



Effects of Fish on Human Health and Nutrient Content

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Keywords:	ABSTRACT
Fish Health Diet Nutrition Seafood	<p>Fish holds a crucial place in our diet, serving as an excellent source of minerals and vitamins for human nutrition. Renowned for its high-quality protein, minerals, vitamins, and fat content, fish is considered an outstanding food source. On average, it provides approximately 19.5 grams of protein per 100 grams. Other seafood and fish have been among the oldest food sources for humans. Consuming fish is generally part of a balanced nutrition program, supporting a healthy lifestyle. Fish are rich in omega-3 fatty acids, high-quality protein, vitamin D, vitamin B-12, minerals, low fat, low saturated fat, antioxidants, and vitamins with anti-inflammatory properties. It is known that at least 13 vitamins are essential for the human body, and a significant portion of these vitamins is found in fish, although their distribution in tissues is uneven and varies based on the fish species. Compared to land animals, fish have higher amounts of fat-soluble vitamins such as A, D, E, and K. Due to its content of essential fatty acids, fish is a vital food source for strengthening the immune system. The purpose of this study is to explain the effects of fish consumption on health and to examine fish consumption-related dietary recommendations, policies, or regulations in order to develop more effective strategies for public health. Additionally, it aims to provide guidance on fish consumption for a balanced diet program.</p>

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INTRODUCTION

The utilization of seafood in human nutrition dates back to prehistoric times. Throughout ancient civilizations, fish has been regarded as an excellent food for maintaining health. Until recent years, many consumers were unaware of the nutritional value of fish, highlighting the importance of understanding the effects of nutrients on our health and investigating food components (Ruxton et al. 2004).

With the rapidly increasing population, nutritional needs are also on the rise. In contemporary times, people strive to make optimal use of seafood to minimize nutritional problems and meet dietary requirements. Seafood is effective in balanced nutrition, easy to digest, and has high nutritional value, making fish one of the preferred food groups (Sivri et al. 2011). Scientific studies have confirmed that regular consumption of seafood and fish has positive effects on human health. Beyond being a source of protein, the main benefits of fish consumption include reducing the incidence of cardiovascular disease, decreasing the risk of sudden cardiac death, lowering the risk of high blood pressure, and reducing the incidence of depressive symptoms and Alzheimer's disease (Morales et al. 2018).

Changing consumer preferences, increased income, and technological advancements have led to a noticeable increase in seafood consumption over the last 60 years. In 2019, 72% of the consumed seafood, totaling 157 million tons, was consumed in the Asian continent. Looking at global seafood consumption, Indonesia, India, China, Japan, and the United States rank highest. Globally, in 2019, 17% of the need for animal protein was met by fish, accounting for 7% of all consumed proteins (FAO, 2022).

Fish consumption worldwide increased from 9 kg per capita in 1961 to 20.2 kg in 2020. In 2019, 75% of per capita seafood consumption came from fish, 12% from mollusks, and 13% from crustaceans. Fish consumption varies between countries due to factors such as consumer income levels and dietary culture. In low-income countries, per capita fish consumption was 5.4 kg in 2019, while in middle-income countries, it was 15.2 kg, and in high-income countries, it was 26.5 kg. Approximately 178 million tons of seafood were produced globally in 2020, with 157 million tons directly used for food supply and the remaining 20 million tons utilized in the production of various non-food items, including fish oil and fishmeal (FAO, 2022).

The contribution of a food item to the intake of specific micronutrients is influenced by both the composition of the food item and the consumption of that food item. This implies that extensively consumed foods are the most suitable targets for enrichment unless there is a significant change in dietary habits. There are substantial differences in the per capita intake of docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) between countries. DHA+EPA intake values are five times higher in fish consumers compared to non-fish consumers (Givens et al. 2008).

Nutrient Values in Fish

The chemical composition of fish varies significantly based on factors such as gender, age, species, season, and habitat. The quantity of proteins, which play a crucial role in human nutrition, in fish depends on factors such as age, species, gender, feeding environment, and the amount of fat and water in the flesh. Generally, the renewable part of the muscle contains approximately 18 to 22 grams of protein per 100 grams (Dean 1990). Unlike plant foods that contain indigestible substances like fiber or cellulose, and land animal meats that contain materials such as cartilage and nerves, which are hard to digest, fish do not contain these components. Therefore, fish is easily digestible, making it a recommended food, especially for individuals who need to be more cautious in their diet (Gorga, 1998).

Nutrients are substances that provide nourishment to the body, promote growth, and sustain body parts. Nutrients can be divided into micro and macro nutrients, both of which are vital for health. Fish contains macro nutrients such as proteins, lipids, ash, and carbohydrates. Micro nutrients like vitamins and minerals are essential dietary elements required in very small amounts and must be supplied from

external sources to the body. Fish has played a significant role in providing nutrition for many animals, including humans. It is a valuable food source with high nutritional value that enhances health. Daily consumption of fish also plays a role in preventing heart diseases. Moisture, proteins, fats, minerals, and vitamins are important micro and macro nutrients that contribute to the nutritional value of fish meat. Compared to other protein sources, the macro and micro nutrients present in fish make it a superior choice. Fish provides essential nutrients, particularly high-quality proteins and fats. Proteins and fats are the primary nutrients that determine the nutritional value of fish. Fish is an excellent food with a rich nutritional value, providing various vitamins and minerals such as vitamins A and D, magnesium, and phosphorus. The micro and macro nutrients in fish are of better quality than those from other animal protein sources. In addition to being a food source, fish also helps prevent various diseases in humans. Fish protein constitutes 15-20% of its total live body weight. Fish protein contains essential amino acids that enhance the overall nutritional quality of a mixed diet. A portion of 140g of fish can provide approximately 50-60% of the daily protein requirement for an adult human. Fish is also rich in micro nutrients that are more readily available than those from plant foods. Compared to land animals, fish are a rich source of protein and have a high content of omega-3 long-chain polyunsaturated fatty acids (Balami *et al.* 2019).

At least 13 vitamins are essential for humans, and these vitamins are found in fish. The distribution of these vitamins in tissues is irregular, and all of them are present in fish. The amount of vitamins varies depending on the fish species. Fat-soluble vitamins A, D, E, and K are abundant in fish (Pigott *et al.* 1990). Vitamins are divided into two groups: fat-soluble (A, D, E, and K) and water-soluble (B and C). Although all vitamins necessary for humans and domestic animals are present in fish to a certain extent, their quantities vary widely from species to species and throughout the year. For instance, some freshwater species like carp have low thiamine content due to their high thiaminase activity. Regarding minerals, fish meat is a valuable source of calcium and phosphorus, as well as copper, iron, and selenium. Marine fish, in particular, contains high levels of iodine. The nutritional properties of fish, including essential amino acids and proteins, are related to the quality of lipids and the content of vitamins and minerals (FAO, Fisheries and Aquaculture Department publications).

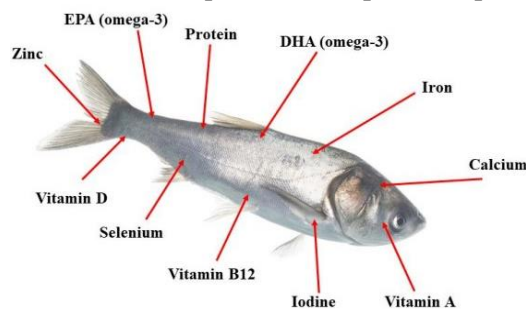


Figure 1. Beneficial effects of fish food on human health (Phogat 2022).

Fatty Acids in Fish

The nutritional content of fish is predominantly categorized into oily and lean based on its fat content. Fish classified as oily has a fat content exceeding 5%, while lean fish, as the name suggests, has a fat content of less than 2%. The majority of the fat in fish is found as triglycerides, compounds composed of glycerol and three molecular fatty acids. Triglycerides consist of fatty acids with varying carbon chain lengths, indicating the degree of saturation of fats (Pigott, 1990). Unsaturated fatty acids found in nature are named omega-9, omega-6, and omega-3, known as oleic, linoleic, and linolenic acids, respectively. Two essential fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), belonging to the linolenic series of omega-3 fatty acids, are not present in other food products and are crucial components found in seafood. These two fatty acids induce significant physiological and biochemical

changes in the body (Gordon 1992). Fats in fish are more valuable in terms of nutrition compared to fats found in land animals. Polyunsaturated fatty acids are formed by unsaturated fatty acids. Fish oil is the sole source of n-3 group fatty acids, namely EPA and DHA (Mol, 2008).

It is highly important for the prevention of various chronic diseases to maintain a specific ratio of α -linolenic acid (n-6), found in green leafy vegetables; linoleic acid (n-3), found in vegetable oils and various plants; and EPA and DHA, found in fish and other seafood, in the diet. Countries that consume abundant fish and other seafood, such as Japan and China, have a dietary ratio of linoleic acid to α -linolenic acid of 1:5, while in Western societies, this ratio is 100:1. Studies suggest that for a healthy lifestyle, the dietary ratio of linoleic acid to α -linolenic acid should be 1:5-1:10. To maintain this ratio, it is recommended to increase the consumption of fish and other seafood to 2-3 servings (450 grams) per week, as advised by the American Heart Association (AHA) (Brown, 2000).

Table 1. Fat Content in Seafood (g/100 g Edible Fish Flesh) (Pigott 1990).

<i>Type</i>	<i>Oil</i>	<i>Saturated</i>	<i>Monounsaturated</i>	<i>Very unsaturated</i>	<i>EPA</i>	<i>DHA</i>	<i>Cholesterol(mg)</i>
Herring	9.0	2.0	3.7	2.1	0.7	0.9	60
Anchovy	4.8	1.3	1.2	1.6	0.5	0.9	-
Carp	5.6	1.1	2.3	1.3	0.2	0.1	67
Mackerel	13.0	2.5	5.9	3.2	1.0	1.2	53
Tuna	6.6	1.7	2.2	2.0	0.4	1.2	38
Channel Catfish	4.3	1.0	1.6	1.0	0.1	0.2	58
Barramundi	1.6	0.3	0.3	0.6	0.2	0.2	-
Halibut	2.3	0.3	0.8	0.7	0.1	0.3	32
Pollock	1.0	0.1	0.1	0.5	0.1	0.4	71
Sole	1.2	0.3	0.4	0.2	Tr	0.1	50
Pink Salmon	3.4	0.6	0.6	1.4	0.4	0.6	-
King Salmon	10.4	2.5	4.5	2.1	0.8	0.6	-
Rainbow Trout	3.4	0.6	1.0	1.2	0.1	0.4	57
Shrimp	1.1	0.2	0.1	0.4	0.2	0.1	147
Crab	1.3	0.2	0.2	0.5	0.2	0.2	78
Oyster	2.5	0.6	0.2	0.7	0.2	0.2	47
Herring Oil	100.0	19.2	60.3	16.1	7.1	4.3	766
Salmon Oil	100.0	23.8	39.7	29.9	8.8	11.1	485
Cod Liver Oil	100.0	17.6	1.2	25.8	9.0	9.5	570

The Balanced and Adequate Nutrition Importance of Fish Oil

In a healthy diet program for humans, the calories derived from saturated fats should be less than 10%, and the calories from fats should not exceed 30%. Many people living in urban areas consume more fat than these amounts, increasing the risk of heart diseases, certain types of cancer, and diabetes (Lau et al. 1993). According to these guidelines, the recommended daily average intake should be:

Linoleic acid: Females 13.0 g, Males 17.0 g.

Alpha-linolenic acid: Females 2.0 g, Males 3.0 g.

EPA and DHA: Females 1.1 g, Males 1.4 g (Eritsland et al. 1995).

The initial focus of the heart-protective mechanism has been on serum lipids. In healthy individuals, there is a positive correlation between the decrease in triglyceride concentrations in serum and the increase in the consumption of long-chain n-3 fatty acids. Low-density lipoprotein cholesterol concentration has increased with supplements prepared with fish oil.

Fish oil affects the interaction between platelets and vessel walls, as well as lipid and lipoprotein metabolism (Prichard et al. 1995).

The Impact of Fish Meat on Human Health

Deaths due to cardiovascular diseases are the leading cause of death worldwide, although the rates vary among countries. Despite significant advances in treatment that extend patients' lives, they have not made a substantial contribution to reducing the risk of heart disease. Therefore, preventive measures termed primary prevention, which aim to prevent the onset of the disease, have gained more importance in recent years. The relationship between heart diseases and the foods consumed by individuals has long been one of the most studied topics in medicine. Studies indicate that the amount of fish consumed is effective in the development of coronary artery disease. An increase in fish consumption has been associated with a decrease in complications and deaths related to heart and vascular diseases (Çömez, 2020).

Looking at the studies conducted, regular consumption of fish has been shown to reduce the risk of heart attacks, strokes, or heart diseases. The protective effect of fish on cardiovascular health is attributed to its high omega-3 content. Omega-3 fatty acids help regulate blood pressure by reducing plaque formation in the arteries. Lowering blood pressure prevents the heart from working excessively, reducing the risk of developing cardiovascular diseases. Two important fatty acids found in fish, EPA and DHA, have been revealed to have disease-treating properties in studies. These fatty acids are essential nutrients and protect the body against conditions such as migraines, joint rheumatism, diabetes, some types of cancer, high blood pressure, high cholesterol, some allergies, and cardiovascular diseases. DHA is a structural component of the retina, brain, sperm, and testis, and its proper function is related to tissue functions. Studies have shown that the level of DHA in the tissues of premature babies is lower than that of babies born at term. Babies born without omega-3 fatty acids in their diet have insufficient development of vision and nerve tissues. Omega-3 fatty acid levels in human milk are high in women who consume fish and low in vegetarians (Nettleton, 2000). Omega-3 polyunsaturated fatty acids (PUFAs) in humans help improve many metabolic problems by reducing hypertension and plasma triglyceride levels and insulin resistance (Berry, 1997). Some studies have shown that omega-3 PUFAs can slow down the progression of prostate cancer (Rose, 1997).

Fish is important for human nutrition and highly beneficial for our health. The proteins, lipids, vitamins, and minerals found in fish are essential nutrients for a healthy life. The recommendation of dieticians for daily consumption of fish or animal protein supports the nutritious value and health benefits of fish. Consuming fish can help maintain muscle mass, aid in weight loss, and regulate appetite. Additionally, fish is rich in omega-3 fatty acids such as EPA and DHA, which are important for a healthy heart. This can be effective in preventing various health problems, including cardiovascular diseases. Overall, fish is a nutritious food source that provides essential nutrients for the body despite being low in calories. Therefore, regularly consuming fish is important for a healthy lifestyle (Mishra 2020).

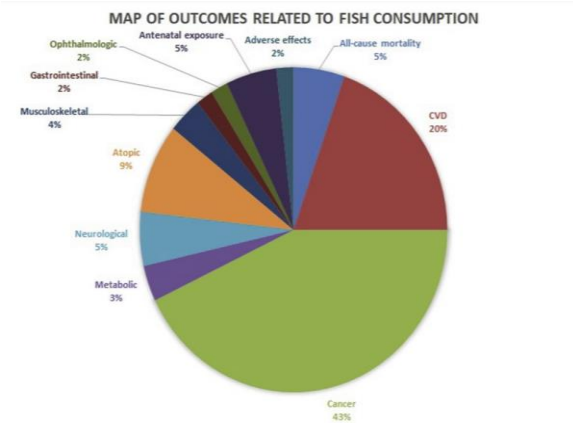


Fig. 2. Map of outcomes related to fish consumption (Li 2020).

CONCLUSION

Based on the conducted studies, it has been revealed that fish meat is highly beneficial for human health. Being a high-quality protein source, rich in omega-3 fatty acids, B-12 vitamin, D vitamin, low in fat, minerals, and antioxidants are just a few of the features found in fish. It is quite effective in preventing various diseases such as cardiovascular diseases, migraines, diabetes, rheumatic diseases, and some types of cancer. The studies suggest an increased consumption of fish and other seafood, emphasizing that it should be a primary component in a healthy diet program. Fish contains a balanced variety of nutrients while being a low-calorie food source. However, these values and benefits are often unrecognized and undervalued by people. Despite its many health benefits, many individuals are unaware of them. Therefore, it is important to educate people about the health benefits of consuming fish. Comparative studies between the consumption of meat and fish can highlight the differences, encouraging people to consume more fish. These studies can help increase fish consumption and steer people towards a healthier lifestyle.

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