Review Article

Dietary patterns using Traditional Chinese Medicine principles in epidemiological studies

Marion M Lee PhD MPH and Jennifer M Shen MD MPH

University of California at San Francisco, Department of Epidemiology and Biostatistics, and Department of Family and Community Medicine, San Francisco, CA. USA

Dietary intake and nutritional factors have been shown to be associated with many chronic diseases, such as heart disease, obesity, diabetes, and cancer. There are many approaches to studying dietary intake in relationship to disease; each approach has its strengths and weaknesses. Examples of different methods of studying dietary patterns will be reviewed. In most cultures, consumed and preferred foods are based on cultural and societal influence. Thus, it is important to consider dietary patterns within the context of culture in addition to the standard nutrients or food groupings approach. Traditional Chinese Medicine (TCM) offers another dimension to food analysis. Our approach classifies dietary intake based on Traditional Chinese Medicine principles of yin and yang, hot and cold, and acidic and alkaline forming food concepts in a case-control study of dietary factors and breast cancer. Our results complement previously reported findings of an increased risk of breast cancer associated with dietary fats in Taiwanese women. Our discussion will focus on the implication of using this dietary pattern research and the challenge of combining this research with culturally sensitive messages to improve health. Our ultimate goal is to design an intervention strategy for disease prevention and health promotion that is culturally appropriate for specific populations.

Key Words: Traditional Chinese Medicine, Yin/Yang, hot/cold, acid/alkaline, foods, dietary patterns

INTRODUCTION

In nutritional epidemiology, researchers often investigate one or two foods, or a single nutrient in the association of risk and disease. This approach has been well accepted in the past. Dietary intake and nutritional factors have been shown to be associated with many chronic diseases, such as coronary heart disease, obesity, diabetes, and cancer. Most commonly, study subjects' individual nutrients or food items are estimated using food frequency questionnaires (FFQ) and dietary records; these are used as indicators of dietary patterns in epidemiological studies. Nevertheless, due to improper study design and differing dietary assessment methods, inconsistency among studies for disease risk is often noted. Some alternative approaches have recently emerged.

In most cultures, consumed and preferred foods are based on social and cultural influence. Thus, it is important to consider dietary patterns in the context of culture in addition to the standard nutrients or food groupings approach in epidemiological research.

The most popular dietary patterns research is called factor analysis or use principal components analysis to identify dietary patterns.[1] Computers use statistical procedures to identify common dietary patterns. One drawback with this technique is that computers define the dietary patterns, but the interpretations may vary by researcher. Another problem with this pattern analysis is data entry. Yet another challenge is that individual studies often use a different kind of FFQ, and as a result, it is often difficult to compare results across studies. A recent factor analysis from the large male Health Professionals Follow-up Study identified a "Western" dietary pattern.[2] This diet was high in meat and refined carbohydrates, very similar to a meat-sweet pattern as defined by factor analysis in the Chinese Shanghai breast cancer study.[3] Two recent studies on dietary patterns were conducted in China and Japan.[3,4] The Shanghai study suggests that a diet rich in meats and sweets increases the risk of breast cancer in postmenopausal women, while there is no association with a diet rich in vegetables, soy, and fresh fish. The researchers define two general dietary patterns: 1) the "meat-sweet" diet which includes various meats, such as pork, poultry, organ meats, beef, lamb, saltwater fish, and shrimp, along with candy, desserts, breads, and milk; and 2) the "vegetable-soy" diet which includes various vegetables, soy-based products, and freshwater fish. The Japanese study defines four major dietary patterns: prudent (consisting of vegetables, fruits, soybean curd, fish, and milk), fatty (consisting of meat and fatty foods), Japanese (cooked rice for breakfast and miso soup), and salty (pickles, dried or salted fish, and salty foods).

Corresponding Author: Dr. Marion M Lee, University of California, Department of Epidemiology and Biostatistics, 185 Berry St., San Francisco, CA. 94107, USA.
Tel: 1-415-514-8117; Fax: 1-415-514-8109
Email: marion.lee@ucsf.edu

The investigators found no clear association of breast cancer risk with the fatty, Japanese or salty patterns, but they did find an inverse association with the prudent dietary pattern. In contrast, the fatty and Japanese patterns may increase breast cancer risk among obese Japanese women. Looking at dietary patterns--not just individual foods--is an area of emerging research for diet and breast cancer links. However, the meat-sweet pattern seems similar to the Western pattern that has been studied in other investigations. The Western pattern has been associated with chronic diseases such as cancer, type 2 diabetes, and heart disease, and has been defined differently by researchers.[5]

Traditional Chinese Medicine and Cultural Beliefs

Traditional Chinese Medicine (TCM) offers another dimension to food pattern analysis. The hot/cold food pattern is perhaps the most widely known medical belief system in the world.[6] In Indian culture, meat (either beef, mutton, fish, eggs, or chicken) was perceived as "hot" and the majority of vegetables were perceived as "cold" foods. Other foods like rice, yogurt, bananas, watermelon, milk, and cold drinks were also thought to be "cold." The general belief that specific foods have hot or cold properties is very common in Asian cultures, even among Asian Americans living in California.[7] This belief is in line with the Yin/Yang belief system of Traditional Chinese Medicine. For over 4,000 years, Chinese and other Asians have believed that some foods consumed in Asia are traditionally known to be either hot (yang), such as ginger, or cold (yin), such as tea, or neutral, which means the yin and yang energy in that particular food is in balance. These balanced yin/yang foods are staple foods such as rice, noodles, soy products, and pork. The concept behind yin and yang is that there are two opposing principles (yin and yang) that regulate the universe and human beings. Health is a result of a balance between yin and yang energy. Yin foods have a tendency to cool body heat and reduce tension, and yang foods have a tendency to warm the body and create tension. In TCM, cold foods are used to treat excess heat in the body and vice versa. In general, plants that take longer to grow like carrots, parsnips, cabbage and ginseng are more yang than those that grow quickly like lettuce, squash, and cucumber. Also, raw food is more yin than cooked food. Foods in blue, green, or purple colors are usually more yin than foods which are red, orange, or yellow. Linda Koo reported in 1984 that Chinese people in Hong Kong often use the TCM concept to maintain their health.[8] Traditional dietary manipulations of avoiding certain hot foods or cold foods have been used to complement Western medicine as well.

A macrobiotic diet is also based on the principle of yin/yang balance. For instance, consuming neutral foods, such as brown rice, wheat, beans, pumpkin, nuts, cabbage, and seaweed is often advocated by people who believe in a macrobiotic way of eating.[9]

Another aspect that has received little attention to date is the balance of acid and alkaline forming foods. The consumption of alkaline-forming foods may be important in buffering the fixed acid load imposed by the ingestion of foods with the potential to form acid in the body. It is possible that fruit's alkaline-forming properties mediate the body's acid-base balance. Studies from China found that the urinary excretion of calcium and acids was positively correlated with the intake of animal and non-dairy animal protein (which are acid-forming foods), but was negatively correlated with plant-protein intake.[10]

Mechanism of Action

Several studies attempt to explain the biological plausibility of the TCM food patterns. A chemical fluorometric analysis by Singaporean scientists found that some herbs with cold properties in TCM practices produce large amounts of superoxide.[11] In contrast, herbs with hot properties have scavenging activities. The electron transfer to form superoxide and the scavenging of superoxide may elucidate the phenomena of yin and yang, respectively. This is the first scientific evidence illustrating the hot/cold food belief system.

More recent reports show that the yin/yang nature of fruits could be determined by the ratio of copper, iron, and magnesium content using mathematical models.[12] Furthermore, Huang et al examined the effects of foods traditionally regarded as hot or cold on the production of PGE2, a well-known proinflammatory mediator.[13] Foods traditionally regarded as hot had a dose-dependent enhancing effect on PGE2 production. This effect was accompanied by significant induction of COX-2 protein expression, while those from cold foods significantly inhibited LPS-induced PGE2 production by the macrophage cell line.

Metabolic nutrition and nutrient interactions provide some leads in understanding how the type, amount, and timing of foods consumed may affect absorption, metabolism, and excretion in our bodies.[14] For instance, high-fat meals enhance the absorption of fat-soluble vitamins. High-protein diets increase the activity of the mixed-function oxidase system and enhance cytochrome P-450 function. And alcohol can deplete reduced glutathione with consequent effects on amino acid transport. It has also been shown that vegetarian diets are significantly more alkaline than omnivore diets. Diet-induced acidity and alkalinity could be determined by the metabolism (oxidation) of sulfur-containing amino acids and organic acid anions of alkali salts, respectively. Consumption of alkaline-forming foods may be important in buffering the fixed acid load imposed by the ingestion of foods with the potential to form acid in the body.

Implications

There are limitations to using FFQs in categorizing TCM food patterns. For instance, most FFQs are subject to recall bias. There may also be missing TCM codes for some food items thus resulting in misclassification. However, reports show that FFQs can be a useful and convenient source of dietary data for measuring dietary patterns even though the FFQ was not originally developed for dietary pattern measurement.

Studies have found that a Western dietary pattern increases the risk of heart disease and cancer, while the prudent dietary pattern with lots of legumes, fruits, cruciferous vegetables, fish, and poultry lowers the risk of heart disease and cancer. The prudent dietary pattern may be similar to the Mediterranean dietary pattern. In the

Western world, it has been consistently shown that people who adapt from a Western to a prudent diet receive all the benefits of a prudent diet.

We utilized existing dietary data collected from a case-control study of breast cancer patients in Taiwan[15] and classified dietary intake based on Traditional Chinese Medicine principles of yin and yang, hot and cold, and acid and alkaline concepts to investigate breast cancer risk. Cases were found to consume more acid forming foods and more neutral yin/yang foods than controls. Cases also consumed more quantity in the meat-sweet pattern than controls. These findings complement previously reported results that beef and pork intake increases breast cancer risk in women less than 40 years old and that dietary fat increases breast cancer risk in all women.

The TCM approach is culturally specific, and therefore, may not be applicable to non-Asian populations. More rigorous research should be conducted to explore the effect of cultural influences and TCM on dietary consumption patterns. Our ultimate goal is to design an intervention strategy for disease prevention and health promotion that is culturally appropriate for specific populations.

AUTHOR DISCLOSURES

Marion M Lee and Jennifer M Shen, no conflicts of interest.

REFERENCES

1. Kline P. An Easy Guide to Factor Analysis. New York, Routledge, 1994.
2. Fung TT, Rimm EB, Spiegelman D, Rifai N, Tofler GH, Willett WC, Hu FB. Association between dietary patterns and plasma biomarkers of obesity and cardiovascular disease risk. Am J Clin Nutr. 2001;73:61-7.
3. Gui X, Dai Q, Teng M, Shu XO, Gao YT, Zheng W. Dietary Patterns and Breast Cancer Risk in the Shanghai breast cancer study. Cancer Epidemiol Biomarkers Prev. 2007;16:1443-8.
4. Hirose K, Matsuo K, Iwata H, Tajiima K. Dietary Patterns and the risk of breast cancer in Japanese women. Cancer Sci. 2007;100:1-8.
5. McNaughton SA, Mishra GD, Stephen AM, Wadsworth ME. Dietary patterns throughout adult life are associated with body mass index, waist circumference, blood pressure, and red cell folate. J Nutr. 2007;137:99-105.
6. Manderson L. Hot-cold food and medical theories: overview and introduction, Soc Sci Med. 1987;25:329-30.
7. Harrison GG, Kagawa-Singer M, Foerster SB, Lee H, Kim LP, Nguyen T, Fernandez-Ami, A, Quinn V, Bal DG. Seizing the moment: California's opportunity to prevent nutrition-related health disparities in low-income Asian American population. Cancer. 2005;104:2962-8.
8. Koo LC. The use of food to treat and prevent disease in Chinese culture. Soc Sci Med. 1984;18:757-66.
9. Kushi LH, Cunningham JE, Hebert JR, Lerman RH, Bandera EV, Teas J. The macrobiotic diet in cancer. J Nutr. 2001;131:3056S-64S.
10. Hu JF, Zhao XH, Parpia B, Campbell TC. Dietary intakes and urinary excretion of calcium and acids: a cross-sectional study of women in China. Am J Clin Nutr. 1993;58:398-406.
11. Lin WS, Chan WC, Hew CS. Superoxide and traditional Chinese medicines. J Jethnopharmacol. 1995;48:165-71.
12. Ni L, Lin X, Rao P. Validation of a mathematical model for determining the Yin-Yang nature of fruits. Asia Pac J Clin Nutr. 2007;16:208-14.
13. Huang CJ, Wu MC. Differential effects of foods traditionally regarded as 'heating' and 'cooling' on prostaglandin E(2) production by a macrophage cell line, J Biomed Sci. 2002;9:596-606.
14. German JB, Roberts MA, Watkins SM. Genomics and metabolomics as markers for the interaction of diet and health: lessons from lipids. J Nutr. 2003;133:2078S-83S.
15. Lee MM, Chang IYH, Horng, CF, Chang JS, Cheng SH, Huang A. Breast cancer and dietary factors in Taiwanese women. Cancer Causes and Control. 2005;16:929-37.