

REVIEW

MODERN DIETARY PATTERNS BASED ON TERRITORIAL ORIGIN – A REVIEW

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Abstract

There are different dietary patterns around the globe formed on the account of various anthropogenic factors: cultural, economic and globalization. Human food consumption patterns can be formulated and defined depending on habitat. For example, since Scandinavian countries are surrounded by seas, fishery was quite developed historically, and even today, seafood constitutes a large part of daily Scandinavian food plate. On the other hand, world globalization has led to the appearance of such unhealthy food consumption patterns as unbalanced nutrition or refined product excess in a daily diet. There is a strong association between unhealthy eating habits and diseases, which means that healthy eating habits could lower a wide range of such disease emergence possibility as metabolic syndrome, type 2 diabetes, and cardiovascular diseases. The review discusses types of modern dietary patterns around the globe – their origins, main principles and effects on health, comparison of nutrient ratios among the most popular dietary patterns (Nordic diet, Mediterranean diet, Okinawa diet) and the “unhealthy” Western diet.

Keywords: Nordic diet, Mediterranean diet, Okinawa diet, Western diet

Introduction

There are different dietary patterns around the globe formed on account of various anthropogenic factors: cultural, economic and globalization.

From the biological mechanism point of view, environment which conditioned human genetic makeup, i.e., where our ancestors survived, is more favorable for descendants (Cordain et al., 2005). It is recognized that industrial revolution and globalization occurred so recently on the time-scale of evolution, that human genome cannot be fully adapted to environment (Carrera-Bastos et al., 2011; Boyd, Eaton, 1985).

The review summarizes types of modern dietary patterns around the globe – their origins, main principles and effects on health, compares nutrient ratios among the most popular dietary patterns and the “unhealthy” Western diet.

1. Nordic diet

Geographical position of Scandinavian (Nordic) countries (i.e. Denmark, Finland, Norway, Sweden) provides unique coastal climate and special light conditions (lack of sunlight in the winter and plenty of light during the summer period) for plant growth (Nordic Council of Ministers, 2008).

1.1. Food pyramid

New Nordic Cuisine Manifesto was defined in 2003 with the purpose to popularize Nordic cuisine among the world (Nordic Council of Ministers, 2008). Principles and guidelines of the New Nordic Diet were widely described in the Guidelines for the New Nordic Diet in 2012. The diet is based on three main cornerstones:

- “more calories from plant foods and fewer from meat;
- more foods from the sea and lakes;
- more foods from the wild countryside” (Mithril et al., 2011).

Compared to the traditional food pyramid, the base of ND pyramid is given to high vegetable and fruit consumption (Figure 1). Nordic diet (ND) suggests to establish the daily diet on (in descending order): fruits and vegetables (including root vegetables, wild berries and potatoes); whole grains and legumes; nuts and fresh herbs; dairy products; seafood; seaweed; free-range meat (including game); sweets, beverages etc. (Mithril et al., 2013).

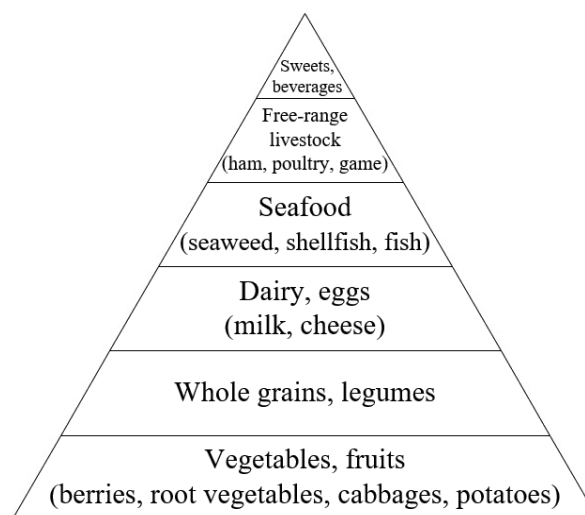


Figure 1. Nordic diet food pyramid
(made by author, based on Mithril et al., 2013)

1.2. Effect on health

High adherence to ND has been strongly associated with a positive influence on inflammation (De Mello et al., 2011; Uusitupa et al., 2013), endothelial dysfunction (De Mello et al., 2011), blood pressure reduction in people with metabolic syndrome (MetS) (Brader et al., 2014; Andersen et al., 2015).

A study in Denmark showed, that there is an evident connection between adherence to Nordic diet and risk of type 2 diabetes (T2D), which is explained by the high content of dietary fibre, which affect the level of glucose and insulin sensitivity due to low glycaemic index (GI) (Lacoppidan et al., 2015). However, two independent studies in Finland (Kanerva et al., 2014), a study in Germany (Galbete et al., 2018) and a study in Sweden (Shi et al., 2018) did not find association between Nordic diet score and T2D biomarkers.

2. Mediterranean diet

Mediterranean diet (MD) origins are found in olive tree growing areas of the Mediterranean basin, which are considered natural in all countries of the Mediterranean coast (Ighbareyeh et al., 2018; Sánchez-Villegas et al., 2018).

2.1. Food pyramid

Principles and guidelines of MD were widely described in Bach-Faig et al. (2011), focusing on nutritional aspects. Later, Dermeni et al. (2017) characterized the benefits of MD in four thematic areas:

- 1) nutrition and health;
- 2) environment;
- 3) economy;
- 4) society and culture.

According to MD principles, 1/3 to 2/3 of every meal should consist of vegetables, cereals and fruits, providing macronutrients, low GI carbohydrates and antioxidants; whole grains, legumes and dairy products are considered as the main source of protein (Figure 2).

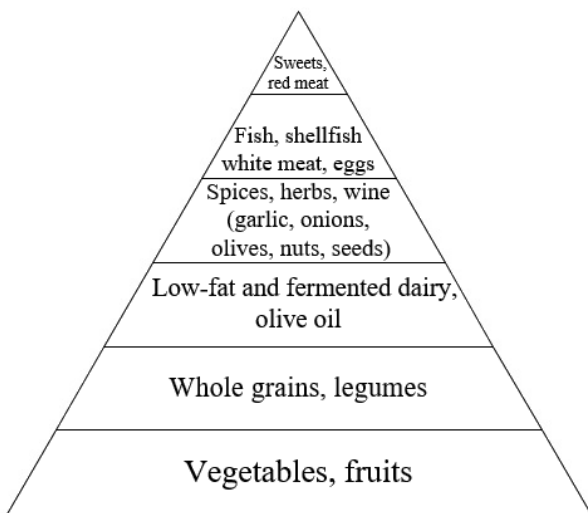


Figure 2. Mediterranean diet food pyramid
(made by author, based on Bach-Faig et al., 2011; Davis et al., 2015)

Olive oil is considered as the main source of lipids; wine and other fermented beverages are recommended as a polyphenol source (1 glass for women, 2 glasses for men daily) (Bach-Faig et al., 2011; Davis et al., 2015).

2.2. Effect on health

Numerous studies show positive effect of adherence to MD pattern regarding moderate alcohol consumption on

the risk of CVD (e.g. 40% as found by Ndlovu, Van Jaarsveld, and Caleb (2019). A 12 year follow-up study even showed that daily alcohol consumption lowers cardiovascular disease (CVD) risk for 30 to 35% for men (Mukamal et al., 2003). As reported by Ndlovu et al. (2019) the type of alcohol is not of importance, as it is ethanol which affects the density of cholesterol. MD has been recognized as a dietary pattern with strong association with the improvement of MetS risk factors, body weight reduction in particular (Shai et al., 2008; Estruch et al., 2016). A randomized controlled trial on obese postmenopausal women (n=144) with at least one other MetS criterion, showed a loss of 6.6–7.6 kg on average in 16 weeks after energy restricted dietary intervention (Bajerska et al., 2018). In the European case-cohort study high adherence to MD was found to lower possibility of T2D by 12% in comparison to individuals with low adherence to MD (Dora Romaguera, 2011). Effects of diet on T2D are affected by several factors, e.g., low-GI carbohydrates, low fat dairy, polyunsaturated fatty acids (PUFA) from vegetable oils, low red meat and processed meat intake (De Koning et al., 2011).

3. Okinawan diet

As stated by Rosenbaum et al. (2010), residents of Okinawa prefecture (most southern island chain of Japan) have a very high life expectancy compared to the rest of the world. Traditional Okinawan diet (OD) is a dietary pattern that existed in Okinawa prefecture before the globalization and westernization after World War II. It is known for a low-calorie and almost vegetarian dietary pattern, due to the specific climatic and terrain conditions (Willcox et al., 2007; Gavrilova, Gavrilov, 2012; Willcox, Willcox, 2014).

3.1. Food pyramid

OD mainly consists of vegetables and legumes, i.e. sweet potato, cabbages and soy in different variations (miso, tofu, soy milk etc.), serving as a carbohydrate and protein source (Figure 3) (Willcox et al., 2014).

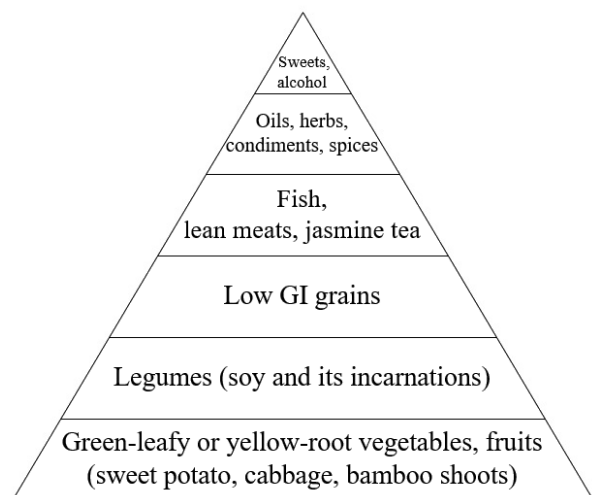


Figure 3. Okinawan diet food pyramid
(made by author, based on Willcox et al., 2014)

3.2. Effect on health

Although seemingly paradoxical, yet historically established caloric (dietary) restriction is considered to be a key factor of longevity (Gavrilova, Gavrilov, 2012). According to Willcox et al. (2007), Okinawan population have been consuming 11% less calories than it would be recommended in relation to body weight. There is a hypothesis that caloric restriction induces stress, which triggers the biological pathways that result in gene encoding which influence longevity, aiding in metabolism regulation (Willcox, Willcox, 2014).

4. Western diet

There are plenty of scientific papers connecting various chronic diseases to the so-called Western diet (WD), like cancer, CVD and diabetes that comprise MetS (Verboven et al., 2018; WHO, 2014), but what does the term Western diet actually imply?

According to WHO, overweight individuals composed a staggering 1.9 billion of all adults. The main cause of obesity is considered energy intake imbalance with energy consumption (WHO, 2018).

A study by Serra-Majem et al. (2009) showed correlation of WD with intake of red and processed meat, eggs, sauces, fast food, pre-cooked food, whole dairy products and potatoes. Several other studies associate WD with high fat and sugar consumption (Verboven et al., 2018). The breakdown of food groups in WD is given in Figure 4.

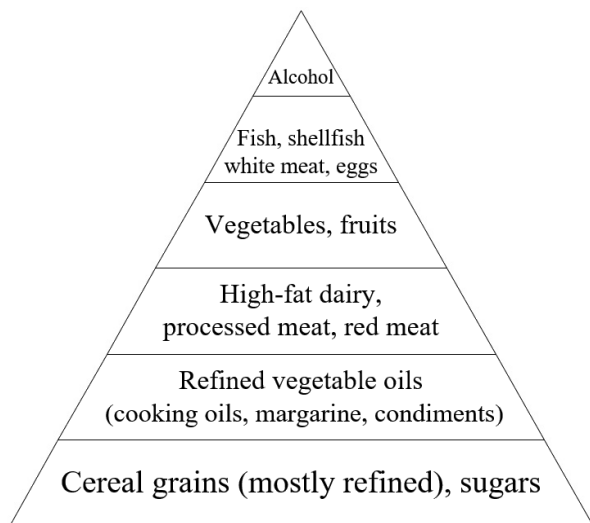


Figure 4. Typical Western diet food pyramid (made by author, based on Cordain et al., 2005)

According to data presented by Cordain et al. (2005), based on scientific papers year from year 2001 to 2004, US diet energy intake constituted of 20.4% refined grains, 18.6% refined sugars, and 17.6% refined vegetable oils.

5. Comparison

According to previously mentioned studies, dietary patterns differ in many ways, e.g. culture of food consumption, its pattern, physical activity, but especially in nutrient intake ratios and their “signature” foods.

5.1. Energy intake

According to EFSA (2017), reference intake (RI) is the amount of macronutrients needed to maintain physiological functions, usually expressed as % of daily energy intake.

The comparison of average nutrient intakes (Table 1) indicates significant variations between types of diets. While Mediterranean diet has similar amounts of carbohydrates, protein and saturated fatty acids to Western diet, average intake of fat is significantly higher. In this case, however, the type of fat is of importance. Okinawa diet shows the greatest differences compared to the rest of diets.

Table 1
Average nutrient energy intake as a percentage of total energy among presented dietary patterns

Nutrients	Types of diets				Reference intake ⁴
	ND ¹	MD ²	OD ²	WD ³	
Carbohydrates, %	51	43	85 ⁵	49.9	45–60
Dietary fibre, g	41	n.d.	n.d.	n.d.	25
Protein, %	17	13	9	15.7	10–20
Fat, %	32	42	6	34.4	20–35
Saturated fatty acids, %	10	9	2	11.6	as low as possible ^(d)

ND – Nordic diet, MD – Mediterranean diet, OD – Okinawa diet, WD – Western diet

n.d. –not defined

¹Mithril et al., 2013; ²Willcox et al., 2014; ³Paeratakul et al., 2003; ⁴EFSA, 2017

With regards to protein reference intake, the data presented in Table 1 corresponds to intake 0.80 g per kg of body weight regardless of gender.

5.2. Signature foods

The term “signature” foods first occurred in (Biltoft-Jensen et al., 2015) and can be described as foods that are characteristic to the diet (Andersen et al., 2015; Biltoft-Jensen et al., 2015).

Signature foods for previously described dietary patterns are presented in Table 2. WD pattern presents itself as an unhealthy example of dietary pattern, typical for most of modern developed countries: fried potatoes, high amount of salt, refined grain products and simple sugars (sucrose, glucose) which drastically affect blood sugar levels. ND, MD and OD dietary patterns have common food group representatives, all of them describe whole grains as the main source of dietary fibre and low-GI carbohydrates. It is recommended to consider whole grains with legumes as the main source of protein; sea products as a source for essential amino acids and PUFAs, fruits and vegetables as the main source for polyphenols and carbohydrates.

The main differences for MD in comparison to ND and OD are olives and olive oil as the source of vegetable lipids, and daily consumption of wine as the source of polyphenols. ND philosophy implies focus on wild forest foods, e.g., wild berries, mushrooms and herbs considered as a source of polyphenols; root vegetables and cabbage as a source of carbohydrates.

Signature food comparison of different dietary patterns

Food group	Types of diet			
	ND ¹	MD ²	OD ³	WD ⁴
Carbohydrate sources	Root vegetables	Vegetables	Yellow-root vegetables	–
	Cereals	Cereals	Rice	–
	Whole grain	Whole grain	Whole grain	Refined grain
	Potatoes	–	Sweet potatoes	Potatoes (deep fried)
	–*	Fruits	–	Sucrose, fructose, glucose
Vegetables and herbs	Cabbage	–	Kale, collard	–
	Mushrooms	–	Shiitake mushrooms	–
	Wild plants	–	–	–
Legumes, nuts and seeds	Legumes	Legumes	Tofu, soy, legumes	–
	Nuts	Tree nuts	–	–
	Seeds	Seeds	–	–
Protein sources	Sea products	Sea products	Sea products	–
	Game meat	–	–	–
	Poultry	Poultry	–	–
	–	Eggs	–	–
Fat sources	Sea products	Olive oil	–	Margarine, butter, cooking oils
Polyphenol sources	Herbs	Herbs	–	–
	Berries	Wine	–	–
Other	–	–	–	Alcohol
	–	–	–	Salt

ND – Nordic diet, MD – Mediterranean diet, OD – Okinawa diet, WD – Western diet

¹Andersen et al., 2015; ²Bach-Faig et al., 2011; ³Willcox, Willcox, 2014; ⁴Cordain et al., 2005

* Not defined.

OD also implies cabbages and cruciferous vegetables, i.e., kale and collard, and yellow-root vegetables. The time and serves as the main source of protein today as well. OD is high in legumes, especially in soybeans and its by-product – soymilk. Soy was common in whole Asia throughout the time and serves as the main source of protein today as well.

Conclusions

Nutrition is an important aspect in staying healthy through one's life. Therefore, chosen dietary patterns greatly affect the resistance of the human body to those chronic diseases where diet is one of the main trigger factors.

Adherence to dietary patterns with higher complex carbohydrate, polyunsaturated fatty acid, fruit and vegetable content have shown the reduction of health problems in long term. Whereas, consumption of deep fried and refined foods, high amount of salt and simple sugars is associated with such chronic diseases as metabolic syndrome, type 2 diabetes, and cardiovascular disease. Even though the residents of Mediterranean terrain and Okinawa prefecture follow dietary patterns, which suggest higher longevity and health benefits, the globalisation has had a negative effect on their dietary patterns, which now have become closer to those of the Western diet.

In order to reap maximal health benefits from nutrition, consumers should try to incorporate signature foods from Nordic, Mediterranean and Okinawa diet into their daily lifestyle instead of traditional Western diet staple foods.

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