competency framework were identified as core or technical competencies (Table 4).

Table 4. Competency framework related to clinical nutrition

Framework name	Author	Competency type
Essential Practice Competencies for the Commission on Dietetic Registration's for Credentialed Nutrition and Dietetics Practitioners	Academy on Nutrition and Dietetics. Commission on Dietetic Registration	Core and Functional
An Integrated Career and Competency Framework for Dietitians	Diabetes UK. 2011	Core and Specific
Clinical Leadership Competency Framework	NHS Institute for Innovation and Improvement and Academy of Medical Royal Colleges. 2010	Core/Technical
International Competency Standards for Dietitian-Nutritionists.	International Confederation of Dietetic Associations. 2016.	Core/Technical



Competency Framework on Clinical Nutrition for Filipino RNDs

The framework organised competencies into domain. These competency domains were categorised either as core or technical competencies (9). The core competencies describe the basic knowledge, skills, judgment and attitudes required for a clinical dietitian. These are the basic expectations from a RND in the healthcare team. Meanwhile, technical competencies describe the knowledge, skills, judgement and attitudes needed for a specialized role of clinical dietitian. It often requires thorough research, training, and experience. Different job requirements were identified according to roles of clinical dietitian ranging from entry-level to supervisory positions. Job titles mentioned in the interview were clinical dietitian, therapeutic dietitian, and nutritionist-dietitian I to II for entry-level RNDs; and nutritionist-dietitian III to VI, section head, supervisor or chief dietitian for supervisory/managerial level.

There are common competencies among the members of the healthcare team that are basic but necessary to perform each job accordingly. These are communication and coordination, ethics and professionalism, and safety and risk management (9). Communication and coordination promote collaboration with other healthcare team members to achieve common goals and optimize delivery of services. Meanwhile, ethics and professionalism lead each team members to maintain respect to the code of ethics, professional obligations defined in legislation, standards and organization policies; work within the professional limitations and abilities; and applies client-centered principles in practice. The safety and risk management equip each healthcare team member to identify, analyse and manage risk; adverse event and safety to staff, client and public. Considering these categories of competency, a layered approach to building competencies common to all healthcare professional, and core and technical competencies on clinical nutrition designed for RNDs is shown in Figure 1.

CONCLUSION

The recognized important role of nutrition in the prevention, control and management of acute and chronic diseases; the expressed demand for upgraded knowledge and skills in clinical nutrition among the practicing RNDs in the healthcare facilities; and the lack of nationally recognized competency framework on clinical nutrition were the factors considered in initiating a move towards developing a competency-based approach to human resource development in the field of clinical nutrition. Hence, the Institute of Human Nutrition and Food, as one academic institution in the Philippines initiated a study to propose a competency framework on clinical nutrition specifically designed for RNDs that can serve as guide to academic and healthcare institutions in developing tools and procedure in the standardization of trainings either through formal or informal education. However, it is recognized that the proposed framework will require further review and discussion with the key institutions and beneficiaries to encourage wide adoption and use of the proposed framework.

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Original

Snacking Pattern and Its Association with Body Mass Index and High Body Fat Percentage in Children

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ABSTRACT: *Background and purpose:* Snacking pattern is known to affect the body composition. Limited data is available on effect of snacking pattern on prevalence of obesity in Indian children. The objective of the study was to assess the prevalence of obesity and high body fat and correlate it with snacking pattern. *Methods:* A cross-sectional study was conducted in 155 children aged 10-11 years. Anthropometry was assessed and body composition was measured using TANITA body fat analyser (MC-780 MA). Three day 24-hour diet recall was used to analyse daily nutrient intake. A weighted food frequency questionnaire of snacks was used to assess snacking patterns and nutrient intake from snacks. *Results:* Of the 155 children 27.7% were overweight and 23.2% were obese. Forty-eight percentage children had body fat percentage above 75th percentile. Total snacks contributed around 47.3% of total daily energy, 47-48% of daily dietary fat and carbohydrates intake and about 39% of proteins intake. Individual regression equations showed that energy (R^2=0.037) and dietary fat (R^2 = 0.108) from snacks has a significant positive correlation with BMI ($p<0.05$). Total energy (R^2=0.027) and dietary fat (R^2=0.088) from snacks also had a significant positive correlation with fat percentage. *Conclusion:* Snacks contribute to almost 40-50% of daily nutrient intake in children. Nutrient intake from snacks had significant positive correlation with prevalence of overweight/ obesity. Immediate school based interventions to correct dietary and lifestyle factors need to be planned to prevent obesity.
Keywords: BMI, obesity, snacking pattern, nutrient intake

INTRODUCTION

Globally, the prevalence of childhood obesity in on rise. As per World Health Organization, worldwide prevalence of childhood obesity increased from 4% in 1975 to 18% in 2016. In Asia alone, over 340 million children and adolescents aged 5-19 years were overweight or obese in 2016 (1). Similar percentage of childhood obesity is observed in India. Pooled data of several studies on prevalence of overweight and obesity have shown that 19.3% Indian children suffer from childhood overweight and obesity (2). With 14.4 million obese children, India has the second highest prevalence of obese children in world (3).

Childhood obesity tends to continue in adulthood with 85% of obese children known to become obese adults (4,5). Adolescents have an odds ratio of 17.5 of becoming obese adults (6). Also, childhood obesity is associated with many health problems and is a pre-cursor for many non-communicable diseases (3) About one third of overweight or obese children exhibit features of metabolic syndrome including abdominal obesity, impaired glucose metabolism, hypertension and dyslipidaemia (7,8) As children with obesity are at an increasing risk of progressing to type 2 diabetes and cardio-vascular diseases in later life and hence early identification and preventive measures are very important (9)

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Visceral fat percentage has known to affect insulin resistance (10) and hypertension (11). Body fat deposition is also known to contribute to dyslipidaemia (12). Hence, body composition, more specifically body fat percentage can be used as a surrogate marker to assess risk of metabolic syndrome especially in children. Studies have shown that risk of metabolic syndrome can be established from body fat percentage either using odds ratio curves or by using body fat percentage thresholds (13).

A snack is distinguished from other food items based on time criterion, i.e. food that is consumed in between main meals (14). Internationally snacking has shown to contribute approximately 27% of daily nutrient intake in children (15). A review on snacking and obesity showed that snacking had a significant effect on BMI. Children who consumed large portioned snacks frequently had higher risk of being obese. Snacking was shown to independently affect weight gain in children (16). Recently a study illustrated very unhealthy snacking patterns in Indian children with 10% snacking on sweets, 30% on chocolates, 20% on pizza, 10% on soft drinks, and the remaining 10% on chips (17).

To the best of our knowledge, there is very limited Indian data on snacking and its effect on overweight/ obesity. Hence, the objective of the current study was to assess the prevalence of overweight and obesity in Indian children and to study its correlation with snacking pattern.

METHODOLOGY

A cross-sectional study was conducted in 155 children (79 boys, 76 girls) aged 10 – 11 years old studying in private schools in Mumbai. Three private schools were approached from suburbs of Mumbai City using purposive sampling to conduct the study out of which the permission was received from one school. The school authorities were given complete details of the study and a consent was obtained from the authorities to conduct the study. A written assent was also obtained from students before enrolling them in the study. Children with chronic medical conditions were excluded from the study. The study protocol was approved by ISBEC (Inter System Bio Medica Ethics Committee), Vile Parle (West), Mumbai.

Sample size calculation

Sample size was calculated in comparison to overall prevalence of overweight and obesity (36.6%) found in study in Chennai (18), India in children aged 6 to 11 years using Indian contemporary cut-offs. Hence, sample size was calculated with a known population prevalence of 37%, expected study incidence of 50%, to achieve 90% power of the study at alpha level of 0.05 using the following formula:

$$N = \frac{p_0 q_0 \left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta} \frac{\sqrt{p_1 q_1}}{p_0 q_0}\right)^2}{(p_1 - p_0)^2}$$

$$= \frac{0.37*0.63 \left(1.96+1.28 \frac{\sqrt{0.5*0.5}}{0.37*0.63}\right)^2}{(0.5-0.37)^2} = 149$$

Sample size was calculated to be 149, however the sample taken was 155.

P0 = population incidence = 0.37, P1 = study expected incidence = 0.50, N = Sample size of study, α = probability of type 1 error, β = Probability of type 2 error, *Z* = critical *Z* value of the given α or β, $q_0 = 1 - p_0$, $q_1 = 1 - p_1$

Anthropometry

Height and weight were measured and BMI was calculated. For height, a site of vertical wall and the horizontal floor was selected and the Stadiometer was fixed on the wall and height was measured to the nearest 1 mm. Weight was measured using a digital weighing scale. Average of three measurements for both height and weight were taken. BMI was calculated by dividing weight in kg by height in meter square. Height, weight and BMI for age *z*-scores were calculated in comparison to Indian reference data (19). Based on BMI for age *z*-score, children were classified as underweight (equivalent to adult BMI <18.5 kg/m^2), normal weight (equivalent to adult BMI 18.5 – 23 kg/m^2), overweight (equivalent to adult BMI of 23-26.9 kg/m^2), obese (equivalent to adult BMI of > 27 kg/m^2).

Body composition

Body fat percentage was measured using TANITA body fat analyser machine (Model MC 780 MA) (Tanita Corporation of American Inc, Illinois, USA. Before analysing body fat percentage, it was made sure that the children's foot pads were clean. Care was taken to ensure that children were not wearing any metallic object or carrying any cell phone while the body composition was analysed to avoid any hindrance in output. Minimum 2 hours' difference was maintained between measuring body composition and food intake, exercise and consumption of caffeinated drink (as it affects hydration levels). Body fat percentage of age *z*-score was calculated in comparison to Indian reference data (20). As per Indian reference, children above 75th percentile for fat mass and percentage are at an increased risk for obesity and hence based on body fat percentage children were classified as: normal (<75th percentile) and at risk (>75th percentile) (20).

Daily dietary intake

Dietary intake was assessed by 24-hour recall on 3 random days (non-consecutive) of a week including a holiday. Each child was asked about the intake of food items consumed during the day at breakfast, lunch, dinner, and snacks, using standard cups and spoons by trained investigators through a face-to-face interview. Daily nutrient intakes (energy, carbohydrates, proteins, dietary fats) were calculated using DietCal Software (version 8.0, 2017, Profound Tech Solutions). Percentage contribution of macro-nutrients to total calorie intake was calculated. Percentage recommended dietary allowance (RDA) intake for energy (boys: 2190 kcal/ day, girls: 2010 kcal/ day) and protein (boys: 39.9 g/day, girls 40.4 g/day) intake was calculated in comparison to Indian RDA (21).

A weighted food frequency questionnaire was used to evaluate intake of snacks in children. Children were asked whether they consumed snacks on a 5 point scale: daily, 3 times/ week, 1/ week, once/ fortnight or never. Snacks were classified as healthy (fruit based/ steamed/ roasted) or unhealthy (fried/ bakery/ confectionary & aerated drinks). Portion size was assessed using standard cups and spoons. Daily nutrient intake from snacks (energy, carbohydrates, proteins, fats) were calculated using Diet Cal Software (version 8.0, 2017, Profound Tech Solutions) for healthy and unhealthy snacks separately. Total nutrient intake from snacks was calculated by adding nutrient intake from healthy snack with nutrient intake from unhealthy snacks. Percentage contribution of macro-nutrients to total calorie intake was calculated. Percentage RDA intake for energy and protein intake was calculated in comparison to Indian RDA (21).

Contribution of nutrients from snacks (healthy/ unhealthy/ total) to daily nutrient intake was calculated by dividing the nutrient intake from snacks by daily nutrient intake * 100.

Statistical analysis

Analyses were performed using SPSS software for Windows (version 16.0, 2007, SPSS Inc, Chicago, IL). Data are presented as Mean±SD or Mean (minimum-maximum) or percentage. Independent sample *t* test was used to analyse the gender difference in nutrient intake of children. The frequency distributions were tabulated for food frequency intake of snacks according to gender and were compared using cross tabulations and Chi-square test. Simple linear regression was used to analyse the correlation between BMI and total daily energy intake. Simple linear regression was carried out separately for energy intake from total snacks and fat intake from total snacks on BMI or fat percentage to avoid co-linearity of dietary data. P-value <0.05 was considered to be statistically significant.

RESULTS

The mean age of boys in the current study was 10.3±0.3 years and was similar to that of girls (10.3±0.3 years) (p=0.854).

Anthropometry and body composition

Table 1 gives anthropometry and body composition of children in the study. There was no

significant difference in anthropometric parameters or body fat percentage of boys and girls (p>0.05).

Figure 1a and 1b shows prevalence underweight, overweight and obesity and high body fat percentage. Overall using BMI for age *z* scores in comparison to Indian reference (19), 27.7% were overweight and 23.2% were obese. There was no significant difference in prevalence of underweight, normal BMI, overweight or obesity when classified according to gender ($\chi 2$=1.158, p>0.05). When body fat percentage was compared to Indian reference standards (20), 47.7% children had high body fat percentage (at risk = body fat percentile >75th percentile). There was no significant difference in prevalence of high body fat % (>75th percentile when classified according to gender ($\chi 2$=4.689, p>0.05)

Table 1: Anthropometry and body composition of children

	Boys (n=79)	Girls (n=76)	Total (n=155)	P value
Height (cm)	140.9 ±7.0	141.5 ±6.6	141.2±6.8	0.598
Weight (kg)	37.6 ±9.1	38.1 ±9.7	37.7±9.4	0.607
BMI (kg/m^2)	18.6 ±3.8	18.8 ±4.1	18.7±3.9	0.748
Fat percentage (%)	22.9 ±11.6	24.5 ±12.3	23.6±11.9	0.395
Height for age *z*-score	0.27 ±1.02	0.32 ±0.97	0.29±0.99	0.757
Weight for age *z* -score	0.44 ±1.01	0.53 ±1.16	0.49±1.08	0.595
BMI for age *z* -score	0.42 ±1.12	0.48 ±1.22	0.45±1.17	0.743
Fat percentage for age *z* -score	0.48 ±0.91	0.32 ±1.32	0.40±1.16	0.392

Data presented as Mean±SD

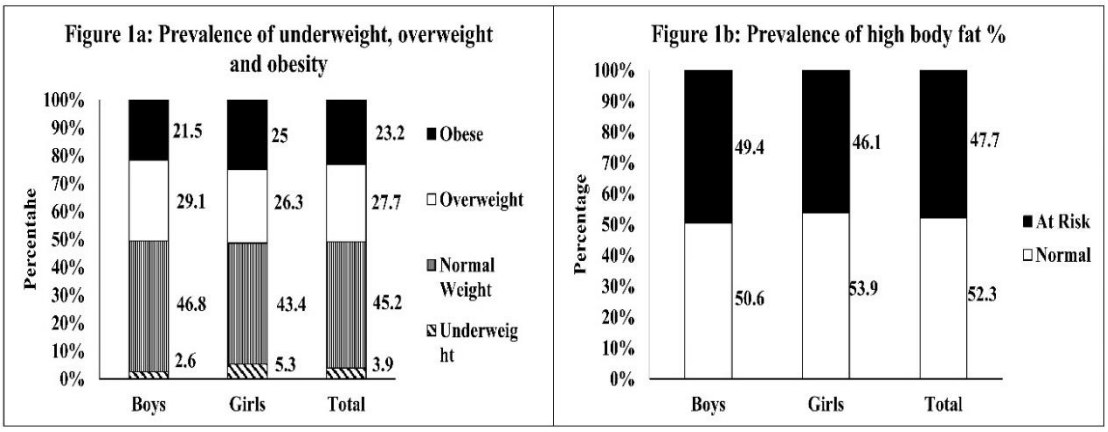

Fig: Prevalence of underweight, overweight and obesity using BMI categories (1a), high body fat percentage (1b)

Fig 1a: Underweight: equivalent to adult BMI <18.5 kg/m^2, Normal: equivalent to adult BMI 18.5 – 23 kg/m^2, Overweight: equivalent to adult BMI of 23-26.9 kg/m^2, Obese: equivalent to adult BMI of > 27 kg/m^2 (19).
Fig 1b: Normal: <75th percentile, At risk: >75th Percentile

Relations between BMI and body fat percentage

There was a significant association of BMI with body fat percentage in both boys (r=0.962) and girls (r=0.976) (p<0.05). To further evaluate the association of BMI with body fat percentage, cross tabulation of BMI status and body fat percentiles were computed ($\chi 2$=161.1, p<0.01). None of the underweight children had body fat percentile >75th percentile. All obese children had fat percentile >75th percentile and 76.7% overweight children had fat percentile >75th percentile. In fact, 7.1% of children with normal BMI also had fat percentile >75th percentile.

Dietary Intake

Table 2 gives dietary intake in study participants. Total daily energy intake was about 65.7% of the recommended dietary allowance indicating that energy intake was 34.3% less than the daily recommended intakes. Total protein intake was 87% of the recommended dietary allowance. Overall dietary fats contributed 31.6 % of the energy intake of the total diet. There was no significant difference in nutrient intake of boys and girls (p>0.05) (data not shown).

Total snacks contributed 47.3% of total daily energy, 47% of daily dietary fats, 48.1% carbohydrates intake and 38.6% of proteins intake. Of this, healthy snacks contributed to 12.6% of total daily energy, 6.5% of daily dietary fats, 16.6% carbohydrates intake and 9.8% of proteins intake. Unhealthy snacks contributed to 34.6% of total daily energy, 41.4% of daily dietary fats, 33.9% carbohydrates intake and 28.5% of proteins intake.

Table 2: Dietary intake in children

	Total for entire day	From total snack	From healthy snacks	From unhealthy snacks
Energy (kcal/day)	1380 (720-3440)	653 (127-1234)	174 (26-584)	478 (60-1105)
Carbohydrates (g/day)	203.8 (104-600)	95.6 (23-184)	31.3 (4-104)	64.2 (10-151)
Protein (g/day)	34.8 (17.6-62)	13.1 (2.1-24.3)	3.4 (1-13.3)	9.7 (1-22.9)
Dietary Fat (g/day)	47.8 (24.9-93.9)	23.4 (2.8-56.1)	3.1 (1-11.9)	19.9 (1.9-54.9)
RDA intake of energy (%)	65.7 (33-157)	30.9 (6-61)	8.3 (1.3-29)	22.6 (3-54)
RDA intake of Protein (%)	86.6 (44-156)	32.7 (5-60)	8.5 (0.5-33)	24.2 (2-57)
Percent energy carbohydrates (%)	59 (45-79)	59.5 (41-74)	72.8 (56-91)	54.8 (35-72)
Percent energy protein (%)	10.4 (5-15)	8.1 (5-11)	7.8 (1-11)	8.2 (5-13)
Percent energy dietary fat (%)	31.6 (15-44)	31.3 (18-51)	17.5 (8-34)	37.2 (20-55)

Data presented as Mean (minimum-maximum). RDA Energy: boys: 2190 kcal/ day, girls: 2010 kcal/ day; RDA protein: boys: 39.9 g/day, girls 40.4 g/day (21)

Table 3: Frequency of snack consumption

	Never (%)	Once in fortnight (%)	Once per week (%)	Thrice per week (%)	Daily (%)
Fruit and Vegetable based snacks (healthy)					
Fruits/ vegetable juices	11.6	40.9	5.2	9.1	2.6
Fruits	3.2	5.8	15.5	14.2	61.3
Steamed Snacks (healthy)					
Idli/ dosa/ uttapam	3.9	25.8	29.7	38.7	1.9
Dhokla/ khandavi/ patra	43.2	36.1	9	11.6	-
Bread & other bakery based snacks (unhealthy)					
Pav/ bread	2.6	20	34.8	35.5	7.1
Bakery/ puff/ cakes/ pastries	16.1	66.5	7.7	9	6
Biscuits/ cookies	12.4	28.1	26.1	18.3	15
Khari/ toast/ butter biscuits	11	14.8	18.7	23.2	32.3
Pizza	20	65.2	5.8	7.1	1.9
Sandwich	9	18.7	30.3	34.8	7.1
Burger	35.9	58.2	1.3	3.3	1.3
Indian Snacks (unhealthy)					
Samosa/ wada/ kachori	14.8	54.8	16.1	14.2	-
Chips/ farsan	8.4	26.6	27.3	29.2	8.4
Frankie/ rolls	31.6	55.5	6.5	5.2	1.3
Chaat/ sevpuri/ bhelpuri	20.6	54.2	12.3	11.6	1.3
Khakra/ thepla	25.8	20.6	18.7	25.2	9.7
Other snacks (unhealthy)					
Instant noodles	15.5	36.1	21.9	23.2	3.2
Ice cream	9	60	14.2	14.2	2.6
Chocolates	2.6	16.8	31	31	18.7
Energy drinks/ aerated drinks	11.6	23.2	18.7	22.6	23.9

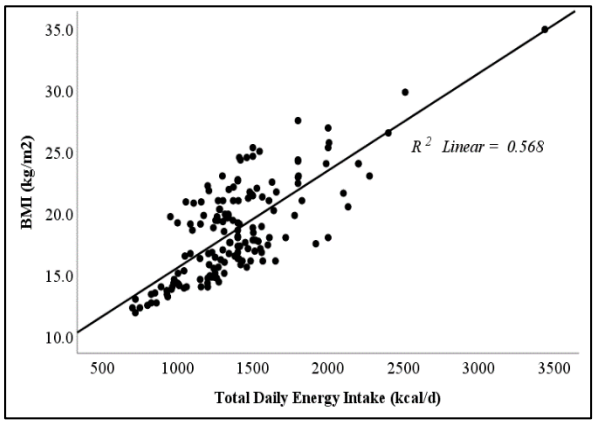

Fig 2: Correlation between BMI and total daily energy intake

Figure 2 gives correlation between BMI and total daily energy intake. BMI was significantly positively correlated with total daily energy intake in the current study ($R^2 = 0.568$)

Snacking pattern

Table 3 gives frequency of snacks consumed by children. The most commonly consumed healthy snack on daily basis was fruits. Steamed snacks such as idli/ dosa/ uttapam were also consumed by most participants on weekly basis. The most un-healthy food consumed on daily basis was khari/ toast or butter biscuits, chocolates and energy drink/ aerated drink. Pav/ Bread, biscuits/ cookies, sandwich, instant noodles, ice-cream and most Indian snacks were consumed by most children on weekly basis.

A regression analysis was run to determine the effect of total energy and dietary fats from snacks (separately to avoid co-linearity) on BMI and body fat

percentage. Overall the models were significant for effect of both energy and dietary fat intake from total snacks on BMI and body fat percentage. Energy (R^2 = 0.037) (Figure 3a) and dietary fat intake (R^2 = 0.108) (Figure 3b) from total snacks was significantly correlated with BMI (p<0.05). Dietary fat intake was significantly correlated fat percentage (R^2 = 0.088, p<0.05) (Figure 3d) whereas energy intake from snacks had marginal association with fat percentage (R^2 = 0.027, p=0.057) (Figure 3c).

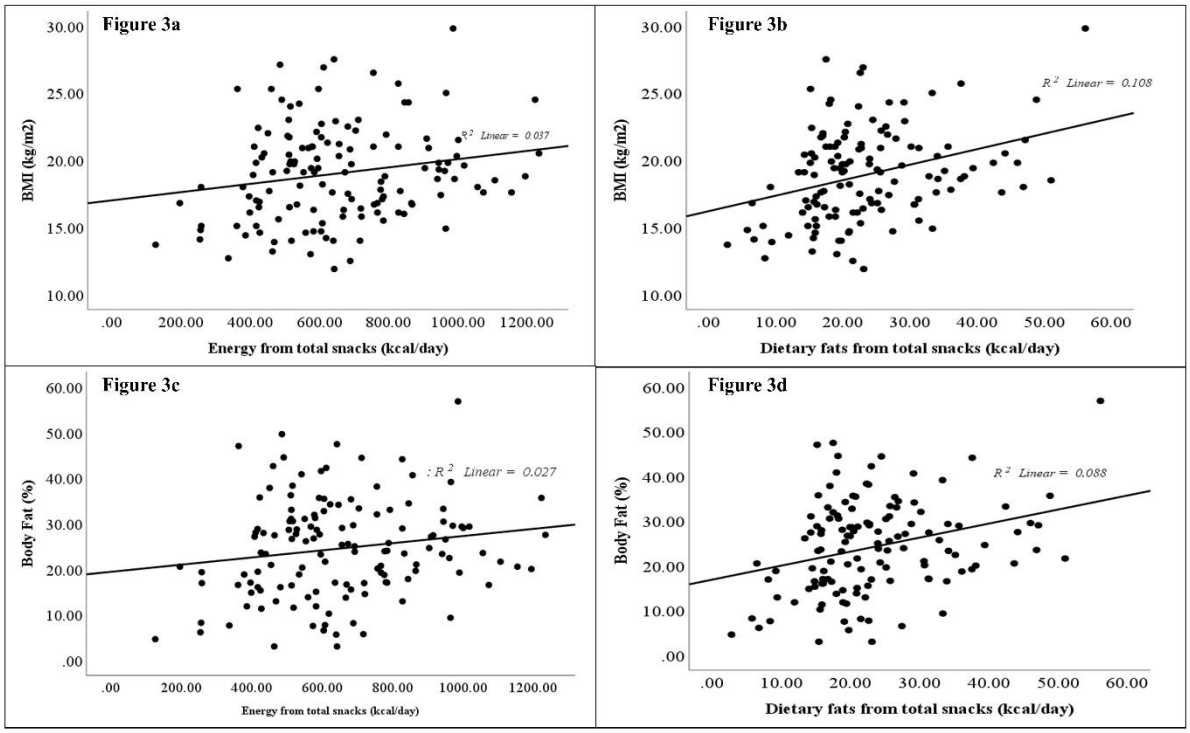

Fig 3: Correlation between BMI and total energy intake from snacks (a), BMI and dietary fats from snacks (b), body fat percentage and total energy intake from snacks (c) and body fat percentage and dietary fats from snacks (d)

DISCUSSION

The present study was conducted in children aged 10-11 years and highlights the increase in the risk of metabolic syndrome in this young age group. In the present study, we assessed the prevalence of overweight/ obesity and high body fat percentage and its correlation with nutrient intake from snacks. Almost 51% children in the study were overweight or obese in comparison to Indian reference curves for BMI. Along with high prevalence of overweight and obesity, 47.7% of children had fat percentage above 75th percentile putting them at additional risk of inflammation. Total energy and fat intake from snacks had a significant effect on both BMI and body fat percentage.

Prevalence of overweight and obesity varies across India. As per pooled data, the prevalence of overweight and obesity is found to be 19.3% across India (2). Using WHO cut-offs, Pan-India prevalence of overweight was found to be 11.1% and that of obesity was found to be 15.9% in Indian children aged 2-17 years (22). In another study conducted in 8-18 year-old children in Northern and Western India, using WHO cut-offs prevalence of overweight was found to be 18.5% and that of obesity was found to be 5.3% (23). Using International Obesity Task Force (IOTF) cut-offs, in 10-16-year-old children in Delhi, North India, prevalence of overweight was found to be 24.7% and that of obesity was found to be 7.4% (24). In a study conducted in Chennai, Southern India, in children aged 6-11 years using IOTF cut-offs prevalence of overweight was found to be 12% and prevalence of obesity was found to be 3.3%. In the same study, using contemporary cut-offs provided by Khadilkar et al and authors found prevalence of overweight to be 19% and that of obesity to be 17.6% (18). In the present study we had a higher prevalence of overweight (27.7%) and obesity (23.2%) as compared to other studies which may be due to the fact that we used the most recent cut-offs as proposed by Indian Academy of Paediatrics (19) which has a lower threshold cut-off to classify children as overweight and obese.

There are very few studies describing body fat percentage of children in India. In Delhi, body composition measured in children aged 10 years using dual energy x-ray absorptiometry showed body fat percentage of 25.5±10.4% in boys and that of 30.8±10.8% in girls (25). In a study conducted in Rural Health Training Centre of a medical college in Bengaluru, the mean body fat percentage was found to be 17.06±6.32% in boys aged 10 years and it was found to be 14.4±6.36% n girls aged 10 years when measured using bio-impedance technique (26). In a study conducted in Mumbai in children aged 10 years studying at private schools, body fat percentage was found to be 21±8.66% in boys and 21.3±5.5% in girls (27). In the same study, 11-year-old children from private schools had body fat percentage of 12.06±7.94% and 15.53±9.88% in boys and girls

respectively. Children in the present study had body fat percentage varying in comparison to previous studies, which may be due to the difference in method of measurement, the environmental factors or their diet.

In the study conducted in Rural Health Training Centre, they also found that about 18.8% children had high body fat percentage (26) whereas in the present study it was found that 48% children had body fat percentage above 75th percentile. The stark difference in prevalence of high body fat percentage in both the study was because in the previous study authors used arbitrary cut-offs of >30% to define children as having high body fat percentage whereas in the present study smoothed Indian percentile curves were used to identify children at high risk.

As per the Indian references curves, children having body fat percentage above 75th percentile are at risk of developing hypertension and other metabolic syndrome co-morbidities (20). With almost 48% of children in the present study having body fat percentage above 75th percentile (Figure 1b), this is an alarming concern to indicate that half of the young population is at risk of poor metabolic health.

The Asian Indian urban phenotype or lean obesity is defined as individuals having high body fat percentage and high waist to hip ratio at relatively low or normal body mass index (BMI) (28). That is despite having lower prevalence of obesity based on BMI, Asian Indians tend to have greater degree of body fat percentage. This phenomenon is referred to "thin-fat Indian Phenotype" (29). In the current study also, 7.1% children with normal BMI has body fat percentile >75th percentile.

There has been a drastic change in eating habits and food consumption in India over the last few decades. In a study conducted in 1155 children from New Delhi, India observed that 39% of children preferred fast foods such as pizzas, French fries and only 11% liked to eat fruits. The study also showed that 44% of children consumed one aerated drink per day (30). In another study from Pune, India on 760 children, it was observed that 79.07% children preferred snacks and fast foods the most, 11.8% preferred Indian sweets and only 3.5% preferred fruits (31). In the present study also, the frequency consumption of chips, Indian snacks was almost on weekly basis and some of them were even consumed by children thrice/ week. Almost 24% of children also consumed either energy drink or aerated drink daily. Indicating that there is a very high intake of low nutrient and high calorie food and snacks in children in the age group of young to older adolescents of that observed in other studies in India (17, 30-31).

Several studies have associated dietary eating habits, especially snacking with an increase in overweight/ obesity. Snacking has been considered one of the main contributors to increase in weight as snacking is association with an increased consumption of energy-dense, high-sugar, high-fat food (14). In a study on 400 children aged 11-13 years, prevalence of overweight/ obesity was 10.4%, 14.4%, 20.5%, respectively, in those consuming <15%, 15% to 10%, and >20% of their energy intake from snacks (14).

Even though total energy intake in the current study is only 65.7% of recommended dietary allowance, it needs to be noted that out of the 1380 kcal/ day consumption almost 47.3% i.e. 653 kcal/day were obtained from snacks. Apart from this it was also observed that intake of calories from fat was very high. Almost 31.6%, i.e 1/3rd of the total daily energy intake was from fats. Thus, the composition of the diet was very poor which may be one of the contributing factors for high prevalence of overweight and obesity in the current study.

Intake of high dietary fat and high sugar snacks are associated with an increase in BMI (32). Snacking on energy dense foods such as chocolate, snack bars, fried foods, condensed milk, fruit syrup and biscuit is shown to have a significant association with childhood obesity (33). Similarly, in the present study, BMI was significantly associated with total daily energy intake from snacks. Like other studies, total dietary fat intake from snacks was also correlated with both BMI and body fat indicating that consumption of high fat snacks increases the risk of overweight/ obesity (Figure 3 a – 3d).

Thus, to conclude present study indicates that almost 50% of children in India are overweight/ obese. Snacks contribute to almost 40-50% of daily nutrient intake in children with a major part coming from unhealthy snacks. The present study also highlights that the nutrient composition of snacks is shown to have a significant effect on BMI and body fat percentage of the children there by increasing their predisposition to an inflammatory state of the body. School based interventions with a focussed inputs towards guiding children for healthy snacking options and lifestyle factors need to be prioritized to prevent overweight/obesity and inflammatory state of their body which predisposes an early onset of non-communicable diseases.

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Research Note

Energy Rich Snacks May be Preferable to Lunch with High Lipid to Increase Energy Intakes in Older Adults at Risk of Malnutrition, Northern Thailand

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ABSTRACT *Background:* Our previous studies have shown that undernourished older adults in Northern Thailand had low lipid intake, resulting in energy deficiency. To increase energy intake, perhaps we could suggest two methods, one is to increase lipid in lunch and the other is an energy rich snack. *Aims:* To investigate effects of lunch with high lipid or an energy rich snack on energy intakes in older adults at risk of malnutrition. *Method:* Participants were 8 elderly people (average age 70.8±4.1 years) with risk of malnutrition (body mass index 17.8±2.0 kg/m^2). A randomized cross-over design was used to compare dietary intake under two diets: control (regular diet) and intervention (energy enhanced with lipids in meal and snack) on three days. Washout period was two days. In this study, energy was enhanced only for lunch and snack, but not breakfast and dinner. Energy for lunch was increased with rice bran oil. Energy in the snack was increased with coconut milk/peanuts and a box of soy milk. A 24-hour dietary survey using the recall method was conducted for the 3 days before, and during each of the two periods. *Results:* Although the energy supply at lunch in the intervention period was increased to about 700 kcal from about 600 kcal in the control period, the intake was similar between the two periods, being about 450 kcal, suggesting that the subjects could not eat increased lipids, maybe because of the large portion size. Average energy intakes from energy-rich snacks increased by about 2.5 times of the control (from 122±34 to 313±48 kcal, *P*=0.012), maybe because the portion size was small, resulting in about a 200 kcal increase per day (from 1,312±153 to 1,511±190 kcal, *P*=0.012). *Conclusion:* From the present study, we found that in older adults at risk of malnutrition, increasing energy from snacks is more acceptable than lunch with high lipid.
Key words: energy intakes, snacks, meals, older adults, risk of malnutrition

INTRODUCTION

Inadequate energy and protein intakes are frequently reported in the elderly (1), thereby increasing the risk of malnutrition. The Thai National Health Examination 2014 reported the prevalence of malnutrition in older aged 60 - 69 years as approximately 10% in males and 4% in females and this increased at advanced ages (2).

Our previous study (3) that showed older adults dwelling in community settings in northern Thailand had inadequate energy consumption, with estimated daily energy and lipid intakes accounting for 92% and 40% of the Thai recommended dietary allowances (RDA).The prevalence of underweight as determined by body mass index (BMI) < 18.5 kg/m^2 was reported as 18% in males and 9% in females, which was two times as high as underweight in the survey of the Thai National Health Examination.

This study was conducted before the main study. The first reason was that we did not know whether our undernourished participants could consume higher lipid than their current intake. We tried to find from various studies what kind of lipids are better accepted by malnourished elderly. In some papers the advantages of oleic acid were reported. Oleic acid has a lower satiating effect than other fatty acids such as saturated and long-chain polyunsaturated fatty acids (4). We looked for oleic acid-rich foods common in Northern Thailand and found that they are peanut oil (45-53%) (5) and rice bran oil (43.9%) (6). Therefore, in the present study, for the intervention lunch, we used rice bran oil. Soybean oil was used in the control diet because it is the most common oil.

In our previous study, we observed that the frequency and the energy of snacks were low. Therefore, in this study we tried to increase the energy from snacks by adding ground peanuts that contain high oleic acid and also used coconut milk, which is rich in energy and tasty. In addition, soy milk was offered as a substitute for milk by people who are lactose intolerant as well as low cost and nutritious.

It is important to explore the effective strategies to promote adequate dietary intake in community dwelling elderly. This will be helpful in preventing or slowing progression of chronic diseases and diminish hospitalization. The Objective of this study was to investigate effects of lunch with high lipid and energy rich snack on energy intakes in older adults at risk of malnutrition.

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METHODS

Study design and participants

This study was a randomized, controlled, cross-over design to evaluate dietary intakes under two diets: control (regular diet); intervention (energy enhanced) at lunch and snack for three days. Washout period was two days. The potential participants were screened from medical records of Ban Ton Keaw District Health Promotion Hospital in November to December 2020. Those willing to participate were informed about the study and screened for inclusion criteria were aged 65 – 79 years old, body mass index less than 20 kg/m^2 and/or recent unintentional weight loss, able to eat by mouth, not having any illness that may affect taste or appetite such as cancer, chronic kidney disease and having no dementia or depression.

After screening, 8 participants (6 females and 2 males) were included in the study and they provided informed consent.

Control and Intervention diet

Daily lunch and snack were delivered to the participants' homes. Lunch consisted of glutinous rice, a main dish (meat/fish), boiled vegetable and soup with meat/fish and vegetable.

In the intervention lunch, rice bran oil was used, and soy bean oil was used in the control diet, general ingredients and seasoning were kept the same in both diets. The composition, energy and macronutrient content of the lunch and snack in the control and intervention diets are shown in Table 1. Energy, protein, lipid and carbohydrate in the intervention and control lunches were 660 - 699 and 580 - 598 kcal, 29 - 43 and 28 - 43 g, 24 - 34 and 10 - 19 g, 69 - 76 and 68 - 75 g, respectively.

The snack consisted of pandan jelly, sweet pumpkin, and glutinous rice with perilla seed. In the intervention snack, coconut milk/ground peanuts were added, and a box of soy milk (250 ml) was offered. Energy, protein, lipid and carbohydrate in the intervention and control snacks were 267 - 471 and 44 - 222 kcal, 7 - 11 g and 0 - 3 g, 11 - 21 g and 1- 10 g and 7 - 34 g, respectively.

A five-point facial hedonic scale was used to evaluate acceptability test (appearance, aroma, texture, taste and overall) of foods.

Anthropometric measurements

Body weight and body composition were assessed about 2 hours or more after breakfast, using bioelectrical impedance analysis (Model HBF214, Omron, Japan). Height was measured using a portable, free-standing stadiometer. Triceps skinfold (TSF) was measured by using a Fat-O-caliper (Takei Kikai Kogyo Co., Ltd.). Hand grip strength was measured by a digital handgrip dynamometer (Camry, South El Monte, CA, USA). All the measurements above were assessed before the study.

Dietary survey

A 24-hour recall method dietary survey was conducted 3 days before the study and in each of the two periods. However, to ensure that the participants provided complete data, they were also requested to keep an estimated record of all foods and beverages consumed in the dietary record form. In addition, all participants were instructed to place all food leftovers and containers in a labeled plastic bag and to show them to the researchers to determine intakes. All data were entered and calculated for energy and nutrient intakes (protein, lipids, carbohydrate, saturated fatty acid, cholesterol and dietary fiber) using the INMUCAL-Nutrient version 4.0 (Institute of Nutrition, Mahidol University, Thailand).

Ethical Considerations

This study was done in accordance with the Helsinki Declaration and was approved by the Committee of Research Ethics in the Faculty of Public Health, Chiang Mai University, Thailand. Project number ET019/2020.

Statistical Analysis

Descriptive statistics such as mean, standard deviation and percentage were used to quantify the characteristics of the participants and dietary intakes. Data were analyzed using SPSS version 22. Results from the two diets' differences were confirmed using Wilcoxon signed ranks tests. All tests were two-tailed and a *P*-value of 0.05 was considered as statistically significant.

RESULTS

Participants

The participants were six females (75%), two males (25%), who had an average age of 70.8 ± 4.1 years, body mass index 17.8 ± 2.0 kg/m^2, body fat 24.8 ± 8.1%, muscle mass 28. 1 ± 1. 4%, calf circumference 21. 9 ± 3. 3 cm, mid upper arm circumference 22.6 ± 3.0 cm, triceps skin fold 16.3± 3.7 mm, hand grip strength 18.9 ± 3.0 kg (Table 2).

Table 2. Baseline characteristics of the 8 participants.

Characteristics	Mean ± SD
Gender (number male/female)	2/6
Body mass index (kg/m^2)	17.8±2.0
Body fat (%)	24.8±8.1
Muscle mass (%)	28.1±1.4
Calf circumference (cm)	21.9±3.3
Mid upper arm circumference (cm)	22.6±3.0
Triceps skin fold (mm)	16.3±3.7
Hand grip strength (kg)	18.9±3.0

The acceptability of control and intervention diet

The acceptability scores of appearance, aroma, texture, taste and overall of both diets were found to be similar (control diet: 4.1 ± 0.2; 4.2 ± 0.1; 4.3 ± 0.2; 4.3 ± 0.2 and 4.3 ± 0.2, intervention diet: 4.2 ± 0.1; 4.2 ± 0.2; 4.4 ± 0.1; 4.3 ± 0.2 and 4.3 ± 0.2, respectively, as shown in Table 3. No difference in acceptability scores between either control diet compared with the intervention diet were identified.

Dietary survey

Although the energy supply at lunch in the intervention period was increased to about 700 kcal from about 600 kcal in the control period, the intake was similar between the two periods, being about 450 kcal, suggesting that the subjects could not eat increased lipids, maybe because the portion size was quite large. Average energy intakes from snack increased about 2.5 times (191 kcal) the control (from 122 ± 34 to 313 ± 48 kcal, $P = 0.012$), maybe because the portion size was small enough for stomach volume.

Table 1. Food composition, energy, and major nutrients content of the three-day lunches and snacks during control and intervention periods.

Control period	Composition	E kcal	P g(%)	F g(%)	C g(%)	Intervention period	Composition	E kcal	P g(%)	F g(%)	C g(%)
Day 1	**Total lunch + snack**	**643**	**31 (20%)**	**21 (29%)**	**82 (51%)**	**Day 1**	**Total lunch + snack**	**958**	**44 (18%)**	**38 (36%)**	**111 (46%)**
	**Lunch** :wax gourd soup with chicken	210	13	13	11		**Lunch:**w ax gourd soup with chicken	245	13	16	11
	Chili paste with ground pork, tomato	127	13	6	6		Chili paste with ground pork, tomato, egg	185	18	10	6
	Boiled vegetables	26	1	0	5		Boiled vegetables	26	1	0	5
	Glutinous rice	235	5	0	54		Glutinous rice	235	5	0	54
	Total lunch	**598**	**31**	**19**	**75**		**Total lunch**	**691**	**37**	**26**	**76**
	Snack: Pandan jelly	**44**	**0**	**2**	**7**		**Snack:** Pandan jelly, soymilk	**267**	**7**	**11**	**35**
Day 2	**Total lunch + snack**	**802**	**30 (15%)**	**32 (36%)**	**99 (49%)**	**Day 2**	**Total lunch + snack**	**1,170**	**37 (13%)**	**55 (42%)**	**131 (45%)**
	**Lunch:** cabbage soup	224	14	16	6		**Lunch:** cabbage soup	303	14	24	6
	Chili paste	20	1	0	4		Chili paste	60	1	4	4
	Boiled vegetables	26	1	0	5		Boiled vegetables	26	1	0	5
	Boiled egg	76	7	5	1		Boiled egg	76	7	5	1
	Glutinous rice	235	5	0	54		Glutinous rice	235	5	0	54
	Total lunch	**580**	**28**	**22**	**68**		**Total lunch**	**699**	**29**	**34**	**70**
	Snack: Sweet pumpkin	**222**	**2**	**10**	**31**		**Snack:** Sweet pumpkin topping with coconut milk, soymilk	**471**	**8**	**21**	**62**
Day 3	**Total lunch + snack**	**739**	**46 (25%)**	**16 (20%)**	**102 (55%)**	**Day 3**	**Total lunch + snack**	**1,059**	**55 (20%)**	**36 (31%)**	**129 (49%)**
	**Lunch:**m ixed vegetable soup, chicken	220	12	13	13		**Lunch** :mixed vegetable soup, chicken	279	12	20	13
	Spicy soup with fish	126	26	2	2		Spicy soup with fish	146	26	4	2
	Glutinous rice	235	5	0	54		Glutinous rice	235	5	0	54
	Total lunch	**581**	**43**	**15**	**68**		**Total lunch**	**660**	**43**	**24**	**69**
	Snack: Glutinous rice, perilla seed	**158**	**3**	**1**	**34**		**Snack:** Glutinous rice, perilla seed, soymilk	**399**	**11**	**13**	**60**

E = energy; P = protein; F =f at; C = carbohydrate

In addition, lipid, protein, carbohydrate, saturated fatty acid, cholesterol and dietary fiber intakes were increased from 3.9 ± 0.9 to 13.0 ± 1.7 g, 1.4 ± 0.5 to 7.0 ± 1.0 g, 20.2 ± 6.0 to 41.9 ± 7.2 g, 3.1 ± 0.7 to 4.9 ± 1.0 g, 0.0 ± 0.0 to 6.1 ± 1.5 g and 0.9 ± 0.2 to 1.2 ± 0.3 g, respectively, as shown in Table 4. This resulted in an increase of about 200 kcal a day from 1,312 ± 153 to 1,511 ± 190 kcal, $P = 0.012$, as shown in Table 5.

The energy and major nutrient intakes from lunch were much lower than the supply. On the other hand, the energy and major nutrient intakes from the snack were more similar to the supply, as shown in Figures 1 and 2.

Table 3. Comparison the acceptability test between control and intervention diet

Menus	Diet	Appearance	Aroma	Texture	Taste	Overall
Chili paste, ground pork with tomato	Control	4.1±0.6	4.3±0.7	4.4±0.5	4.3±0.7	4.5±0.5
	Intervention	4.3±0.7	4.3±0.7	4.4±0.5	4.4±0.7	4.5±0.5
Wax gourd soup with chicken	Control	4.0±0.5	4.4±0.5	4.3±0.5	4.4±0.7	4.3±0.5
	Intervention	4.3±1.0	4.0±0.6	4.4±0.8	4.0±0.8	4.0±1.7
Cabbage soup with pork	Control	4.1±0.6	4.3±0.7	4.4±0.7	4.4±0.7	4.4±0.5
	Intervention	4.4±0.5	4.3±0.7	4.4±0.5	4.6±0.7	4.4±0.5
Chili paste with dried fish	Control	4.4±0.9	4.1±0.8	4.4±0.7	4.8±0.5	4.8±0.5
	Intervention	4.3±0.7	4.3±0.5	4.3±0.7	4.3±0.9	4.4±0.7
Spicy soup with fish	Control	3.9±0.4	4.0±0.0	4.4±0.5	4.1±0.4	4.4±0.5
	Intervention	4.1±0.6	4.4±0.5	4.4±0.5	4.5±0.5	4.3±0.5
Mixed vegetable soup with chicken	Control	3.9±0.4	4.3±0.7	4.3±0.5	4.4±0.5	4.0±0.0
	Intervention	4.1±0.4	4.0±0.8	4.3±0.5	4.4±0.5	4.1±0.4
Pandan jelly	Control	4.3±0.9	4.1±0.6	4.8±0.5	4.4±0.5	4.4±0.5
	Intervention	4.1±0.4	4.5±0.8	4.4±0.5	4.4±0.5	4.3±0.5
Sweet pumpkin	Control	4.1±0.8	4.0±0.8	4.4±0.7	4.4±0.7	4.4±0.7
	Intervention	4.3±0.7	4.1±0.8	4.4±0.5	4.1±0.8	4.1±0.6
Glutinous rice with perilla seed	Control	4.1±0.8	4.4±0.7	3.9±0.8	4.0±0.5	4.1±0.6
	Intervention	4.3±0.7	4.4±0.7	4.4±0.5	4.1±0.6	4.4±0.7
Average	Control	4.1±0.2	4.2±0.1	4.3±0.2	4.3±0.2	4.3±0.2
	Intervention	4.2±0.1	4.2±0.2	4.4±0.1	4.3±0.2	4.3±0.2

Data are shown in mean ± SD. There were no statistically difference between control and intervention diets in each dish by Wilcoxon's signed rank test at $P < 0.05$.

Table 4. Comparison of energy and nutrient intakes during control and intervention periods at lunch and snack

	Lunch		*P value*	Snack		*P value*
	Control	Intervention		Control	Intervention	
Energy (kcal)	449±67	454±137	1.000	122±34	313±48	0.012*
Lipid (g)	11.2±2.4	14.5±4.6	0.161	3.9±0.9	13.0±1.7	0.012*
Protein (g)	22.5±3.2	20.8±7.0	0.674	1.4±0.5	7.0±1.0	0.012*
Carbohydrate(g)	64.6±11.1	60.0±19.1	0.484	20.2±6.0	41.9±7.2	0.012*
Saturated fat (g)	3.2±0.8	3.8±1.3	0.327	3.1±0.7	4.9±1.0	0.012*
Cholesterol (mg)	100.8±25.7	131.7±33.3	0.036*	0.0±0.0	6.1±1.5	0.011*
Dietary fiber (g)	3.7±0.7	3.2±1.0	0.327	0.9±0.2	1.2±0.3	0.017*
P:F:C	20:22:58	18:29:53		3:30:67	9:37:54	

Data are shown in mean ± SD. *$P < 0.05$, control vs. intervention periods, Wilcoxon's signed rank test
P = protein; F = fat; C = carbohydrate

Table 5. Energy and nutrient intakes at before the study, control and intervention periods

	Before the study	Control period	Intervention period	*P value*
Energy (kcal)	1,299±205	1,312±153	1,511±190	0.012*
Lipid (g)	28.3±6.7	32.9±6.3	45.9±8.9	0.012*
Protein (g)	48.1±5.4	51.7±5.0	53.7±6.9	0.674
Carbohydrate(g)	213.1±38.4	203.7±27.7	220.9±27.4	0.036*
Saturated fat (g)	7.7±2.4	10.4±4.8	15.5±3.0	0.012*
Cholesterol (mg)	116.7±49.9	166.2±74.5	202.2±41	0.575
Dietary fiber (g)	8.4±2.6	10.1±2.8	7.9±1.8	0.036*
P:F:C	15:19:66	16:23:61	14:27:59	

Data are shown in mean ± SD. *$P < 0.05$, control vs. intervention periods, Wilcoxon's signed rank test.
P = protein; F = fat; C = carbohydrate

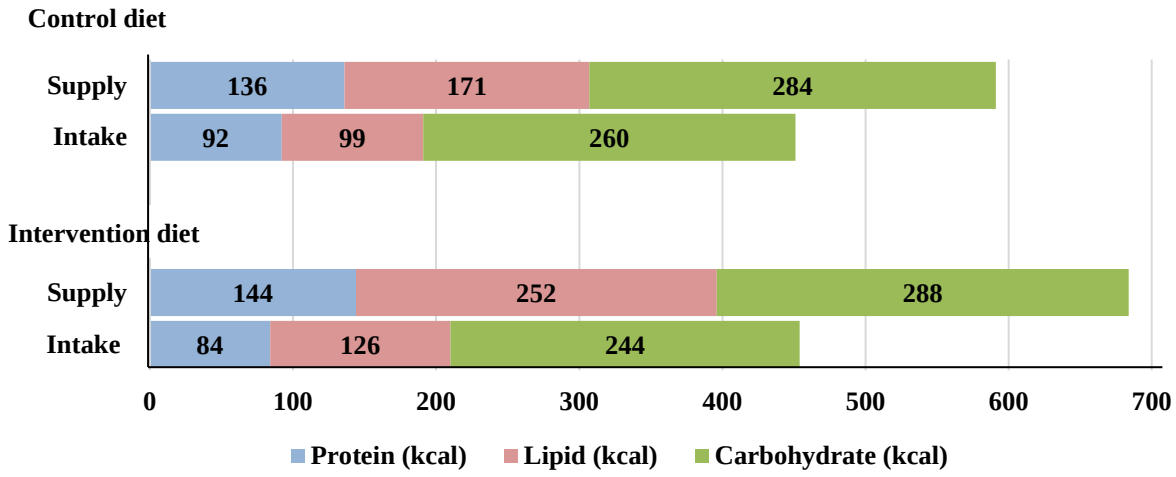

Fig 1. Energy and major nutrient intakes from lunch

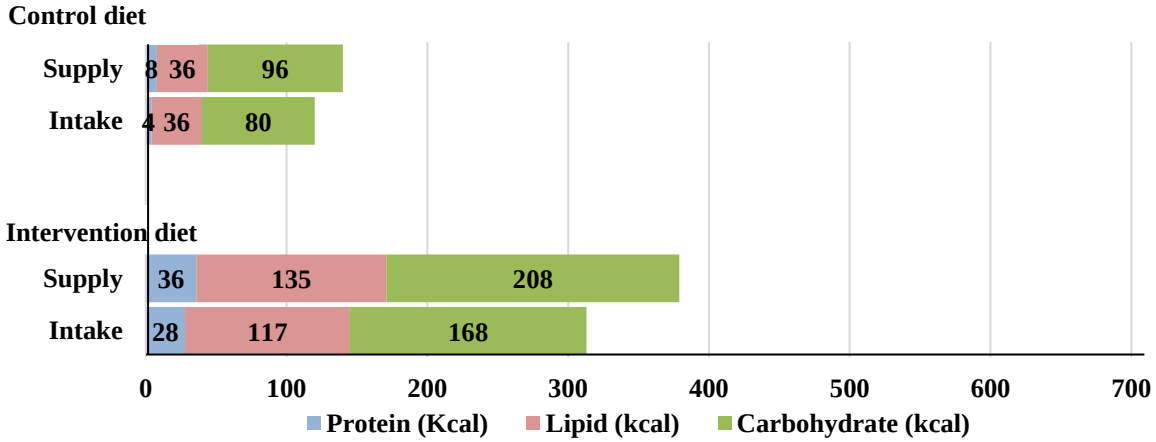

Fig 2. Energy and major nutrient intakes from snacks

DISCUSSION

This study was a small-scale preliminary study conducted before the main study. The main purpose was how to increase energy intake in older adults at risk of malnutrition. However, we found that in undernourished older adults, increasing energy from lipid-fortified meals was difficult but that snacks were acceptable.

We tried to use oleic acid-rich oils, e.g. rice bran oil was used in the lunch dishes, and ground peanuts were used in some snacks because there were reports that showed oleic acid is more acceptable in elderly with poor appetites (4, 7).

However, before we designed the type of lipid for the lunch dishes and snacks, we tried to use various types and amounts of lipid and conducted an acceptability test a small number of elderly and researchers; after that the recipes with the highest acceptance scores were chosen for the intervention study.

However, our present study was not successful in increasing energy intake at lunch. In the regular meal diet, we gave about 600 kcal and the intake was about 455 kcal. We increased the intervention lunch to about 700 kcal but the actual intake was about 450 kcal. Intake of all the 3 major nutrients was the same, indicating that the increased lipids were not taken. Conversely, the study of Faxén-Irving et al (7) showed the positive effect of energy-dense oleic acid-rich supplement (30 ml, 3 times/ day), which increased energy intake about 390 kcal higher in the intervention group compared to the control group and indicated better appetite. This may be because offering the small but frequent energy dense oleic acid-rich supplement stimulated appetite and resulted in increased energy intake.

Our present study reported that energy rich snacks with coconut milk/ ground peanuts and a box of soy milk were successful and energy intakes became 2.5 times higher than the regular snacks (control 122 ± 34, intervention 313 ± 48 kcal, $P = 0.012$).

The above results may indicate that the participants could not consume large portions of

high energy foods, especially lipids, suggesting the digestion of lipids is not smooth but if the lipid amount is less than about 125 kcal in each meal and snack, they could eat the whole amount. Therefore, we concluded that for the elderly, small, frequent portions are easier than large amounts in a few meals and the upper limit of lipids may be approximately 125 kcal (25 - 30% of total energy).

This is supported by some reports that mention that although foods high in energy from lipids tend to be more palatable, the elderly may not eat them in large amounts because of some symptoms such as gastric distention and emptying rates (8). Some studies showed that the elderly have significantly reduced enzyme secretions such as lipase, chymotrypsin, and amylase compared with younger people (4, 10).

On average older adults eat more slowly, are less hungry, and consume smaller meals than young people do. Small meals or snacks have been used to improve dietary intake. For example, Kruizenga et al (11) reported that if they offered two snacks per day to frail malnourished hospital patients, they found that the intervention group increased intake by approximately 600 kcal and 12 g protein/day compared to the control group (no snacks).

The taste, variety, familiarity, and portion size of the fortified foods and snacks may lead to a higher rate of consumption and preference (12). In this study, the average acceptability of appearance, aroma, texture, taste, and overall appeal of both the control and intervention diet were found to be similar. All of the participants were satisfied with the portion size of the supply of snacks. On the other hand, some of them informed us that the portion size of the supplied lunches was too large.

This study was the preliminary study for the following main study to find a good method for increasing energy. Although the number of subjects was small and the study period brief, our finding that a higher energy lunch with fortified oil was not effective but increasing energy with frequent snacks with slightly higher energy may be preferable is significant. In the subsequent main study, we will adopt this finding (frequent and higher energy).

CONFLICT OF INTERESTS

The authors declare no conflict of interests regarding the publication of this article.

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The authors wish to express their gratitude to Prof. Emeritus Dr. Maitree Suttajit for his valuable suggestions during the planning of this study. We would like to thank the Director and staff of Ban Ton Keaw District Health Promotion Hospital, the staff of the Faculty of Public Health, Chiang Mai University and our participants for their collaborative effort during data collection. Finally, we would like to express thanks to Prof. Andrew Durkin for careful proof-reading of the paper.

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Research Note

Perceptions of Dietitians about Sustainable Food Systems and Dietetic Practice

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ABSTRACT In an effort to better understand the role of dietitians in contributing to sustainable food systems (SFS), an exploratory survey about the perceived importance of SFS to dietetic practice was distributed to a convenience sample of dietitians practicing in Asian countries who attended the Asian Congress of Dietetics in Hong Kong, July 9 -11, 2018. Results from 36 participants across 8 countries emphasize that dietitians in Asian countries place a strong importance on this topic, regardless of their age or current role in practice, and that they can identify several important ways to approach this work. These findings align very closely with similar work in other regions, however, Asia-specific data on sustainable dietary patterns, and dietetic practice-based guidance would expedite this work in the Asian context. Similarly, integration of SFS into formal education and training is an important long-term investment.
Key words: sustainable food systems, dietitians, Asia

INTRODUCTION

Food systems are creating complex challenges to our social and ecological systems (1-2). Amidst global calls for collaboration among disciplines, professions and sectors to address food systems sustainability challenges, dietitians are very well placed to participate. They work in many different roles with influence throughout food systems (food industry, health care, consumer choices, institutional menus). Sustainable food systems (SFS) *"ensure food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition of future generations are not compromised"* (3, page 13). Some work is being done in various parts of the world to explore and define the relevance and role of dietitians in sustainable food systems (4-7) however, to the authors' knowledge, none focusses on the Asian countries. There is some work highlighting potential opportunities for public health nutrition to contribute to the Sustainable Development Goals (published after the data for this study was gathered), but no studies gather intelligence from dietitians and in the broader dietetic field of practice (8). The purpose of this research was to explore, through a small pilot study, the perspectives of dietitians and nutritionists practicing in Asian countries about the role of dietitians and nutritionists in sustainable food systems (SFS).

METHODS

A convenience sample of dietitians practicing in Asian countries was drawn from participants who attended the Asian Congress of Dietetics in Hong Kong, July 9-11, 2018. Participants were recruited by word of mouth, and through invitation cards freely circulated and left outside presentation rooms. The invitation cards included a QR code to the online survey. The survey asked questions about the country in which they practice, their perceptions of sustainable food systems, their perceived level of importance of sustainability in various areas of practice, including their own, and the importance of various types of approaches/activities in carrying out this work. Data was analyzed using descriptive statistics using Microsoft Excel.

Ethical approval for collection of this data was obtained by the Research Ethics Board at Acadia University.

RESULTS

Thirty six conference participants from eight countries responded to the survey. The highest percentage of participants were employed in India (30.56%), followed by Hong Kong (25.00%) and China (16.67%). Places of employment of the survey participants varied. This survey included dietitians and nutritionists working at hospitals or clinics, universities, in the food industry, in food service, with government or non-government organizations, and "other". The greatest number of participants were employed in a hospital or clinic (33.33%), followed by employment at a university (22.22%). Participants of this survey were all above the age of 19, with the majority of participants (75.00%) above 40 years of age.

Participating dietitians articulated their ideas about what sustainable food systems are, and responses covered a range of social, economic and ecological topics. Some were very comprehensive, for example: *"A sustainable food system is a collaborative network that integrates several components in order to enhance a community's environmental, economic and social well-being. It is built on principles that further the ecological, social and economic values of a community and region."*

When asked "*How important is the role of nutritionists and dietitians in promoting SFS*?" 72.2% (n=26) of participants agreed that promoting SFS is a very important role of dietitians and nutritionists. The average importance rating was 4.58 out of 5

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(Figure 1). Qualitative responses from the participants further emphasized the importance of dietitians and nutritionists promoting SFS. For example, by sharing messages about how to do so: "*We (should) eat local food. We (should) thank for the harvest. Do not eat too much. Do not throw away food. We should educate how to eat and how much we eat*", was a comment from one participant. Many participants also strongly expressed that it is important for everyone to promote SFS, and to work collaboratively. One participant wrote that "*It is everybody's responsibility. Not only dietitians. We should work together with others from the same work environment; food tech, food workers, restaurants etc. To help prevent the increasing food waste and promote proper food distribution or donation instead of throwing food away. This would also help with malnutrition and food imbalance*." Another wrote: "*Engaging with ALL stakeholder(s) is essential. Need to identify the incentives within each sector (government, industry, academia, dietetics) to work towards a sustainable food system*". Additional comments from participants strengthened this positive response to SFS: "*Everybody should have the mindset, we have one earth, we have one mission (to) keep the sustainable environment.*"

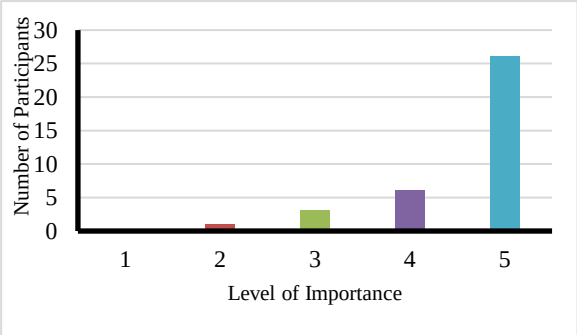

Fig 1. Perceived level of importance of the role of dietitian and nutritionists in promoting SFS (1=Not important, 5 = Very important)

Results show that regardless of work role participants felt that the level of importance was at least moderate. When the level of importance was broken down across five areas of work, or roles, (hospitals or clinics, universities, food industry, food service, government or non-government organizations, and other), the mean rating of importance was three (moderately important).

The survey asked participants to rank the level of importance of several approaches in contributing to SFS *in general*, and *in their own workplace*. These approaches included: education, helping food industry, advocacy, research and other. Regarding the approaches that dietitians and nutritionists can use in promoting SFS, in general, participants rated advocacy (mean = 4.53) and education (mean = 4.50) to have the highest level of importance. When participants were asked about their specific role in promoting SFS in their own workplace, on average, participants ranked their role in education (mean = 4.24) and research (mean=4.00) to have the greatest level of importance (Figure 2). No significant differences emerged across age groups and places of employment. All approaches were ranked highly across participant roles.

Finally, through the survey's open comments, dietitians recognized that there are barriers to applying some of these ideas in practice, and they are related to knowledge. One participant expressed that we *"need more research evidence to show sustainable food is not only good to environment, but also to health"*. Another suggested that *"Dietitians should get advance training on sustainability and modern agricultural methods"*.

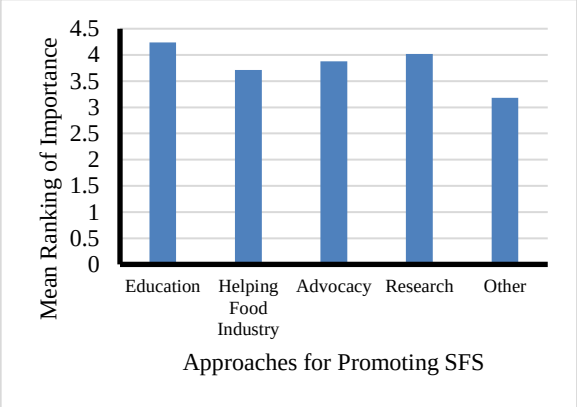

Fig 2. Perceived level of importance across approaches, *within current roles*, for promoting SFS.

DISCUSSION

Results of this exploratory work indicate that dietitians practicing in Asian countries, like their colleagues in other parts of the world (7, 9, 10) have a nuanced understanding of what sustainable food systems are, and that regardless of age or roles in the food system (e.g., clinical, food industry, etc.), the majority of participants felt that dietitians and nutritionists have an important role in promoting SFS. Further, similar to work in other regions (6, 11), participants identified several important approaches that can be applied to this work, and emphasized using education, advocacy, and research. For example, dietitians working in food industry can advocate for setting industry regulations that support sustainability, and those working with clients (individuals, families, communities, organizations) have opportunity to educate for SFS. As many participants in this study worked in research, participating in research teams to understand sustainable diets in the Asian context is one important opportunity. Results support the idea that dietitians are indeed well positioned to contribute meaningfully to more sustainable food systems.

It is critical to note some participants emphasize that while dietitians have an important role, this is an issue that requires participation and leadership from many other disciplines and sectors – that this is a "mindset" that is needed in the work.

The question we ask ourselves now is "Where do we go from here?" The barriers identified related to knowledge are significant, and will take time to address. While some good resources about sustainable dietary patterns exist (2, 12), and some specific to Asian countries (13), further research about the comprehensive sustainability (i.e., not only climate impacts) of dietary patterns across Asian countries would be a valuable contribution to supporting this work. Advocating for, or participating in research

teams which produce research on sustainable dietary patterns in the Asian context is needed.

Further, little is published about the level or type of training in sustainable food systems that dietetic trainees receive, although research from Australia shows that more work needs to be done (14). The International Confederation of Dietetics Associations has been working to support international member associations and dietitians with knowledge development for sustainable food systems through development of an online toolkit (15), but acknowledge that there is a dearth of Asia-specific resources. Dietitians practicing in Asia can support one another within the profession about how to incorporate SFS into practice, share resources, and to seek appropriate professional development in this topic if needed. A practice network with a focus on this topic may be helpful.

This exploratory, pilot study is limited in its generalizability to the entire population of dietitians and nutritionists practicing in Asia due to the small sample size. The results suggest significant interest in this area and invite further study.

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Research Note

Acceptability of Vietnamese Rice Noodle by Japanese

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ABSTRACT There are noodles in both Japan (UDON) and Vietnam (PHO), but the ingredients are completely different: the former are made from wheat and the latter are made from rice (Indica rice). Japanese rice (Japonica rice) has strong adhesiveness and is not suitable for making noodles. Currently, wheat is mainly imported to Japan from North America, so if Vietnamese rice is used, the cost of transportation will be much lower. However, since Japanese noodles are traditionally made from wheat flour, we do not know whether noodles made from rice would suit Japanese tastes. This study was conducted to clarify the question. The dish used in this test was "Kitsune Udon," which is the most popular noodle dish in Japan. The subjects were 53 students from a women's university in the Tokyo area. Three surveys were conducted. The first was on the experience on eating noodles, the second was a sensory test of Japanese-style noodle dishes and the third investigated whether UDON can be replaced with PHO. Most of the subjects had not eaten rice noodles previously. The results of the sensory test showed that concerning aroma, appearance, texture, compatibility with fish and kelp-based broth. UDON was evaluated a little higher but the overall taste ranking was similar or both kinds of noodle. About 60% of the subjects answered that they could replace UDON with PHO. In conclusion, Vietnamese rice noodles will be accepted by Japanese, especially if they become more commonly available and familiar.

Key words: noodle, udon, pho, acceptability, Japanese young women

INTRODUCTION

In Japan and Vietnam, the main source of carbohydrates is rice. Noodles are common dish in both Japan and Vietnam, but the ingredients are very different. Japanese noodles (UDON) are made from wheat, while Vietnamese noodles (PHO) are made from rice. Japanese rice is not suitable for making noodles because the rice is too sticky. Rice contains two types of starch; amylopectin and amylose. Amylopectin contributes strongly to viscosity due to its branched chain structure of glucose chain, and amylose has a linear glucose chain that contributes less to viscosity. The ratio of amylose to total starch is called the amylose content. Amylose-high, -medium, and –low content rice contains amylose about 22-28%, 16-18%, and 15% or less amylose (1). High- amylose rice is not sticky but crunchy. On the other hand, glutinous rice consisting only of amylopectin is very sticky. Generally, Vietnamese rice is medium-amylose in content and is suitable for making noodles. Japanese rice is low-amylose rice (amylose content less than 15%), which is too viscous to make noodles. For this reason Japanese UDON is made from wheat. Currently, wheat is mainly imported from North America, so transportation costs are high. In Vietnam, rice can be harvested two to three times a year, so the price is low and the transportation cost to Japan is also low. PHO is a popular dish among Japanese tourists to Vietnam. However, PHO is rarely seen in Japan. We suspect the reason for this is that Japanese people have a long tradition of making UDON from wheat and therefore do not think of making noodles from rice. In this research, we tried to see how well Vietnamese PHO is accepted by Japanese.

Photo 1. Japanese noodle UDON Sources: https://www.photo-ac.com/main/

Photo 2. Vietnamese noodle PHO Sources: https://p-pho.com/shop/archives/473

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METHODS

A sensory test was conducted with 53 female panelists from 18 to 22 years old at a university in the Tokyo Metropolitan area. Menus with the popular Japanese dish noodle Kitsune were served, except that the noodles were either UDON or PHO. First, we conducted a survey of panelists' experience eating noodles by asking 5 questions: 1. do you like UDON, 2. how frequently do you eat UDON, 3. have you ever eaten PHO, 4. do you like PHO, and 5. how frequently do you eat PHO.

Secondly, we did a sensory test of UDON and PHO scored on a 5-point scale (very good:5, good:4, neither good or bad:3, poor:2, very poor:1) to evaluate acceptability with regard to aroma, aroma, appearance, texture, compatibility with fish and kelp UMAMI-based soy sauce broth and overall taste.

Finally, we asked the panelists whether they would replace UDON with PHO using a 5-point scale; (strongly agree: 5, agree: 4, neither agree nor disagree: 3, do not agree: 2, strongly do not agree:1. Panelists were informed of the survey method and responses were gathered anonymously so that personal information was not identified.

Statistical analysis was conducted by paired Student t-test. Significant differences were evaluated by p values less than 0.05 and 0.01.

RESULTS

Experience on eating noodles of panelists:

The results of frequency of eating noodles were: at least once a week 14.8%, more than once a month 75.9%, more than once in three months 5.6%, rarely eat not 3.7%. On the experience of eating PHO, 68.5% of panelists answered "yes", and 31.5% of panelists answered "No". Furthermore, 81.6% of those who have eaten PHO said that they liked it. Many of them commented that the reason was that they were healthy, light, easy to eat, and unique slick texture. About 4% of panelists answered that they usually use PHO in their meals", the others like but don't use PHO because there not easily available and few restaurants.

Sensory evaluation of UDON and PHO:

Each panelist tasted UDON and PHO, and according to 5-point scale (very good: 5, good: 4, neither good or bad: 3, poor: 2, very poor: 1) ① aroma, ② appearance, ③ texture, ④ compatibility with soy sauce soup and ⑤overall taste. The mean score of UDON was higher than that of PHO, but overall taste scores were similar ($p>0.05$) (Table 1).

Table 1. Comparison of taste evaluation between UDON and PHO

	Aroma	Appearance	Texture	Compatibility with fish and kelp based soy sauce broth	Overall taste
Japanese noodle	4.39±0.56	4.52±0.61	4.72±0.49	4.81±0.39	4.41±0.53
Vietnamese noodle	3.44±0.77*	4.02±0.81*	3.93±0.89*	3.60±0.97**	4 .33±0.93

Values are mean±SD n=53

*, ** Significant difference from Japanese noodle by paired Student t-test at $p<0.05$ and $p<0.01$, respectively.

Possibility to replace UDON with PHO

Figure 1 shows the answer to a question whether they would replace UDON with PHO. The panelists answered strongly agree: 15.1%, agree45.3%, either agree or not 34% and disagree 15.7%.

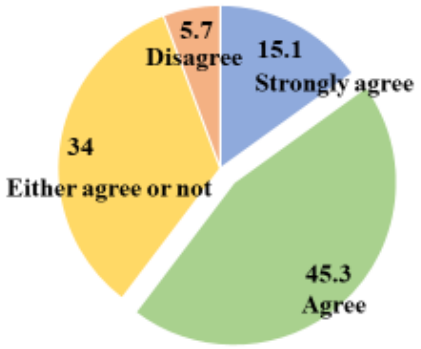

Fig 1: Evaluation for PHO by Japanese cooking method (N=53)

DISCUSSION

In this study, the acceptability of Vietnamese rice noodles PHO by Japanese women students was high. These noodles were prepared using the same method as for Kitsune UDON (noodle dish with fried tofu).As a result, there was not a big difference in preference between the PHO and the UDON, suggesting that PHO may be well accepted by Japanese.

For Japanese people, PHO is not an ingredient they consume on a daily basis. Many of the subjects in this study had never eaten PHO. On the other hand, UDON is a familiar ingredient for Japanese. It is easy to get and is an ingredient that they have been accustomed since their childhood. Not many people can eat unfamiliar foods like PHO without any hesitation. However, the evaluation of tastiness in the present study was similar, and about 60% of the subjects answered that they could use PHO instead of UDON. This result is considered to be a fairly high evaluation for PHO.

UDON does not have the smell of wheat, whether it is fresh noodles or dried noodles, but PHO has a unique rice smell. The subjects were not accustomed to the combination of the aroma of PHO and the scent of soy sauce soup with UMAMI of kelp and dried

bonito flakes. However, such reaction to differing aromas may decrease as subjects become accustomed to eating PHO.

In terms of texture, UDON was evaluated as chewy but PHO was soft, which is thought to be the result of the preference for UDON over PHO. In this study the UDON was made from fresh noodles but the PHO from dried noodles because it was imported from Vietnam. This difference is the great limitation of this study. For a fair comparison, both noodles should be in a similar condition.

From an economic point of view, about 80% of the wheat used in Japan is imported from North America (2). The distance to Japan is about 10,000 km, but it is only about 3,865km from Vietnam to Japan. In Vietnam, rice can be harvested two to three times a year, so the price is low. From the economic point of view, PHO is much superior to UDON. PHO could be common and familar food in Japan by proper promotion.

REFERENCES

1) Shizuoka Prefectural Office 1998, Rice Mini Encyclopedia, www.pref.shizuoka.jp (accessed on June 15, 2021)
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