



# Asian Journal of Clinical Nutrition

ISSN 1992-1470

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## Research Article

# An Analysis of Factors Affecting Fish Consumption in a Healthy and Balanced Nutrition

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## Abstract

**Background and Objective:** Seafood is rich in vitamins has a high biological value and contains a low level of fat. It is an effective source of food for people to have a balanced and healthy nutrition. In this study, the factors affecting fish consumption decisions of people were determined in terms of a healthy and balanced nutrition. **Materials and Methods:** Interviews were conducted with 380 individuals by using the proportional sampling method at the 95% confidence interval and 5% margin of error. A factor analysis was carried out to determine the behavior and attitudes of individuals affecting their fish consumption in terms of healthy nutrition. **Results:** In the study, the amount of fish consumption per person was calculated to be 14.32 kg/year. It was found that 68.42% of the fish consumed by the individuals (9.78 kg/person) were sea fish and 31.58% (4.54 kg/person) were freshwater fish. Through the factor analysis, 17 factors that were effective on fish consumption were reduced to 6 main factors that explained 76.369% of the variance. During the factor analysis, the following main factors emerged to be the significant factors in determining consumption decisions for a healthy and balanced nutrition: Healthy Nutrition and Motivation for Life, Nutritional Elements, Cardiovascular Support, Omega-3 Awareness, Consumption Preference and Economic Nutrient. **Conclusion:** It has been reiterated that fish consumption is essential for healthy and balanced nutrition and that it is important that fish is an economical product as well as being rich in nutrients. Attention should be drawn by experts to the issues that need to be considered when consuming fish as nutrition and studies should be carried out to raise awareness.

**Key words:** Healthy nutrition, balanced nutrition, fish consumption, seafood, cardiovascular support, sea fish

**Citation:** Nildem Kizilaslan, 2019. An analysis of factors affecting fish consumption in a healthy and balanced nutrition. Asian J. Clin. Nutr., 11: 9-16.

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**Competing Interest:** The author has declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

In order for cells that are the smallest building block of the body to function properly, it is necessary to consume nutritional elements daily that are obtained from nutrients such as proteins, carbohydrates, fats, vitamins, minerals and water. Consuming them adequately and on a regular basis is important for growth, continuation of life and protection of health and is defined by the concept of adequate/balanced nutrition<sup>1</sup>. In this respect, it is necessary to aim to protect the health of all individuals, restore and enhance their health, enhance the quality of their lives and adopt healthy lifestyles (healthy nutrition and physical activity habits)<sup>2</sup>.

Consumer demand for high-quality healthy food is increasing rapidly. Consumers are now drawing more attention to the harmful effects of saturated fatty acids on human health, especially of those found in animal products. The content of fat in seafood is much lower than that in farm animals<sup>3</sup>. For a healthy and balanced diet, fish is an important source of animal protein. The live weight of fish consists of 70-80% water, 17-20% protein and 2-10% fats<sup>4</sup>. The consumption of proteins of animal origin is very low especially in the developing and underdeveloped countries of the world. This protein deficit can be covered by seafood in the most economical way<sup>5</sup>.

The Second International Conference on Nutrition (ICN2) stated that "Fisheries and aquaculture should be thoroughly handled through coordinated public policies"<sup>6</sup>.

The protein value of fish is much greater than that of other foods containing protein due to the high amount of amino acids in it. Therefore, the widespread adoption of fish, which is not widespread enough in Turkey and has many equivalent and/or superior features compared to red meat, is seen important in terms of balanced nutrition of consumers<sup>7</sup>. Seafood is regarded as an important alternative to animal protein due to the fact that it is an important source of food of animal proteins<sup>8</sup>. A person should consume 70 g of protein per day for an adequate and balanced nutrition and at least half of that should be of animal origin<sup>9-12</sup>. Fish consumption is still not at the desired level in Turkey despite its known benefits on human health. Although there are differences in consumption between regions in Turkey, which has rich fishing resources, the average fish consumption of 5.49 kg per capita remains below the world and EU average<sup>13</sup>. In 2015, the average fish consumption was 20 kg per person in the world and 23 kg in the EU<sup>14</sup>.

Seafood is high in protein ratio and is easy to digest. It contains almost all amino acids found in nature. It is rich in vitamins has a high biological value and contains a low level

of fat. With such outstanding and important features, it is an effective source of food for people to have a balanced and healthy nutrition<sup>7,15,16</sup>.

For healthy living, it is important to consume animal-derived proteins within the nutritional elements in amounts recommended by nutrition specialists. For a balanced and healthy nutrition, it is beneficial to consume fish and seafood at least 2-3 times a week due to both its nutritional value and its therapeutic and preventive effects on major diseases. Nutritional habits are linked to lifestyles of individuals. Consumption patterns should be transformed by planning the lifestyle in terms of balanced and adequate nutrition and by individuals' making it sustainable. In this study, the factors affecting the fish consumption decisions of people were determined in terms of a healthy and balanced nutrition.

## MATERIALS AND METHODS

**Research time and sample:** This study was conducted from January, 2018-October, 2018. The primary data of the research material were the data obtained from consumers in Tokat/Turkey provincial center. The data were obtained through face to face interviews with the consumers using a questionnaire form arranged for the purpose of the study.

**Data collection:** The total number of questionnaires to be conducted was determined by the data obtained from the records of the Tokat/Turkey province Directorate of Census. The number of questionnaires was determined using the proportional sampling method<sup>17</sup>. Using this method, interviews were conducted with 380 consumers at the 95% confidence interval and 5% margin of error.

**Data analysis:** Likert-type scale was used to measure the factors affecting the fish consumption decisions of individuals in a healthy and balanced diet. The Likert-type scale is used to obtain information about the extent to which consumers participate in statements related to research<sup>18</sup>. Likert type scale is the ordinal-interval hybrid scale type. Such scales are actually ordinal scales. However, it is assumed that researchers have an artificially spaced-out scale for advanced statistical analysis. Basic mathematical operations such as average can be applied by means of Likert type scale<sup>19</sup>. Factor analysis is used to describe a limited number of factors that will represent the variables in the interdependence relationship within the cluster<sup>20</sup>. The main purpose of factor analysis, to make the data structures associated with each other independent and smaller in size and to classify them by

revealing the structure in the relations between variables. Moreover, it is aimed to find measurable variables with high correlation with the factors defined in the analysis<sup>21</sup>. Variables may not always be favorable for factor analysis. For factor analysis, whether or not the data set is appropriate is determined by using three methods.

- **Correlation matrix between variables:** If the correlation between the variables is low, it is unlikely that these variables take a share of the general factors. The correlations between the desired variables are high. The high correlation between the variables increases the likelihood of variables forming common factors
- **Bartlett test:** It tests the probability that there are high correlations between at least some of the variables in the correlation matrix<sup>22</sup>
- **Kaiser-Meyer-Olkin (KMO):** It used to test that these explanatory variables are subject to analysis. The KMO sampling adequacy criterion is an index used to compare the magnitude of the correlation coefficient and the size of the partial correlation coefficient. The KMO ratio should be above 0.50. Factor analysis is more appropriate as the ratio increases<sup>23,24</sup>

The square of the multiple correlation coefficient between a variable and other variables is another indication of the power of the linear relationship between variables. These values are expressed as communality<sup>25</sup>. In factor analysis, there are different criteria for determining the number of factors to be obtained<sup>26</sup>.

Eigenvalue is used in determining the number of sufficient factors. Eigenvalues (eigenvalues), values less than 1 are not taken into account. After the values are determined, rotation technique is used. The rotation technique is to simplify rows and columns to facilitate interpretation. Orthogonal and oblique methods are used in rotation technique. The factors obtained in orthogonal rotation methods are not correlated with each other. In these methods, the axes are rotated at an angle of 90° without changing their positions. Varimax rotation solution which is orthogonal technique has been used in this study. This method is based on variance maximization. It is the most widely used method. It is aimed to simplify the columns of the load matrix by maximizing the variance explained by each factor.

Various questions, each of which were arranged in the form of a 5-point likert scale were directed to the consumers included in the scope of the study in order to determine their attitudes and behaviors affecting their fish consumption<sup>18,19</sup>.

The answers to these questions were subjected to a factor analysis by using the SPSS package program and they were summarized. During the analysis of the data, as the first step, it was decided how many factors were sufficient to explain the change in their attitudes affecting fish consumption by using the principal component analysis. In the next stage of the analysis, used the varimax rotation solution method, it was determined which variables form the factors. Accordingly, the factors were named according to varimax rotation solution and interpreted according to their factor loads by taking into consideration the variables with a factor load of 0.5 or more<sup>27</sup>. The Kaiser-Meyer-Olkin (KMO) measurement was used to test the suitability of the descriptive variables for a factor analysis to be considered in the study<sup>28</sup>. The eigenvalues, variance and cumulative variance used to determine the number of factors in the initial solution of factor analysis (principal component) was calculated. According to the results of this calculation, attention was paid to select the factors with an eigenvalue that was greater than<sup>23,24</sup>.

## RESULTS

### Certain socio-economic characteristics of the individuals:

Socio-economic characteristics of the Individuals are given Table 1. In all individuals, 47.11% were female and 52.89% were male. Out of the individuals, 38.95% were elementary school graduates. According to the occupational groups, 37.89% were public servants. Considering the income status of the individuals, the proportion of the individuals with an income level of 3000 TL or more was 47.37%.

### Fish consumption status of the individuals:

Fish consumption status is given Table 2. According to the calculations, the amount of fish consumption per capita was calculated as 14.32 kg/year. The amount of consumption was above the average of Turkey. It can be said that there was a culture of fish eating. It was found that 68.42% (9.78 kg/person) of fish consumed by the individuals were saltwater fish and 31.58% (4.54 kg/person) were freshwater fish. The most commonly consumed saltwater fish by the saltwater fish consumers was anchovies with 65.77%. Out of the individuals consuming freshwater fish, 60.83% consumed trout. The maximum fish consumption was in winter with a rate of 38.16%. In reality, the demand for seafood was in two different ways. In the study, 70.26% of demand by the individuals was for fresh products and 29.74% was for processed products. A total of 48.16% of individuals consumed fish once a week.

Table 1: Socio-economic characteristics of the individuals

Parameters	Number	Percentage
<b>Gender</b>		
Female	179	47.11
male	201	52.89
Total	380	100.00
<b>Education</b>		
Elementary school graduates	148	38.95
Middle school graduates	144	37.89
Higher education graduates	88	23.16
Total	380	100.00
<b>Occupational</b>		
Public servants	144	37.89
Freelancers	68	17.89
Workers	60	15.79
Retired	50	13.16
House wives	31	8.16
Farmers	19	5.00
Unemployed	8	2.11
Total	380	100.00
<b>Income (TL)</b>		
0-1500	39	10.26
1501-3000	161	42.37
3000	180	47.37
Total	380	100.00

Table 2: Status of fish consumption

Consumption preference	Number	Percentage
Saltwater fish	260	68.42
Freshwater fish	120	31.58
Toplam	380	100.00
<b>Saltwater fish species</b>		
Anchovies	171	65.77
Horse mackerels	27	10.39
Small blue fish	22	8.46
Bonitos	18	6.92
Salmons and blue fish	9	3.46
Sea bass	7	2.69
Grey mullets and mackerels	6	2.31
Total	260	100.00
<b>Freshwater fish species</b>		
Trout	73	60.83
Catfish	34	28.34
Carp Fish	13	10.83
Total	120	100.00
<b>Consumption season</b>		
Winter	145	38.16
Summer	122	32.11
Autumn	84	22.11
Spring	29	7.63
Total	380	100.00
<b>Consumption demand</b>		
fresh products	267	70.26
processed products	113	29.74
Total	380	100.00
<b>Consumption frequency</b>		
Once a week	183	48.16
Once every 2 weeks	122	32.10
Once every 4 weeks	65	17.11
Once a year	10	2.63
Total	380	100.00

Table 3: KMO and Bartlett's test results

Kaiser-meyer-olkin measure of sampling adequacy (KMO)	Approx. chi-square	0.796
Bartlett's test of sphericity	$\chi^2$	4836.476
	df	136
	Significance	0.000

Table 4: Statistical results of the initial factor analysis solution

Factor No.	Eigenvalue	Variance	Cumulative variance
1	5.081	29.891	29.891
2	3.564	20.965	50.855
3	1.164	6.850	57.705
4	1.107	6.513	64.218
5	1.053	6.192	70.410
6	1.013	5.959	76.369

**Analysis of factors affecting fish consumption:** A factor analysis was carried out to test whether the 17 variables were collected under certain factors in order to determine the behaviors and attitudes of the individuals affecting the fish consumption in a healthy nutrition. Firstly, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of Sphericity were carried out to test whether the results of the factor analysis were useful and usable and whether the data were suitable for conducting a factor analysis. Table 3 shows the KMO and Bartlett's test results. According to the table, a KMO value of 0.90-1.00 is accepted as excellent, 0.80-0.89 as very good, 0.70-0.79 as good and 0.60-0.69 as medium. In this study, the results of the factor analysis showed that the KMO coefficient was 0.796 and that the variables were suitable for factor analysis at a very good level. Moreover, since the result of the Bartlett test was  $0.000 < 0.05$ , it was decided that the data were suitable for factor analysis.

The eigenvalues, variance and cumulative variance used to determine the number of factors in the initial solution of factor analysis were calculated and given in Table 4. These 6 factors altogether explained 76.369% of total variance.

According to the results of the factor analysis, the 6 factors were composed of the components seen in Table 5. These 6 factors were named by considering the components with a factor load of 0.5 and more.

Factor 1 was called "Healthy nutrition and motivation for life." It explained 29.891% of the variance. Factor 1 consisted of the following components: it protects against infections, improves body resistance is low in calories, is easy to digest, is a nutrient contributing to the diet, helps the brain and cells develop, improves quality of life and lowers cholesterol.

Factor 2 was named "Nutritional elements" and explained 20.965% of the variance. Factor 2 consisted of the following components: it is rich in vitamins is a major source of minerals and is an important source of protein.

Table 5: Factor analysis results

Factors and components of the factor	Factor load	Variance
Factor 1 "Healthy nutrition and motivation for life"		29.891
Protects against infections	0.820	
Improves body resistance	0.804	
Low in calories	0.777	
Easy to digest	0.763	
Nutrient contributing to the diet	0.693	
Helps the brain and cells develop	0.604	
Improves quality of life	0.558	
Lowers cholesterol	0.524	
Factor 2 "Nutritional elements"		20.965
Rich in vitamins	0.899	
Major source of minerals	0.893	
Important source of protein	0.885	
Factor 3 "Cardiovascular support"	6.850	
Supports the cardiovascular system	0.694	
Low fat content	0.597	
Factor 4 "Omega-3 awareness"		6.513
High value of omega-3	0.566	
Factor 5 "Consumption preference"	6.192	
Safer than other meat products	0.693	
Fresh and delicious	0.594	
Factor 6 "Economic nutrient"	5.959	
Cheaper than other sources of protein	0.503	

Factor 3 was named "Cardiovascular support" and explained 6.850% of the variance. Factor 3 included the following components: it supports the cardiovascular system and it has a low fat content.

Factor 4 was named "Omega-3 awareness" and explained 6.513% of the variance. Factor 4 consisted of the following component: it has a high value of omega-3.

Factor 5 was named "Consumption preference" and explained 6.192% of the variance. Factor 5 contained the following components: it is safer than other meat products and is fresh and delicious.

Factor 6 was named "Economic nutrient" and explained 5.959% of the variance. Factor 6 consisted of the following component: It is cheaper than other sources of protein.

## DISCUSSION

In this study, fish consumption and factors affecting fish consumption in a healthy and balanced nutrition were addressed. In addition, fundamental decisions were made and the factors were named and gathered under certain names. It was concluded that the individuals consumed fish because they cared about healthy nutrition as well as its being cheap compared to other products of sources of protein-even though it is just a little bit cheaper- because they considered nutritional elements.

In previous study Thilsted *et al.*<sup>29</sup> reported that fish are beneficial in terms of nutrition and health and will play an important role in sustaining healthy nutrition in the future where they are culturally appropriate. Those who consume seafood at least twice a week have been found to be statistically healthier than those who do not consume<sup>30,31</sup>. It is stated that fish is traditionally seen as an important part of a healthy and balanced nutrition and that emphasis is placed on the regular consumption of fish in national nutritional diets known as the Mediterranean diet<sup>32</sup>. They have stressed that consumers should consume 1 serving of fish (140 g) at least twice a week, according to the Food Standards Agency.

It was demonstrated that frequent fish consumption may help reduce sleep problems (better sleep quality) and enable children to benefit from long-term cognitive functionality<sup>33</sup>. As fish offers increased body resistance, it also helps to preserve the mineral balance of the body with its high levels of calcium, phosphorus and iodine. It is also possible to satisfy the body's need for vitamins A, B1, B2 and D, which increases even more in the winter season, through fish consumption<sup>34-36</sup>.

It was found that seafood is crucial in order to economically satisfy protein needs of people<sup>37</sup>. The study in Turkey has also shown that the fact that anchovies and horse mackerels are cheap and abundant in the whole black sea region during the season plays an important role in meeting the protein needs of middle-income citizens<sup>5</sup>.

Fish consumption is also known to have a positive effect on certain diseases. It has been emphasized that diet also has a vital place that underlies diseases such as heart disease, high blood pressure, diabetes and cholesterol. The remedial role of fish in these diseases has been investigated for a long time and it has been stated that positive results have been accomplished<sup>38-40</sup>. Wallin *et al.*<sup>41</sup> have investigated that how fish consumption correlates with myocardial infarction (MI), stroke and mortality in patients with type 2 diabetes, by starting off with the fact that fish consumption has a negative correlation with cardiovascular diseases and mortality. While fish consumption was associated with a lower incidence of myocardial infarction in individuals with type 2 diabetes, it had no relationship with stroke. The findings supported the current general recommendation for regular fish consumption in patients with type 2 diabetes in the high-risk group. There are certain findings indicating that fish consumption reduces the risk of death due to any cause<sup>42</sup>.

Long-chain omega-3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are essential nutrients basically found in fish<sup>43,44</sup> and fish face received increasing attention in terms of its potential health benefits from cardiovascular health to mental health<sup>45,46</sup>. It was determined that, contrary to scientific evidence, 46% of consumers are not aware that fish contains dietary fibers and less than one third of consumers are unaware of omega-3 fatty acids, which have a positive effect on human health. They have determined that the gap between consumers with low educational status and the scientific evidence is greater<sup>47</sup>. Turan *et al.*<sup>39</sup> have stated that fish from sea and fresh waters have an important and nutritious place in nutrition. They have stated that seafood, which has high digestibility among the protein sources, is very low in terms of fat content compared to other high-protein foods. It was concluded that individuals prefer fish because fish is nutritious and delicious (81%). They have found that 62% of the participants were conscious about the importance of seafood in terms of nutrition (whether it is protein rich, source of omega-3 and omega-6 and digested easily)<sup>48</sup>. It was stated in the study on seafood that, fatty acids are utilized in the prevention and treatment of certain diseases such as cardiovascular diseases, depression, cancer, coronary heart diseases, inflammation and arrhythmia, rheumatoid arthritis, inflammatory and autoimmune disorders. The human diet seriously lacks the consumption of omega-3 PUFAs, so this study recommends that nutrients containing fatty acids should be consumed more<sup>49</sup>.

They examined the effects of fish consumption behaviors of families and motivation and differences of mothers on fish consumption in rural and urban areas. The results showed that the urban families preferred fresh saltwater fish and the rural families preferred the pindang fish<sup>50</sup>. The results of the multiple linear regression analysis showed that the factors affecting the fish consumption behavior of the rural family were family size and income and that the fish consumption behavior of the urban family was significantly influenced by family size, income and preference. It has been found in the study of Akbay *et al.*<sup>51</sup> that the most important factors that are effective in the seafood consumption of families are income, education and regional differences. Other factors that are statistically significant besides these factors are family size, gender of head of family, marital status and age. In another study of Yavuz *et al.*<sup>52</sup> in Ankara, it was found that educational level and income status were two important factors that were effective in consumers' seafood choices overall. It has determined the attitudes and behaviors of the consumers in Rize province in terms of fish consumption and analyzed the factors that are effective in fish consumption. In that study, a total of 9 factors were

found to explain attitudes and behaviors in fish consumption, namely the dietary product, cultural integration, health and nutritiousness motivation, economic product, time effect in consumer satisfaction, creating a time benefit, more confidence, the effect of advertisements in consumption and saltwater fish preference<sup>53</sup>. It was reported that the rapid growth of commercial aquaculture in Bangladesh is due to a decrease in fish prices, an increase in extremely poor and moderately poor consumers and an increase in fish consumption in rural areas<sup>54</sup>.

## CONCLUSION

An adequate and balanced nutrition requires regular consumption of nutritional elements daily. According to the results of this research study, individuals stated that they consumed fish especially because fish are rich in healthy nutrition and nutritional elements. Moreover, the average fish consumption per capita was found to be 14.32 kg and above the Turkey average. This study indicated that a fish consumption habit and culture was formed in the region where the study was carried out.

## SIGNIFICANCE STATEMENT

This study is discovered that it is needed to transform individuals' consumption habits into adequate and balanced nutritional habits, it is necessary to give training on systematic nutrition in all schools starting from pre-school institutions and the training should be taught as a compulsory course in curriculum programs. Programs on television, internet, newspapers and magazines should be organized to include nutrition training and the cautions by nutrition specialists should be presented frequently. This study will help the researchers to uncover the critical areas of fish consumption in a healthy and balanced nutrition. Accordingly, considering the production potential in Turkey and the added value it can create as well as the positive aspects of fish in terms of a healthy nutrition, it is of utmost importance to conduct studies to determine the factors affecting fish consumption in Turkey and increase consumer awareness.

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