

# A Review of Applying Healthy Dietary Nutrition Knowledge in Tertiary Education Setting

Li Yalun

College of Arts, Media, and Technology  
Chiang Mai University  
Chiang Mai, Thailand  
aaronlee950708@gmail.com

Achara Khamaksorn

College of Arts, Media, and Technology  
Chiang Mai University  
Chiang Mai, Thailand  
achara.k@cmu.ac.th

**Abstract**—The review of a systematic analysis for the *Global Burden of Disease Study* pointed out that the relationship between dietary habits and a Non-Communicable Diseases (NCDs) has been extensively investigated, and China's dietary structure is no better than the U.S. It indicates a tight connection between the dietary structure and overall physical health of people. Moreover, there is a dietary structure unbalanced problem existed among university students. However, there is a gap in understanding of nutrition knowledge. Thus, it is especially important for university students to understand how to better apply healthy nutrition knowledge to their daily diet. Therefore, this study aims to identify the key concepts and key factors that influence their dietary structure, basic nutrition knowledge, and lifestyle. Moreover, the key concepts and key factors bring together to develop a conceptual model. This conceptual model will later be used to help university students to better apply healthy dietary nutrition knowledge to their diet and healthy life. Five major databases were searched for randomized controlled trials and other nonexperimental studies from 2001 to 2015 that were conducted in the tertiary education settings (i.e., colleges and universities). This literature review suggests that with a variety of interventions, the dietary behavior and knowledge could be improved, but more research is required to examine the effectiveness of a specific intervention among different groups of people, particularly from the developed countries and developing countries.

**Keywords**—dietary nutrition, knowledge, tertiary education, college students

## I. INTRODUCTION

Recently an article published on The Lancet Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study stated that the relationship between dietary habits and a Non-Communicable Diseases (NCDs) has been widely investigated, and it shows that China's dietary structure is not better than that of the U.S. [1]. Also, the research in 2011 showed that the mean Body Mass Index (BMI) by age-adjusted was 23.8 (95% CI=23.7, 23.9) for men and 23.4 (95% CI=23.2, 23.5) for women. The age-adjusted prevalence of obesity was 11.3% (95% CI=10.8%, 11.9%) overall, 11.8% (95% CI=10.8%, 12.6%) among men, and 11.0% (95% CI=10.3%, 11.8%) among women. Estimates of age-adjusted obesity prevalence among the Chinese population were significantly lower than those of the U.S. population (all  $p < 0.05$ ). Over the 20-years period, the prevalence of obesity increased from 2.88% to 11.8% among men (age-adjusted annual change in OR=1.08, 95% CI=1.07, 1.09,  $p < 0.001$ ) and from 4.55% to 11.0% among women (OR=1.05, 95% CI=1.05, 1.06,  $p < 0.001$ ). According to the World Health Organization (WHO), similar important findings have been observed for both men and women [2].

Over the last two decades, China has witnessed a great growth of economic development and the living standards have significantly improved. The choices of food are overly abundant, nonetheless, the popularization of the food nutrition knowledge of the Chinese did not keep up the pace with the economic development. When people are facing excessive options of different food, they usually feel lost, and make bad decisions in terms of health.

Thus, promoting the knowledge of dietary nutrition is becoming quite necessary and priority for our society. It has a significant influence on people's mental and physical health. The university students are the group of people who are accepting a higher level of education. These groups have the openness for new knowledge, and at a critical point in building up the lifetime value of the world and a healthy lifestyle. As a result, the paper chooses this group of people as the sample which could represent the top level of present knowledge. And the students at this period who just graduated from high school and had a lot of free time to do anything they are interested in; thus, it is the perfect sample for studying this topic. Once the research figured out a method that works for the students of Chengdu University, then it means that it could be applied to most Chinese students in some ways. It signifies the health of Chinese people could be improved obesity and the diabetes rate could be decreased and the life expectancy would be longer.

Moreover, there have been a lot of studies assessing the level of a group of people nutrition knowledge, dietary habits, and various factors contributing to poor dietary habits. However, few studies exist that examine dietary nutrition from the perspective of college students or provide a contextual understanding of how college students perceive the role of food and nutrition in their lives. Furthermore, the absence of nutrition education in China is severe. The purpose of this study was to elicit attitudes and beliefs of college students regarding their health, nutritional practices, perceived nutrition information needs and improve their dietary knowledge to improve the overall health of college students. There is a great variety of factors that influence the overall health of people to facilitate the qualitative and quantitative analysis of the factors that have on students in the tertiary setting. The factors can be classified into several categories (e.g. body image and weight concerns, healthy eating on a budget, expert nutrition, basic nutrition, healthy meal planning) which could have a different rating by experts or the research staff and students [3]. [3] reveals the dearth of nutrition specially designed for college students by searching 232 web resources of college nutrition. There are only 7 webpages used the interactive tools and 5 pages used the

nutrition strategies in their pages which only take 3% and 2% respectively. In attempting to overcome the limitations of a focus group in Cousineau and colleagues' research, the researchers employed the process of concept mapping. This process is typically conducted with 10 to 20 participants to ensure a variety of opinions [ibid]. Thus, university students need to understand how to better apply healthy nutrition knowledge to their daily diet. Therefore, this study aims to identify the key concepts and factors that influence their dietary structure, basic nutrition knowledge, and lifestyle.

## II. REVIEW OF TOOLS USED IN THE NUTRITION AREA

This section examined the four main tools used in the nutrition area, i.e. Concept Mapping (CM), A Knowledge, Attitude, and Practices (KAP) survey, Nutrition Education, and The Mediterranean Score. A literature search was used to identify evidence-based on several interventions in a tertiary setting among young adults. The electronic databases searched included Medline, PubMed, Science Direct. The search terms used were nutrition, dietary, intervention, university or colleges. And the additional articles collected by examining the reference list of the original articles. The health promotion or nutrition knowledge was also searched for any missing studies.

### A. Concept Mapping (CM)

Concept Mapping (CM) is a kind of structured conceptualization that could be used by groups or any organizations to develop a conceptual framework that can guide assessment or planning. In the typical case, there are six steps involved: 1) Preparation (including selection of participants and development and focus on the developing conceptualization), 2) the Generation of statements, 3) the Structuring of statements; 4) the Representation of Statements in the form of a concept map (using multidimensional scaling and the cluster analysis), 5) the Interpretation of maps, and 6) the Utilization of Maps. Concept mapping: encourages the group to stay on task; results relatively quickly in an interpretable conceptual framework; expresses this framework entirely in the language of the participants; produces a graphic product which simultaneously shows all major ideas and their interrelationships; and often improves group or organizational cohesiveness and morale [4]. The concept mapping process is shown in Figure 1.

### B. A Knowledge, Attitude, and Practices (KAP) survey

KAP survey is a quantitative method (predefined questions formatted in a form of standardized questionnaires) with access to quantitative and qualitative information. KAP surveys show that misconceptions or misunderstandings that may constitute obstacles to the activities that we would like to perform and potential barriers to behavior change. A KAP survey essentially records an "opinion" and is based on the "declarative" (i.e., statements). In other words, the KAP survey reveals what was said, but there may be considerable gaps between what was said and what was done. In the early stage of research by using the KAP model, the researcher could collect information with the research topic, could also include questions about general health practices and beliefs to find out what is known, believed and done in the research topic [5].

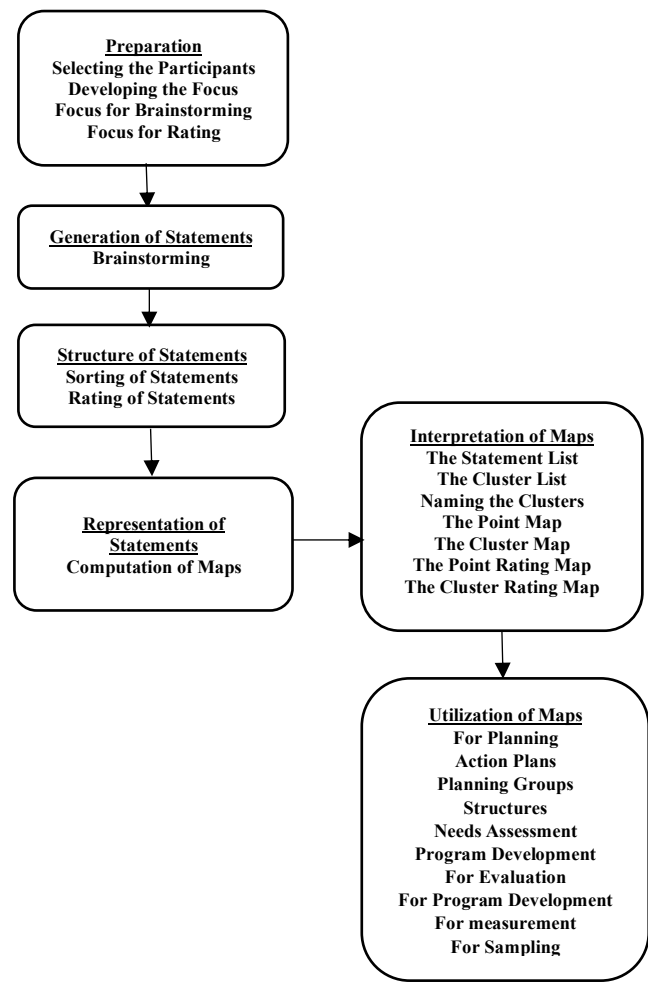


Fig 1. The Concept Mapping Process

### C. Nutrition Education

Nutrition education needs to address food preferences and sensory-affective factors; person-related factors such as perceptions, beliefs, attitudes, meanings, and social norms; and environmental factors. Nutrition education has been defined as "any combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food and nutrition-related behaviors conducive to health and well-being; nutrition education is delivered through multiple venues and involves activities at the individual, community, and policy levels." [6]. To meet the objectives of the study, the nutrition education is a very necessary method to accomplish the goal, but the nutrition education here is not just confined to the conventional class but may involve quite a different kind of activities, at individual, community, and policy levels.

### D. The Mediterranean Score

The Mediterranean score is calculated based on the consumption of eight different types of food, and if the criteria for each category are met, the score is one: 1. High monounsaturated: saturated fat ratio ( $>1.6$ ). 2. Moderate ethanol consumption (men:  $<10\text{g}=\text{day}$ ). 3. High consumption of legumes (men  $>60\text{g}=\text{day}$ , women  $>49\text{g}=\text{day}$ ). 4. High consumption of cereals (mean  $>291\text{g}=\text{day}$ , women  $>248\text{g}=\text{day}$ ). 5. High consumption of fruits (men  $>249\text{g}=\text{day}$ , women  $>216\text{g}=\text{day}$ ). 6. High consumption of vegetables

(men >303g=day, women >248g=day). 7. Low consumption of meat and meat products (men <109g=day, women <91g=day). 8. Low consumption of milk and dairy products (men <201g=day, women <194g=day). These values were adjusted to daily intakes of 2500kcal for men and 2000kcal for women. A score of 3 or 4 scores is also been used to relate Mediterranean dietary patterns to better health outcomes [7]. By using the evaluation score, the study could get a brief concept of the participants' dietary structure.

### III. FACTORS THAT INFLUENCE THE DIETARY BEHAVIOR

The key factors that influence the dietary behavior will be examined in this section based on four main themes, i.e. use of the nutrition labels, POP (point-of-purchase) intervention, Portion Size Control, and Intrapersonal / Interpersonal Factors.

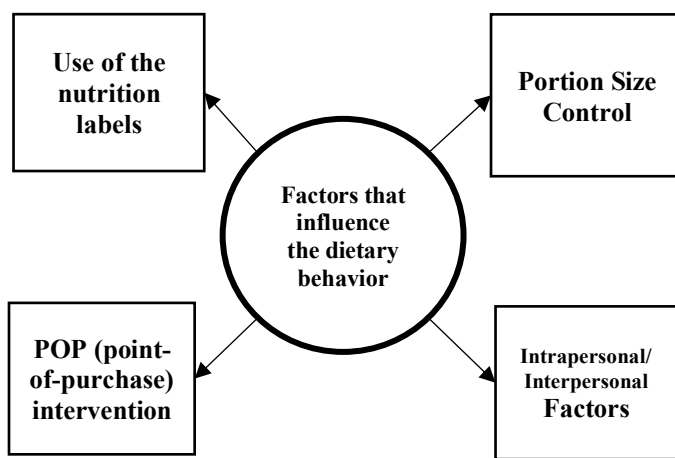


Fig 3. The model of influencing factors of dietary behavior

As you can see from figure 3, it is shown that the four main factors influence the dietary behavior from the literature review.

#### A. Use of the nutrition labels

As in [8] study found out that the use of nutrition label may positively influence the food choice of the university dining hall patrons, which in their study shows that 58.5%(n=120) out of 204people in total used the nutrition label, and with 45% of adults who use it to track macronutrient. Also, this study shows that women (79.1%; n=72) are significantly greater in using nutrition labels than men (42.1%; n=48). From this dietary outcome, it could be concluded that the nutrition labels have a significant gender difference, and the food labels do have a great impact on the choice of food by university students.

However, [9] also states that nutrition information is highly associated with the higher rating for food quality for both the short and long term, and the food with nutrition information may stimulate the intentions of repurchase. And in this study, the selected of higher fat, higher-calorie entrées dropped from 67% to 47% and the lower fat, lower-calorie entrée increased from 33% total entrée sold to 53% in total of entrées with the nutrition facts labels posted on the counter with laminated card sold out of 150 participants. A research in

an University residence hall also shows the calorie labeling is strongly associated with the weight control, in which the mean weight gain among 120 participants over 36 weeks intervals indicating 3.5 kg less weight gain, representing an effective way to combat the rapid weight gain seen in young adults especially in freshmen in university [10].

Thus, in this study, this could be a very important step in designing nutrition education or activities for the students in the case study, but in this paper, it did not mention the existed perception for nutrition labels. There are other potential reasons that cause the determinant of not using nutrition labels by men. Therefore, in the case study of Chengdu University, the intervention to the participants may not only involve popularize the concepts of reading nutrition labels is healthy behavior in food choice but also put macro and micronutrient knowledge sharing after these concepts. All the relative studies show that the connection between the healthy food choice and the use of nutrition label which would be important in promoting a healthy dietary choice habit and weight control.

Moreover, [11] states that in a randomized controlled intervention trial that energy content labels and labels plus motivational posters control on beverage by people who use the vending machine had an effective influence in sales of beverage, vending machine with energy label and posters resulted in a lower growth rate of sugar-sweetened beverage sales, and the total revenue increased for non-energy containing accounted for 70.52% of the whole increase.

#### B. POP (point-of-purchase) intervention

In a cross-sectional study in a University cafeteria with 72 samples by monitoring the food sales over 2 weeks baseline found that with POP prevention the yogurt, pretzel, whole fruit, packaged salads, and candy sales increased while fruit and vegetable basket did not, and more men just read the promotion message while more women bought food because of the messages [12].

A study shows that participants reported are more aware of healthful food choices in the dining hall after the intervention. And a great increase in taking the cottage cheddar and low-fat salad dressing and a trend toward increased consumption of fresh fruit was reported, the main intervention they used in the case was the POS (point-of-selection) intervention, which is basically about placing promotional materials with attracting logo above the target food, and also distributed flyers with nutrition information [13].

In a cross-section study found that categorizes a few food items in each of these food (cereal, soup, cracker, bread) by labeling as healthful using "Fuel Your Life" shelf tag in University convenience store could increase the healthful choice which brought 3.6% increase in the sales which mainly indicates that providing the POP nutrition information in college campus convenience store is helpful to promote the healthful food choice [14]. However, in another study [15] found the interpretive nutrition labeling or promotion message of the 12 best meal combination received star ratings for nutrients or good food groups that did not comply with 223 samples which shows in a way that meal choice and nutrient intake may not greatly be impacted by these kinds of message.

This could be applied to my study, that to put more POP

messages where are women passing by mostly daily due to the result that women purchase more of food because of the message, and such as poster with cartoon character and put it next to several targeted healthy food items. The POS intervention is also more than effective in directing the food choice in the tertiary settings. Therefore, combining nutrition promotion or information with providing incentives to increase the purchase of healthy food, such as lowering the price of healthy foods, or making healthy foods more accessible [16].

### C. Portion Size Control

The awareness of portion size did have a positive effect on controlling the whole amount of food people intake, the results show that the participants consumed an average of 186.9g fewer snack per week with 100-kcal snack packs compared with the standard-size packs of snacks [17]. People always attempted to eat up all the food they have at hand, thus the portion size control would be an effective way to help people to build up a healthy dietary habit and control too much energy intake. Moreover, [14] found that reducing the portion size of an item results in reduced intake of that food for most individuals by observing subjects selecting the food in an all-you-can-eat environment.

### D. Intrapersonal/Interpersonal Factors

According to study of [18], it shows that there are so many intrapersonal factors determining the food choice of individual in tertiary setting, from the food preference some students reported that the taste of food itself is an important factor influencing the food choices, which also means taste could be the determinants that students eat healthy or unhealthy. Self-discipline also is mentioned in this study that some students reported self-dependency may influence their eating behavior. State of mind is also a factor influence the dietary behavior, in campus, usually, students may have a lot of pressure from study, sometimes under the stressful circumstance eating patterns tend to go two extremes, and the stress is not only from the academic but also from social and peer. Another big intrapersonal factor is the time and convenience, some students acknowledged that time is of great importance in meal preparation, thus providing the quick and healthy meal for students may be one of the most important interventions in improving the dietary behavior among college students. The body image and self-concept are also being taken into consideration when making a dietary decision, students felt that body image is related to the socio-cultural ideal image and in turn, related to media advertisement strategies. Also, the dietary knowledge, daily rhythm, past eating behavior, home education, social support from both friends and family, the appeal of foods, food prices, metabolism may be the influencing factors. In his study, the author divided the environment into two parts, the one is microenvironment, which contains the physical environment like community settings, such as the availability and accessibility of healthy foods and cooking supplies. And the social environment, college students may just free from parental control, which made them feel so lost when it comes to food choice. As for macro-environment, the policy and legislation, socio-cultural norms and values, media and advertising, university characteristics like residency, student society, university lifestyle, exams, etc. (ibid).

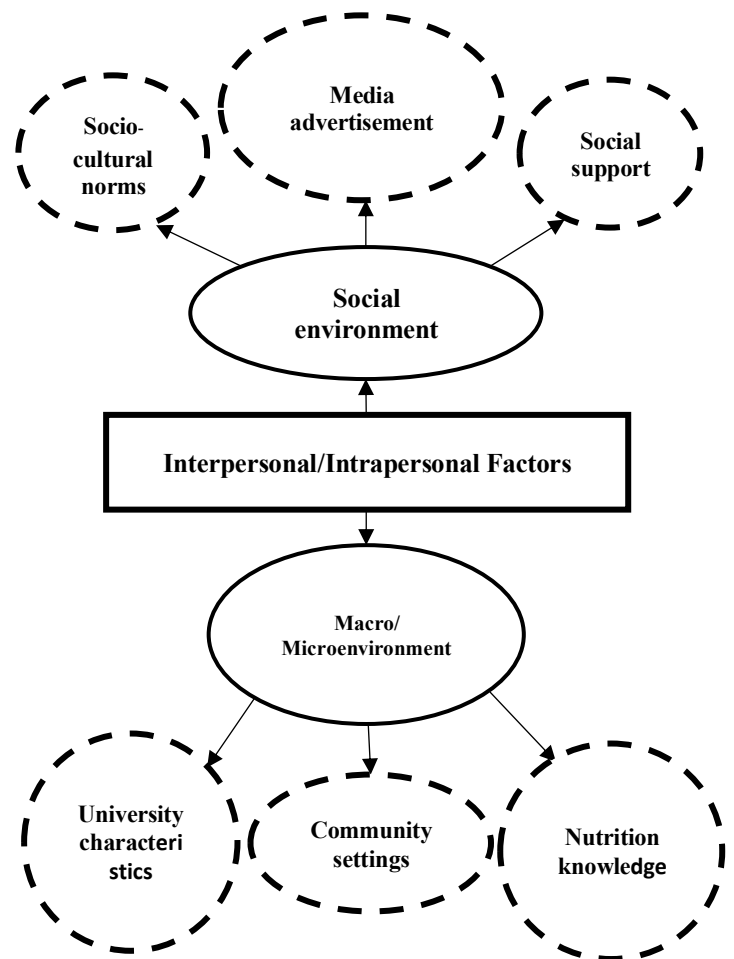


Fig 2. The main sub-factors of Interpersonal/Intrapersonal factors

As you can see from figure 2, it is shown that the two main components from the inter-personal/ intra-personal factors that influence dietary behavior from the literature review.

## IV. DISCUSSION AND CONCLUSION

This study aims to identify the key concepts and factors that influence their dietary structure, basic nutrition knowledge, and lifestyle. Hence, university students need to understand how to better apply healthy nutrition knowledge to their daily dietary and some limitations left fruitful avenues open for future research.

After a comprehensive literature review of related areas. The influencing factors have been identified and a model of the influencing factors has been designed. Based on the model, a questionnaire will be designed to collect the data in the university. After the quantitative research, qualitative research will be carried out to form the focus group to collect the data through fieldwork with a case study. The content analysis of interviews and questionnaires will facilitate the development of a conceptual model. Lastly, complete the IS, the conclusion includes the recommendations for future research. And made a recommendation from the focus group participants as well. As for the means of recruiting questionnaire participants, an invitation e-mail will be sent to the study advisor. The e-mail provides the research title and

overall background, the purpose of the research, a summary of research and methodology. The participation information sheet and consent form are attached to this e-mail. A follow-up phone call will be made after receiving a reply and getting approval from the study advisor. The direct communication with the class advisors at least through WeChat or phone call is necessary, to let them know the basic information of the research, and the questionnaire will be sent out through the QQ or WeChat groups by the class advisers, it's more effective than sent out individually.

Then an invitation e-mail will be sent to the key participants, the details of the research will be attached to it. Participants are advised to take at least 48 hours (or more if necessary) to consider whether to take part in this research for the whole research. After receiving a reply and getting approval from key participants, a WeChat group chat of key participants will be formed. Lastly, the research will prepare an online meeting with all participants. A questionnaire survey will be carried out. Participants will be asked about their names, contact details, age, major background, basic physical data related to nutrition and dietary. Moreover, they will be asked to nominate other potential key participants for this research. As for Interview participants, firstly ask for permission from the class advisors to recruit students' participants after the questionnaire. And analyze their physical data in deep and get the key information from them. And an interview schedule with open-ended questions will be carried out to enrich more information on the conceptual model of dietary nutrition for college students at Chengdu University.

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