YEDITEPE UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF NUTRITION AND DIETETICS

COMPARISON OF FUNCTIONAL FOOD KNOWLEDGE - AWARENESS LEVELS AND CONSUMPTION FREQUENCIES OF STUDENTS IN A PRIVATE UNIVERSITY

MASTER THESIS

BAŞAK KARAKAYA

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SUPERVISOR

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ISTANBUL, 2019

TEZ ONAYI FORMU

Kurum : Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü

Program : Beslenme ve Diyetetik

Tez Başlığı : Bir Vakıf Üniversitesi öğrencilerinin fonksiyonel gıdalara yönelik bilgi ve farkındalık düzeylerinin ve tüketim sıklıklarının

Tez Sahibi : Başak KARAKAYA

Sınav Tarihi : 18.06.2019

Bu çalışma jurimiz tarafından kapsam ve kalite yönünden Yüksek Lisans Tezi olarak kabul edilmiştir.

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ONAY

Bu tez Yeditepe Üniversitesi Lisansüstü Eğitim-Öğretim ve Sınav Yönetmeliğinin ilgili maddeleri uyarınca yukarıdaki jüri tarafından uygun görülmüş ve Enstitü Yönetim Kurulu'nun 28/06/2019 tarih ve 2019/11-05 sayılı kararı ile onaylanmıştır.

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Sağlık Bilimleri Enstitüsü Müdürü

ii

DECLARATION

I hereby declare that this thesis is my own work, I didn't have any unethical behavior at any stage from planning to writing, I have obtained all the informations in the academic and ethical rules, all the information and interpretations obtained from other resources has been listed in the list of resources, there is no violation of patent or copyright rights.

22.07.2019

Başak KARAKAYA

iii

ACKNOWLEDGMENT

Firstly i would like to thank my thesis supervisor, Asst. Prof. Hülya DEMİR, a member of the Department of Nutrition and Dietetics in Yeditepe University, who guides me with her knowledge and experience in the planning and execution of my study, and supports me with all kinds of scientific and moral support.

Secondly, i would like to thank Ebru OSMANOĞLU, a statistical expert who helped in statistical evaluations and 1st and 4th grade students of Yeditepe University Department of Nutrition and Dietetics who helped me in my study,

Finally, I must express my special gratitude to my dear family, who all time support me with all kinds of material and spiritual,

I would like to thank the most sincere feelings.

Başak KARAKAYA

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

EU: European Union

US: United States

FOSHU: Foods For Specific Health Use

DNA : Deoksiribo Nükleik Asit

HDL: High Density Lipoprotein

LDL: Low Density Lipoprotein

GI : Glycemic Index

EFA : Essential Fatty Acids

RDA: Recommended Dietary Allowance

ALA: Alpha Linolenic Acid

EPA: Eicosapentaenoic Acid

DHA: Docosahexaenoic Acid

UK: United Kingdom

SPSS: Statistical Package for the Social Sciences

ABSTRACT

Karakaya,B.(2019).“Comparison of functional food knowledge-awareness levels and consumption frequencies of students in a private university”. Yeditepe University Institute of Health Sciences, Department of Nutrition and Dietetics. Master Thesis. Istanbul.

Food choice is not just one dimensional, but a complex human behaviour influenced by many interrelating factors. Studies show the existence of a relationship between functional food consumption and education. The increase in the level of education brings with it many behavioral changes such as healthy nutrition in food purchasing behavior, flexibility against new products. The aim of this study is to create a perspective on whether nutrition and dietetics students' knowledge and awareness levels and functional frequencies are changed with theoretical knowledge. The study consists of 1st and 4th year students in Nutrition and Dietetics Department studying in Yeditepe University. The number of students willing to participate voluntarily is 99. 55 (55.6%) of the students were in the 1st grade and 44 (44.4%) were in the 4th grade. The questionnaire used in the study was composed of 4 parts such as demographic characteristics of the students and questions about functional food, functional food sections and the section on measuring the consumption frequency, judgments about functional foods, opinions about whether to prefer functional foods. When the study is examined according to educational level, 16,4% of 1st year students and 77.3% of 4th grade students have previously heard and are familiar with the term functional food. In this case, the rate of hearing the term functional food of 4th grade students was found to be statistically significantly higher than the first year students who have not yet received sufficient academic education. When the percentages were examined, it was observed that the functional foods preference ratio of the 1st grade students was significantly lower than the 4th grade students in order to protect from the diseases such as cholesterol, blood pressure, heart diseases, diabetes and strengthen the digestive system. When the percentages of the 1st grade students were not aware of the functional foods and they did not know enough about the function of the product, the rate of not choosing was significantly higher than the 4th grade students.

Key words: nutrition, nutrition education, food preference, functional foods

ÖZET

Karakaya, B. (2019). "Bir Vakıf Üniversitesi öğrencilerinin fonksiyonel gıdalara yönelik bilgi ve farkındalık düzeylerinin ve tüketim sıklıklarının karşılaştırılması". Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü, Beslenme ve Diyetetik ABD. Master Tezi. İstanbul.

Besin seçimi birçok bağlantılı faktörden etkilenen kompleks bir insan davranışıdır. Yapılan araştırmalar fonksiyonel gıda tüketimi ile ve eğitim arasında ilişki olduğunu göstermiştir. Eğitim seviyesindeki artış gıda alışverişinde sağlıklı gıdalara yönelim ve raflardaki yeni ürünlere karşı daha açık olma gibi birçok davranış değişikliği getirmektedir. Bu araştırmanın amacı Beslenme ve Diyetetik bölümünde okuyan öğrencilerin fonksiyonel gıdalara yönelik bilgi ve farkındalık düzeylerinin ve tüketim sıklıklarının teorik bilgiyle değişip değişmediğine yönelik bir bakış açısı oluşturmaktır. Çalışma Yeditepe Üniversitesi Beslenme ve Diyetetik Bölümü 1. ve 4.sınıf öğrencileri arasında yapılmıştır. Araştırmaya gönüllü olarak katılmayı kabul eden 99 öğrencinin 55'i (%55.6) 1.sınıf iken, 44'ü (%44.4) 4.sınıftır. Çalışmada kullanılan anket öğrencilerin demografik özelliklerini belirlenmesine yönelik ve fonksiyonel besin hakkında bilgi soruları, fonksiyonel besinin yer aldığı tüketim sıklığını ölçmeye ait kısım, fonksiyonel besinler ile ilgili sağlık iddalarına yönelik yargılar ve fonksiyonel besinleri tercih edip etmeme sebepleri gibi 4 bölümden oluşturulmuştur. Yapılan çalışma eğitim seviyesine göre incelendiğinde, 1.sınıf öğrencilerinin %16.4'ünün, 4.sınıf öğrencilerinin ise %77.3'ünün göre fonksiyonel gıda terimini daha önceden duyduğu ve aşina olduğu gözlemlenmiştir. Bu durumda 4.sınıf öğrencilerinin fonksiyonel gıda terimini duyma oranı, henüz yeterli düzeyde akademik eğitimi almamış 1.sınıf öğrencilerinden anlamlı düzeyde yüksek bulunmuştur. Yüzdelere bakıldığında 1.sınıf öğrencilerinin fonksiyonel gıdaları merak ettiği /ilgi duyduğu, kolesterol, tansiyon, kalp hastalıkları, diyabet gibi hastalıklardan korunmak ve sindirim sistemini güçlendirmek için tercih etme oranının, 4.sınıf öğrencilerinden anlamlı düzeyde düşük olduğu görülmüştür. Yüzdelere bakıldığında 1.sınıf öğrencilerinin fonksiyonel gıdaları üründen haberdar olmadığı ve ürünün işlevi hakkında yeteri kadar bilgisi olmadığı için tercih etmeme oranının, 4.sınıf öğrencilerinden anlamlı düzeyde yüksek olduğu görülmüştür.

Anahtar kelimeler: beslenme, beslenme eğitimi, besin seçimi, fonksiyonel gıdalar

1.INTRODUCTION AND PURPOSE

In recent years, due to reasons such as globalization, commercialization, population growth and urbanization, it has paved the way for significant changes in consumer demand for food products (1). Increasing healthy lifestyles, health problems and high treatment costs for this purpose to turn to natural food sources every day in the food industry to provide new products to the market (2). Functional foods are one of the fastest in the market in this new product chain. Functional foods, as well as the nutritional requirements of the components they contain, as well as health, including biological elements, which can be effective in protecting the disease, which can have a negative impact on the life function of the items that are free of quality and improve the quality of food (3). The concept of functional food first emerged in order to overcome the problems caused by the inadequate natural resources of Japan and to provide sustainable and good nutrition. The functional nutrients that the Japanese called FOSHU (Foods For Specific Health Use) began to be discussed in the USA in the early 1990s and in Europe in the mid-1990s. The US, Japan and EU countries both produce and consume approximately half of the functional food market.

There is no complete consensus on the definition of functional food. Because all foods are considered functional food because of the energy and nutrients they contain(4). While the functional food market in the world is expanding, the most remarkable market area has been the probiotic products market. functional food industry in Turkey; milk and milk products, margarines, fruit juices and nectars, biscuits / crackers and herbal teas, food groups come forward (5). Recently, companies have been developing new products at a great speed and launching functional food products one after the other. The area covered by this category on the market shelves is rapidly expanding and product variety is increasing (4). There are many reasons why consumers have a positive approach and buy into functional foods. Consumers no longer treat a disease rather than taking measures to prevent it more important than in the past. In addition, consumers have begun to become more aware of the relationship between functional nutrients and their health, with the scientific evidence of the multifaceted benefits of functional nutrients (2).

Distinctly from other similar studies, participants were chosen only from nutrition and dietetics students who are receiving special nutrition education. The sample of the study consists of 1st and 4th grade students to analyze educational level difference because 1st grade students are expected to receive less nutrition education and 4th grade students are expected to receive more nutrition education in comparison with 2nd and 3rd grades. The purpose of this study is to create a perspective on whether nutrition and dietetics students' knowledge-awareness levels and consumption frequencies are changed with nutrition educational level.

2.GENERAL INFORMATION

2.1. Description of Functional Food Concept

In last decade; As a result of changing production and consumption motives due to globalization, commercialization, population growth and urbanization, there have been significant changes in consumer demand for food products. People prefer to achieve healthier and higher quality of life depending on their knowledge and behavior, and prefer to take preventive measures instead of treating their health problems in order to increase their life and quality. Functional foods, although not yet agreed upon for functional foods, are generally nutritional foods, as well as health-enhancing foods that are beneficial to health and that are similar to traditional foods whose appearance is consumed on a daily basis. They are foods that are produced by the addition of bioactive substances obtained from natural foods to the foods we consume in our daily life and they are not synthetic. In order for a food to be functional, it must have factors such as bioactive compounds, probiotic microorganisms and prebiotic substances, and these factors must be adequately sent to the relevant region of the body. The effect of the bioactive compound should not be confused with the elimination of the symptoms of the disease caused by its deficiency, but due to its benefit from its basic function (6).

Each sector uses a different definition of functional food from regulatory bodies to experts in the field of nutrition. Functional food according to the Canadian Health Authority; Functional nutrient appearance may resemble a traditional food. It can be consumed as part of an ordinary diet, its physiological benefits have been demonstrated, or it can be used to reduce the risk of chronic disease beyond the basic nutritional functions (4). The Turkish Food Law also defines functional foods as nutritional effects, as well as health and clinically proven foods that have a protective or corrective and / or disease risk reduction effect depending on one or more effective components (6).

According to the definition of the European Union Functional Foods Commission;

- The drug, should not be in the form of capsules or any dietary support
- Effects should be approved by the world of science
- In addition to being adequate in terms of nutrition, it should have positive effects on one or more functions in the body and / or reducing the risk of disease,
- It should be part of the normal food consumption model.

Despite this recognition in 2001, it was accepted that functional foods in Japan could also be in the form of pills and capsules. In Japan, products are sold in the form of pills or capsules in the context of nutritional supplements or dietary supplements (7).

Definitions of common functional nutrients recommended by various organizations (4);

- Functional nutrients are part of the usual diet.
- Functional foods are in food form.
- Functional nutrients contain a substance or bioactive that provides the well-being of one or more functions in the body or has the effect of reducing the risk of disease.
- The drug is not in the form of capsules or any dietary support.
- Its impact must be approved by the world of science.

2.2. Types of Functional Foods

Functional food products can be segmented into two main categories: functional ingredients, which are used in finished end-products that have functional benefits and finished end products themselves, comprising food products that claim or offer functional benefits to consumers.

Based on ingredient, the market has been segmented as follows(8):

- Proteins & amino acids
- Phytochemical & plant extracts
- Fibers & specialty carbohydrates
- Omega fatty acids
- Carotenoids
- Probiotics- Prebiotics
- Vitamins
- Minerals

Based on source, the market has been segmented as follows:

- Natural
- Synthetic

Based on application, the market has been segmented as follows:

- Food
- Beverages

Table 2.2.1. Major classes and examples of functional foods (31)

Classes of Functional Foods	**Active Ingredient / Fortificant**
Functional Beverages	Dietary fiber, Probiotics, Prebiotics, Minerals, Vitamins, Antioxidants
Functional Bakery Products	Dietary fiber, Minerals, Vitamins, Antioxidants
Functional Dairy Products	Minerals, Vitamins, Bioactive peptides, Probiotics, Conjugated linoleic, Dietary fiber
Functional Meat Products	Low sodium, Dietary fiber, Bioactive peptides, Probiotics, Conjugated linoleic acid, Antioxidants
Functional Fruits&Vegatables Product	Minerals, Vitamins, Probiotics, Antioxidants, Dietary fiber
Functional Confectionery	Dietary fiber, Antioxidants, Phytosterols, Probiotics & Synbiotics

Functional foods;

- A natural food containing a functional factor (rich tomato producing lycopene, beta-carotene storage carrots etc.)
- Functional agent added (iodized salt, omega-3 fatty acid egg, calcium-enriched orange juice, etc.) or
- Foods without a harmful compound (sodium reduced salt, etc.)
- Some compounds in food have been modified (yoghurt-protein bioactive peptide etc.)
- Functional food can be produced by increasing bioavailability (lycopene in processed tomato products)(9).

2.3. History of Functional Food Concept

Although it is a newly recognized concept in the world, BC. Traditional Chinese medicines and medical herbs have been intertwined since the 1000s. Functional foods, which have been used to prevent and treat diseases for long years, have been remarkable with the rapid growth trend in recent years. Functional food concept has emerged in Japan in 1980s. In the 1990s, the Food for Specified Health Uses (FOSHU) concept that has a positive effect on health, physical performance and mental status of the individual has emerged in Japan. The first functional food production in Japan in the 1980s and the first to enter this market, Japan produced nearly half of the market, while keeping the half of the global market for many years (2). The interest in functional foods in Japan has raised awareness on the need for these products in the United States and Europe. Since the 1990s, the use of the term functional food has become widespread all over the world, thanks to the claims of health benefits and prevention of diseases, and the large number of research studies conducted by scientists and nutritionists, the functional food market has developed rapidly (10).

2.4. Functional Food Components and Their Benefits for Health

2.4.1. Proteins

Proteins are large macromolecules, consisting of one or more long chains of amino acid residues. The physical and chemical properties of a protein are

determined by its constituent amino acids. Proteins are essential nutrients for the human body cause they are associated with all forms of life in living systems and serve crucial functions in essentially all biological processes. They function as catalysts, they transport and store other molecules such as oxygen, they provide mechanical support and immune protection, they generate movement, they transmit nerve impulses, and they control growth and differentiation Their importance lies in the fact that every cell in the body is partly composed of proteins, which are subject to continuous wear and replacement (11).

They are one of the building blocks of body tissue and can also serve as a fuel source. As a fuel, proteins provide as much energy density as carbohydrates: 4 kcal (17 kJ) per gram; in contrast, lipids provide 9 kcal (37 kJ) per gram.

Humans can synthesize about half of the amino acids needed to make proteins. Other amino acids, called the essential amino acids, must be provided in the diet. These are ten essential amino acids, arginine, valine, methionine, threonine, phenylalanine, histidine, isoleucine, lysine and tryptophan. Proteins that provide all the essential amino acids in about the right proportions for human nutrition are called complete proteins. Examples of complete proteins are those in meat, fish, milk, and eggs. Proteins that are severely deficient in one or more of the essential amino acids are called incomplete proteins. Plant proteins are generally incomplete. Beans, peas, and other legumes have the most complete proteins among the common plants, but they are deficient in methionine (12).

The amount of protein required in a person's diet is determined in large part by overall energy intake, body weight and composition, rate of growth in the individual, physical activity level, the individual's energy and carbohydrate intake, and the presence of illness or injury. The protein/amino acids requirement for a healthy young adult is 0.75-0.8 g/kg of body weight supposing complete amino acid solution or the first class protein and adequate energy supply. During illness and convalescence intakes of 1–1.5 g/kg are desirable and have proved beneficial also in the elderly (13).

Amino acids, peptides and proteins are important constituents of food. They supply the required building blocks for protein biosynthesis. In addition, they directly

contribute to the flavor of food and are precursors for aroma compounds and colors formed during thermal or enzymatic reactions in production, processing and storage of food. Proteins also contribute significantly to the physical properties of food through their ability to build or stabilize gels, foams, emulsions and fibrillar structures.

Whey proteins are becoming an important ingredients in the recipe of many functional foods because of the unique amino acid composition and bioactivity (14). Protein enrichment occurs for various reasons: protein concentration in the raw material may be too low for certain purposes, the sensory characteristics of the material (color, taste) may not be acceptable, or undesirable constituents may be present. Enrichment results from the extraction of the constituents (protein concentrate) or from extraction and subsequent separation of protein from the solution, usually through thermal coagulation or isoelectric precipitation (protein isolate). Protein concentrates and protein isolates serve to enhance the nutritional value and to achieve the enhancement of the above mentioned physical properties of foods (12). Whey proteins based commercially available food products include sports supplements, low fat dairy desserts, medical foods, infant formulations and geriatric foods. They are added, sometimes after modification to traditional foods, such as meat and cereal products, but they are also used in the production of novel food items such as meat, fish and milk substitute (14).

2.4.2. Carotenoids

Carotenoids are one of the most important natural pigment sources with structural diversity and unlimited functions. Carotenoids, although the main source of plants and fungi can be synthesized by many bacteria. Carotenoids are pure multiple hydrocarbons containing carbon and hydrogen atoms, including acidic lycopene, β, α, γ carotene. The carotenoid compounds consist of a 40-carbon central skeleton by aligning eight isoprenoid units of 5 carbons side by side. Carotenoids are pigments in almost all high plants, in many microorganisms, in red and green algae, in photosynthetic bacteria and fungi, to give them natural colors in yellow-red tint and are synthesized by the parts of photosynthetic microorganisms or plants that play a key role for metabolism. The main carotenoids of green leaf plants are lutein, violaxanthin, cryptoxanthin and β carotene, while the main carotenoids in the fruits

are β carotene, lycopene and different xanthophylls. Palm oil rich in carotenoids (0.05-0.2%) contains mostly α-carotene and β-carotene. Egg yolk only contains xanthophyll especially lutein, zeaxanthin and cryptoxanthine (0.3-8 mg / kg)(15).

Carotenoid compounds not only give color to the product they are in, but also have a strong antioxidant activity and some show provitamin A activity. The main biological effects of these properties are lipid peroxidation, the pathogenesis of atherosclerosis, DNA oxidation and the potential protective role against cancer (4).

Carotenoids can demonstrate the ability to prevent cancer by many mechanisms of action. One of these mechanisms is antioxidant activity. Animal studies have shown that antioxidants destroy the effects of free radicals that damage DNA and are effective in the initial stage of cancer. In many studies, carotenoids with provitamin A activity such as β-carotene, carotenoids such as lycopene, xanthaxanthin, lutein, astaxanthin, fucoxanthine, as well as provitamin A activity, have been found to have an antioxidative effect, thus preventing cancer formation. As a result of the study, it was found that lycopene or β-cryptoxanthine did not have much effect on lung cancer, but the high risk of ß-carotene, α-carotene and lutein decreased significantly.

It was stated that high levels of lycopene in plasma could significantly reduce the risk of pancreatic and prostate cancer. Consumption of tomato-based foods rich in lycopene, it is stated that there is more chance of decreasing prostate cancer risk in men over middle age, and there is a negative relationship between serum lycopene level and risk of bladder, pancreas and digestive system cancers (16).

2.4.3. Phenolic Compounds

Phenolic compounds are those containing one or more hydroxyl groups, including functional derivatives linked to an aromatic ring. Phenolics are the most active natural antioxidants, antioxidant effects of free radicals, binding with metals and chelates to form and inhibit lipoxygenase enzyme are realized. Phenolic substances in vegetable foods; lignans, phenolic acids, stilbenes and flavonoids. Phenolic acids and flavonoids are important antioxidants.

Some of the phenolic compounds are effective in the formation of the taste of fruits and vegetables, especially in the formation of two important taste elements such as bitterness and acridity in the mouth. Some of them provide yellow, yellow-brunette, red-blue shades of fruits and vegetables. They cause various problems such as enzymatic browning in the processing of fruits and vegetables. These properties are extremely important for fruits and vegetables and the products obtained from them. Fruits are considered as functional food because of their positive effects on health due to their antioxidative and antimicrobial effects. Phenolic compounds are also called bioflavonoids because of their positive effects on nutrition physiology. In some sources, they are called P factor (permeability factor) or vitamin P (17).

2.4.3.1 Flavonoids

In general, fruits, vegetables, nuts and products prepared with these foods are found. Flavonodes can be subdivided into six main subgroups according to the changes in the C-ring: flavones, flavanols, flavanones, catechins, anthocyanidins and isoflavones.

The main dietary sources of flavonoids are broad and contain different groups. Flavonols; (quercetin, myricetin, kaemferol) is found in a large amount of plant foods and in vegetable leaves, apples, onions, broccoli and blackberries, raspberries are found. Flavones; (apigenin and luteolin) and anthocyanidins are found in small amounts in cereals, herbs and vegetable leaves. Catechins; (epicatesin, catechin) tea, apples, grapes, chocolate and red wine is very common. Flavonones; (naringenin and hesperetin) citrus fruits and the fruits of this fruit is very much. Isoflavones; (daidzein and genistein) are found in soy-based foods and soybeans (18).

Flavonoids are important because of their role as free radical scavengers, regulating enzyme activities, inhibiting cell proliferation, antibiotics, antiallergen, antidiarrheic, antiulcer and antiinflammatory drugs (19).

Many studies have shown that flavonoids act as protective against neurodegenerative diseases, gout, hemorrhoids and periodontal diseases such as heart diseases, eye diseases, Alzheimer's or Parkinson's disease (4).

2.4.3.2. Phenolic Acids

Phenolic acids are generally not free in viable plant tissues, are hydrolyzed during the processing of plants and are divided into hydroxysinamic acids and hydroxybenzoic acids. Phenolic compounds make up glycosides by compounding with glucose in living tissues such as leaves, flowers and fruit. The amounts of phenolic acids in fruits vary according to the degree of maturity of fruits. Fruits and vegetables that contain the main phenolic acid are nuts, nuts such as nuts, carrots, cherries, cherries, apples, strawberries, raspberries, broccoli, oranges, tomatoes and whole grains. It has an active role in control of enzymatic activities, prevention of formation of nitrosamines and elimination of blood lipid level imbalances (20).

2.4.4. Dietary Fibers

The dietary fiber, which is not digested in the human small intestine, but is completely or partially fermented in the large intestine, is examined under two groups as water-soluble and water-insoluble. Insoluble fibers in water; lignin, cellulose and water-insoluble pentosans, while water-soluble fibers; water-soluble pentosans, pectins and gums. The nutrients contain a mixture of both soluble and insoluble pulp. A nutrient that is a good source of soluble pearl may also contain some insoluble pus. For example; fruits and vegetables contain pectin (soluble) and cellulose (insoluble). However, fruits contain mostly pectin and vegetables contain cellulose. Dietary fiber is one of the food components resistant to digestive enzymes, mainly found in cereals, fruits and vegetables (21).

Pectin: Pectin is high in fruits and vegetables and low in grains. It is a polysaccharide which forms a gel in all plants, especially fruits. Pectin is a cement-like task that forms the body of the fruit and helps it maintain its shape. As the fruit matures, it breaks down into pectin monosaccharides and softens the fruit (22).

Resin / Gum: Chewing gum and gum are the dense gel forming fibers such as pectin that hold plant cells together. Gums known as plant secretions are used for preserving textures in foods due to their high viscosity and gel formation properties.

Cellulose: Cellulose is a linear structure consisting of β, 1-4 linked glucose units in myofibrils in the walls of plant cells. Cellulose polymers combine with strong

interactions of intracellular and extracellular hydrogen bonds to form fiber bundles. Cellulose is present in 30-40% of the cell wall of many fruits and vegetables, while in some cell walls of cereal grains it is only 2in4%. Cellulose is generally associated with structural components such as hemicellulose and pectin

Hemicellulose: Polysaccharide showing a different structure from plant to plant. Plant cell walls are mixed with cellulose. Whole grain products etc. The grain layer of many cereal grains as in the products are rich in hemicellulose.

Lignin: These compounds are complex polymers which are found only in certain cell types. Although they are very low in plants, they are important because they are protective against the formation of cancer in the large intestine. The lignin plant in the wood gives additional strength and hardness to the cell wall. Lignin is a polymer consisting of phenylpropanoid units formed with polysaccharides in plant cell walls and has phenolic and aliphatic effects (23).

Dietary fiber is sufficient to maintain healthy life and to prevent some diseases. To maintain a healthy life and to protect against diseases, dietary fiber should be taken from natural foods. In large-scale epidemiological data, dietary fiber has an effect on many diseases. It is known that serum cholesterol levels are lower and deaths from cardio-vascular diseases are lower in societies with high consumption (pp (especially soluble)). Glycemic index of foods with a high fiber content are low and such dietary nutritional supplements help diabetic individuals to control their blood glucose levels. It has been observed that it prevents the concomitant disorders. It also supports the theory that it is protective against colon cancer. Dietary fiber (soluble pulp) has been shown to be beneficial in the prevention of colon cancer from the large intestine by changing the large intestinal flora positively, reducing the proliferation of harmful bacteria, carcinogenic effect, and reducing the time of contact with the intestinal cell.

Consumption quantities for dietary fiber for different ages and special conditions have not been determined yet. However, for healthy adults over 20 years of age, daily intake of 10 g or 10-3013 g of dietary fiber for every 1000 calories per day is recommended (21).

2.4.5. Polyoles (Sugar Alcohols)

Sugar alcohols (polyols) are low-calorie, carbohydrate-based sweetening agents which are as sweet as sugar in the same amount and contain less energy. Common sugar alcohols are sorbitol, mannitol, xylitol, erythritol, isomalt, laktilol, hydrogenated starch hydrolysates and maltilol. They are found naturally in many fruits and vegetables. Their characteristic is that they are less digestible because they are not fully digested in the small intestine and are fermented in the colon. The sweetness of sugar alcohols varies from 25% to 100% of the sweetness of sucrose. Polyols are also called "calorie reduced" sweeteners because they contain less calories than sucrose. While the calories released from the sucrose are 4 kcal / g, the calories in sugar alcohols range from 1.5 to 3 kcal / g. Sugar alcohols are often used in products such as candies, sugary chewing gum, frozen foods, flavored jams, jelly, baked foods, ice cream, chocolate and milk desserts. Dietary and diabetic products are used in most of the sugar alcohols. Another advantage of polyols is that the mouth does not adversely affect tooth decay as it does not use bacteria as a food source. Apart from the other polyols, xylitol has been reported to prevent caries, and in particular, xylitol is preferred in chewing gum. In contrast to synthetic sweeteners, polyols have a positive effect on microbiota and act as a prebiotic (24,25).

2.4.6. Herbal Sterols and Stanols

Plant sterols and stanols, which are the main building blocks of the plant cell membrane, are similar in structure to cholesterol and are not produced by the body. While cholesterol is predominantly from animal origin, sterols and stanols are naturally found in fruit, vegetables, nuts, various seeds, vegetable oils and various plants (26). Phytosterols, which are available from all vegetable origin foods as a natural component in nutrition, are now added to various foods as functional food components. They are usually mixed with commercial foods such as yogurt and margarine, which are functional foods. Addition to various foods as functional food components is an important development for increasing the consumption of phytosterol in human nutrition. Because of its positive effects on human health due to dietary phytosterols (plant sterols and plant stanolls), which are not synthesized in the human body, they are currently the focus of scientific research. Studies have shown that plant stanols and sterols reduce total and LDL-cholesterol and do not affect HDL-cholesterol and triglyceride levels. As a result, plant sterols and stanols can be used

and recommended in addition to drug therapy, especially in cases where cholesterol should be reduced moderately. Antibacterial, antifungal and anti-ulcer effects of phytosterols against certain types of cancer are also known (27).

2.4.7. Phytoestrogenes

Plant-derived estrogens or compounds that have an estrogen-like effect are called phytoestrogens herbal. Phytoestrogens, which have different degrees of estrogenic activity, enter the race with the natural estrogens found in the organism and show activity by binding to receptors. Phytoestrogens behave differently according to estrogen levels. It acts as estrogen-like at low estrogen level and as estrogen at high estrogen level. When they act as estrogen agonists, they act like endogenous estrogens, which in turn produce estrogenic effects. In antagonist activities, they may render the estrogen receptors that they bind to, thereby causing antiestrogenic activity. Many health-promoting effects of phytoestrogens such as anticancer effect, prevention of hormone-dependent diseases, positive effects on osteoporosis and cardiovascular diseases are known (28).

The most important phytoestrogens that have come to the forefront in the light of recent scientific research are isoflavones in the soy. In addition to the beneficial effects of soybean, there are also studies showing that harmful effects may be present when consumed excessively. The use of phytoestrogen depends on various factors such as the metabolism, disease and age of the patient and it is important that the dosage, the way of use and the duration of the use are controlled. Food and Drug Administration is recommended by The American Heart Association and other health organizations as a result of studies on the consumption of foods containing soy and soy (29).

Endocrine Disrupting Chemicals (Endocrine Disrupting Chemicals-EDCs), defined as endocrine disrupters in the class and genistein in the soy, is a substance with estrogenic effect and may cause some pathologies in the reproductive system is emphasized. High levels of estrogen have been shown to increase the growth of breast canal cells and the risk of breast cancer due to the majority of breast cancer. It is concluded that soybean consumption should be avoided during pregnancy and excessive consumption of soy in adult period may adversely affect the reproductive

system. The studies conducted have different results and further studies are needed (30).

2.4.8. Isothiocyanates

Isothiocyanates, which are the product of decomposition of glucosinolates, are a group of phytochemicals containing sulfur. Cruciferous vegetables such as broccoli, cauliflower, cabbage, radish, brussel sprouts are rich in these phytochemicals (31). Because they are naturally found in foods, they are affected by high temperature cooking methods. They reduce the risk of some types of cancer (breast, lung, liver, esophagus, stomach, small intestine and colon). Helicobacter Pylori bacteria, which is effective in the development of gastric cancer, can be killed by sulforaphan (4).

2.4.9. Probiotics, Prebiotics, Synbiotics

2.4.9.1. Probiotics

The term probiotic, which consists of two parts as pro and biota, means ”for life” and is the opposite of the term antibiotic. Probiotics are defined as foods that contain beneficial bacteria for beneficial to health when taken orally in sufficient quantities. The positive effects of probiotic microorganisms on human health were first introduced in 1908 by the Nobel laureate Russian researcher Elie Metchnikoff. Russian researcher Metchnikoff noticed that Bulgarian villagers lived longer years ago, and when he investigated this, he saw that people were consuming plenty of yogurt, when he examined the yogurt, he encountered live bacteria and named them Lactobacillusbulgaricus. Generally probiotics are Lactobacillus, Bifidobacterium, Streptococcus species, which are usually of the family Lactic bacteria (32).

The probiotic, beneficial-friendly bacteria have been consumed with nutrients in Asia and the Middle East for thousands of years, and they also use fermented dairy products for the treatment of gastrointestinal diseases. Although it is frequently consumed in Asia and the Middle East, it does not attract such a degree of interest in the scientific community and society in the western world.

Probiotic foods; Fermented milk products in culture or added (yogurt, fermented milk, cheese, buttermilk, butter), baby milk or food, added to fruit juices,

ice cream, margarines, drug capsules, cachets are found in powder form. Probiotic bacteria are often associated with dairy products because they act as a buffer against gastric acid and are likely to survive until they reach the intestines.

Probiotics should have the following characteristics;

• It should be harmless and reliable.

• It should contain a high percentage of live microorganisms. (108 cfu / ml-g)

• Be able to survive and maintain metabolic activity in the gastrointestinal tract. It should be able to colonize the intestine for a short time.

• Must be able to adapt to natural microflora.

• Must be able to stimulate the immune system.

• Be able to produce antimicrobial agents.

• The carrier must be able to remain viable throughout the shelf life of food (108 CFU / ml-g).

• It should be safe to add to the foods and use in the clinic.

• It should not adversely affect the taste of the added product (33)

Probiotics are effective by producing inhibitory substances against harmful microorganisms (bacteriocins, organic acids, etc.), by breaking down their toxins, which can be transformed into carcinogenic and mutagenic compounds by making food competition difficult to hold. Probiotics are also beneficial to the general health by producing compounds (vitamins, bioactive peptides, immunoglobulin proteins) useful for the body and the immune system.

2.4.9.2. Prebiotics

Prebiotics; In the upper gastrointestinal tract, it can reach the large intestine without digestion and there are some bacteria or bacterial groups (friendly bacteria) proliferation, stimulating the activity is called nutrients. Major prebiotics are substances such as inulin, fructooligosaccharides and β-glucan. In addition, these substances are also found in the beneficial physiological effects in the colon. Many fruits and vegetables (localization, onion), cereals (wheat, oats) and legumes (soybean) contain prebiotics (6).

2.4.9.3. Synbiotics

Products created by the use of probiotics and prebiotics are called synbiotics. With the synbiotic application, the life of probiotic bacteria is prolonged and they colonize the colon better. The aim of the synbiotic products is to obtain a useful agent for both the small intestine and the large intestine. In vitro studies have shown that a synbiotic administration alone is more avantic than prebiotic or probiotic (33).

2.4.10. Long Chain Essential Fatty Acids

Fats, which are essential food components and have an important role in human nutrition, are not only high energy sources, they contain fat-soluble vitamins, they combine with proteins to form lipoproteins and their effects on health are very important. Physical, chemical and nutritional properties of fatty acids; The number of carbon atoms in the molecule is determined by the degree of saturation, the number of double bonds between the carbon atoms and the position of the hydrogens bonded to the carbon atoms. Fatty acids are divided into two main groups as saturated and unsaturated. Fatty acids containing more than one double bond; polyunsaturated fatty acids and essential fatty acids. EFAs are polyunsaturated fatty acids and are divided into omega-3, omega-6 and omega-9 fatty acids (34).

EFAs cannot be synthesized in the human body, so food must be taken from outside. They are also called good fats and are known to be essential for nutrition as well as having a significant effect on biochemical and physiological changes in the body. It is widely accepted as part of modern nutrition because of its beneficial effects on metabolism. They fight against trans fats and cholesterol known as bad fats. They increase HDL, known as good cholesterol, and help lower LDL, which is bad cholesterol (35).

The absence of essential fatty acids plays a role in inflammatory diseases, especially in cardiovascular diseases, neurological, neuropsychiatric diseases, cancer and chronic diseases (such as diabetes, arthritis, colitis) (36).

2.4.10.1. Linolenic Acid (Omega-3)

Linolenic acid, which is classified as omega-3 fatty acid, is found in oily fish such as certain vegetable oils (flaxseed oil, walnut oil), green leafy vegetables, beans and nuts, mackerel, mackerel, trout, herring, tuna and salmon fish. Omega 3 fatty acid types;

- alpha linolenic acid (ALA),
- eicosapentaenoic acid (EPA) and
- docosahexaenoic acid (DHA).

ALA is found in vegetable oils, while EPA and DHA are abundant in fish oil. Omega-3 fatty acids are useful for strengthening the immune system, reducing LDL cholesterol with serum triglycerides and reducing the risk of blood clotting.

2.4.10.2. Linoleic Acid (Omega-6)

Linoleic acid, which is classified as omega-6 fatty acid, is found in vegetable oils such as corn oil and soybean oil, which contains a high percentage of linoleic acid, in grains, meat and seeds of many plants. It has been shown to play an important role in the prevention of cardiovascular diseases and it is necessary for the development of brain and nerve.

The US, the National Institutes of Health, recommended that EPA-DHA, alpha linolenic acid and linoleic acid daily intake be 650 mg, 2.22 g and 4.44 g respectively.

2.4.10.3. Oleic Acid (Omega-9)

Unrefined raw olive oil, avocado, almond, peanut, sesame oil, pecan, pistachio, pistachio, hazelnut, canola oil, hazelnut oil, hazelnut oil and flax seed oil are the main sources of ω-9. Oleic acid reduces the risk of heart attack and arteriosclerosis and helps to prevent cancer (35).

2.4.11. Vitamins and Minerals

2.4.11.1. Vitamins

Vitamins are organic compounds that are not synthesized in the body, stimulating significant reactions in cell metabolism with very small amounts required

for life. Because most of the vitamins cannot be made by the body, nutrients must be taken(37). Adequate intake of vitamins is necessary to maintain normal growth and health. The recommended dietary allowance (RDA) of vitamins is based on the intake of vitamins and minerals to provide the lower limit of serum or blood reference values of American and Canadian populations. However vitamin deficiency is not very common, if the long-term intake with diet is below these values, the deficiency should be eliminated by taking the missing vitamins or mineral drugs (38).
Vitamins are divided into two groups as oil and water-soluble vitamins.

1. Fat-soluble vitamins: A, D, E, K
2. Water-soluble vitamins: C and B group

2.4.11.1.1. Oil Soluble Vitamins

2.4.11.1.1.1. Vitamin A

Vitamin A melts in oil, is heat resistant. Not available as a single compound. Retinol is found in several forms as retinal and retinoic acid, all of which are called retinoids. It is mostly found in foods such as milk, butter, carrot, tomato and apricot. In case of deficiency, the skin is in dry and rough condition, deterioration of the epithelial tissue in the eye, drying and deterioration of the protective layer, niktalopia (night blindness), breathing, hardening in the skin and urethral tract, tooth formation disorders and nervous degeneration are seen (37).

2.4.11.1.1.2. Vitamin D

Vitamin D contains up to 10 different compounds, but the most important ones are D2 (Ergocalciferol) and D3 (Kolekalsiferol) vitamins. The human needs vitamin D in two ways:
1. Foods
2. Vitamin D provitamines called calciferols in the skin layer of the body are converted to vitamin D by the effect of sunlight (UV).

7-dehydrocholesterol, which is synthesized and stored in leather exchange, is converted to D3 by the effect of the sun's UV rays and this is the biggest source of vitamin D. Due to this feature, vitamin D is also known as solar vitamin. Limited

exposure to the sunlight and limited intake of vitamin D with daily diet are among the most important reasons lying behind vitamin D deficiency(39). Although no consensus has yet been reached on the optimal level of serum 25 (OH) D, most experts describe values below 20 ng / ml (50 nmol / l) as deficiencies. Serum 25-Hydroxyvitamin D level is ks10 ng / ml; severe deficiency is 10-20 ng / ml; the deficiency is 20-30 ng / ml; moderate deficiency or inadequacy, ≥30 ng / ml; if it is enough, 40-50 ng / ml; ideal, if> 150 ng / ml; is considered toxic

Although it is not found enough in natural foods, it is still nutritional sources; in fish liver oils and egg yolk, milk and butter. Vitamins D accelerate the absorption of calcium and phosphate ions from the intestines and thus help the calcification of the bones. As vitamin D deficiency decreases the absorption of calcium and phosphate, the bones are softened and as a result, a disease called rickets is seen in children (40).

2.4.11.1.1.3. Vitamin E

People, because they can not synthesize vitamin E in their bodies with lipids from the outside of the body. Since there are sufficient amounts of dietary foods, the symptoms of insufficiency are not common in humans. Egg, liver, kidney animal; oily seeds, cereal grains (embryos), vegetable oils, oilseeds (nuts, walnuts) are rich in vitamin E in the grain and dried legumes (37).

Vitamin E is the major chain-breaking antioxidant in body tissues and is considered to defense the body against lipid peroxidation, protecting cell membranes at an early stage of free radical attack. The most important duties of vitamin E in health are preventing or minimizing free radical damage associated with cancer, cardiovascular disease, premature aging, cataracts (41).

2.4.11.1.1.4. Vitamin K

K1 and K2 are found in two natural vitamin K.K2 vitamin is also produced by bacteria in the intestine in the body. Since it is an effective vitamin in the blood clotting, it is named after the initial letter of coagulation. Vitamin K is found to be sufficient in our daily food and in the large intestine is made by bacteria. Main sources of liver, cheese, butter, spinach, parsley, alfalfa, lettuce, cabbage, green tea

such as green leafy vegetables and herbs; dried legumes, coffee and cereals. Vitamin K is necessary for the synthesis of the substance that provides blood clotting in the liver (42).

2.4.11.1.2. Water Soluble Vitamins

2.4.11.1.2.1. Vitamin B1(Thiamin)

Vitamin B1 is needed for energy metabolism, so people who consume more carbohydrates need more. Vitamin B1 is not a vitamin that is stored in the body. It is therefore necessary to be taken in daily nutrition. Plant sources of vitamin B1; cereals, dried beans, walnuts, nuts, nuts, nuts, nuts, such as nuts, green vegetables and brewer's yeast, animal sources of meat, offal (liver, heart, brain and kidneys), eggs and milk (37)

2.4.11.1.2.2. Vitamin B2 (Riboflavin)

Vitamin B2 was first obtained from milk and was therefore called lactoflavin. Riboflavin is named after other foods. In our body, the most concentrated place of riboflavin is the liver and kidneys. The liver contains 1/3 of the amount of riboflavin. The richest sources; liver, kidney, meat, fish, milk and dairy products, such as eggs, animal foods, brewer's yeast, peanuts, green leafy vegetables and dried legumes(43). Cereals are not rich in riboflavin. In riboflavin deficiency, there are mouth cracks in the mouth, vascularization in the eyes, cataract and laryngitis and skin inflammation (38).

2.4.11.1.2.3. Vitamin B3 (Niacin, Nicotinamide, Nicotinic Acid, PP Vitamin)

The niacin in the food is either free or dependent on proteins. It is free in animal tissues and legumes. However, cereals are also dependent and therefore the biological usefulness of niacin in grains is lower.

2.4.11.1.2.4. Vitamin B5 (Pantothenic Acid)

Since pantothenic acid (vitamin B5) can be found in both animal and vegetable sources, it is derived from the Greek word "pantos" which means "everywhere" and its deficiency is not seen much. Pantothenic acid is an important group B vitamin since it enters the composition of Co A, which initiates the krebs ring that provides

energy from the protein, fat and carbohydrates. The main sources; Meat, liver, kidney, egg, milk, cauliflower, cabbage, and vegetables (44).

2.4.11.1.2.5. Vitamin B6 (Pridoxine)

Vitamin B6 is found in foods in three forms: pyridoxine, pyridoxamine and pyridoxal. They can turn into each other in the body. Pridoxin is found in vegetable foods and pridoxamine and pridoxal are found in animal foods.

2.4.11.1.2.6. Vitamin B9 (Folic Acid)

Folic acid comes from the word “folium inden which means Latin leaf. It is a vitamin B group that plays a role in nucleic acid synthesis with aminoacid metabolism. The body absorbs folic acid better than natural folate.

Mammalian cells cannot synthesize folic acid. Therefore, it is compulsory to purchase from outside. The richest sources; liver and other organ meats, red meat, trout, eggs, green vegetables, tomatoes, nuts, oranges. Fruits, corn, yeast, dried legumes are also sources of folic acid. Folic acid, which is a synthetic form, is added to enrich the nutrients and is used as a vitamin supplement (45). Folate deficiency; malnutrition, digestive disorders, alcohol and smoking and depression can occur in situations such as. In cases where cell division and metabolism, such as pregnancy, growth and cancer, are accelerated, the folate requirement of the body increases (46). Folate deficiency prevents the organism from maintaining its important metabolic activities and causes various disorders. Particularly, its participation in DNA synthesis is very important in terms of the development of babies and adolescents in the early stages of pregnancy. In the case of low serum folate levels during pregnancy, it was determined that normal cell functions were impaired due to the limited availability of folic acid to the cells of the embryo, and that the proliferation was limited as a result of the neural tube defect (45).

2.4.11.1.2.7. Vitamin B12 (Cyanocobalamin)

Vitamin B12, which is the most complex in the group B vitamins, is the most complex structure. This structure is also called cobalamin or cyanocobalamin because it contains cobalt in its structure.

Vitamin B12 is essential for the maturation of blood cells, the normal functioning of the nervous system, and acts as a coenzyme in chemical reactions involved in DNA synthesis. Vitamin B12 is found in foods of animal origin. It is not found in plant foods. It is abundant in liver, kidney, heart, shellfish. Red meat, fish, skimmed milk, eggs are also considered good sources. Vitamin B12 is also produced in the large intestine by beneficial bacteria (44,47).

Although there are enough vitamin B12 to meet the body's needs, especially in animal origin foods, vegetarian diet, autoimmune or parasitic diseases, drugs, absorption disorders, gastrointestinal surgery and transcobalamin II deficiency can cause vitamin B12 deficiency which is a common health problem in our society and in the World (48).

2.4.11.1.2.8. Vitamin C (L-Ascorbic acid)

Vitamin C is a water-soluble antioxidant vitamin and is the cofactor of many enzymes. Its chemical name is L-Ascorbic acid. It is easily oxidized by contact with air, it dissolves in water, it is sour taste, its color becomes darker in contact with light, it is a heat-resistant vitamin (49). It is usually found in green vegetables and limongiller. The best sources are green leafy vegetables, oranges, lemons, peppers, parsley, strawberries, blackberries, rosehips, tomatoes.

Thanks to its antioxidant properties, it reacts with free radicals and protects the cell membrane from damage and supports the immune system. It facilitates the passage of iron and folic acid, which is necessary for the production of blood in the body, to the blood and increases the absorption and use of the iron taken in food and thus prevents anemia. Keeps the bones and gums healthy. Vitamin C also keeps Vitamin C, connective tissues together, increases collagen synthesis and retards aging. It has a negative effect on the growth of cancer cells.

The daily need for vitamins is 75-90 mg. In childhood, in the period of rapid growth, during pregnancy and lactation, in the period of febrile illness increases. Since vitamin C is not a store, it should be balanced with daily nutrients.

Vitamin C deficiency develops bleeding in the gums, decreases in body resistance and scurvy in children. Excessive urine excretion. It can lead to stone formation, diarrhea and allergic skin symptoms (37).

Table 2.4.11.1.1. Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes,Vitamins(50)

Life Stage	Vitamin A	Vitamin C	Vitamin D	Vitamin E	Vitamin K	Thiamin	Riboflavin	Niacin	Vitamin B6	Folate	Vitamin B12	Pantothenic Acid	Biotin	Choline
Group	(µg/d)	**(mg/d)**	**(µg/d)**	(mg/d)	**(µg/d)**	**(mg/d)**	**(mg/d)**	(mg/d)	**(mg/d)**	(µg/d)	**(µg/d)**	**(mg/d)**	**(µg/d)**	(mg/d)
Infants														
0–6 mo	400*	40*	10*	4*	2.0*	0.2*	0.3*	2*	0.1*	65*	0.4*	1.7*	5*	125*
6–12 mo	500*	50*	10*	5*	2.5*	0.3*	0.4*	4*	0.3*	80*	0.5*	1.8*	6*	150*
Children														
1–3 y	**300**	**15**	**15**	**6**	30*	**0,5**	**0,5**	**6**	**0,5**	**150**	**0,9**	2*	8*	200*
4–8 y	**400**	**25**	**15**	**7**	55*	**0,6**	**0,6**	**8**	**0,6**	**200**	**1,2**	3*	12*	250*
Males														
9–13 y	**600**	**45**	**15**	**11**	60*	**0,9**	**0,9**	**12**	**1**	**300**	**1,8**	4*	20*	375*
14–18 y	**900**	**75**	**15**	**15**	75*	**1,2**	**1,3**	**16**	**1,3**	**400**	**2,4**	5*	25*	550*
19–30 y	**900**	**90**	**15**	**15**	120*	**1,2**	**1,3**	**16**	**1,3**	**400**	**2,4**	5*	30*	550*
31–50 y	**900**	**90**	**15**	**15**	120*	**1,2**	**1,3**	**16**	**1,3**	**400**	**2,4**	5*	30*	550*
51–70 y	**900**	**90**	**15**	**15**	120*	**1,2**	**1,3**	**16**	**1,7**	**400**	2.4h	5*	30*	550*
> 70 y	**900**	**90**	**20**	**15**	120*	**1,2**	**1,3**	**16**	**1,7**	**400**	2.4h	5*	30*	550*
Females														
9–13 y	**600**	**45**	**15**	**11**	60*	**0,9**	**0,9**	**12**	**1**	**300**	**1,8**	4*	20*	375*
14–18 y	**700**	**65**	**15**	**15**	75*	**1**	**1**	**14**	**1,2**	400i	**2,4**	5*	25*	400*
19–30 y	**700**	**75**	**15**	**15**	90*	**1,1**	**1,1**	**14**	**1,3**	400i	**2,4**	5*	30*	425*
31–50 y	**700**	**75**	**15**	**15**	90*	**1,1**	**1,1**	**14**	**1,3**	400i	**2,4**	5*	30*	425*
51–70 y	**700**	**75**	**15**	**15**	90*	**1,1**	**1,1**	**14**	**1,5**	**400**	2.4h	5*	30*	425*
> 70 y	**700**	**75**	**20**	**15**	90*	**1,1**	**1,1**	**14**	**1,5**	**400**	2.4h	5*	30*	425*
Pregnancy														
14–18 y	**750**	**80**	**15**	**15**	75*	**1,4**	**1,4**	**18**	**1,9**	600j	**2,6**	6*	30*	450*
19–30 y	**770**	**85**	**15**	**15**	90*	**1,4**	**1,4**	**18**	**1,9**	600j	**2,6**	6*	30*	450*
31–50 y	**770**	**85**	**15**	**15**	90*	**1,4**	**1,4**	**18**	**1,9**	600j	**2,6**	6*	30*	450*
Lactation														
14–18 y	**1,2**	**115**	**15**	**19**	75*	**1,4**	**1,6**	**17**	**2**	**500**	**2,8**	7*	35*	550*
19–30 y	**1,3**	**120**	**15**	**19**	90*	**1,4**	**1,6**	**17**	**2**	**500**	**2,8**	7*	35*	550*
31–50 y	**1,3**	**120**	**15**	**19**	90*	**1,4**	**1,6**	**17**	**2**	**500**	**2,8**	7*	35*	550*

2.4.11.2. Minerals

Minerals are inorganic substances commonly seen in nature. Minerals are needed for the growth and development of the body, the maintenance of life and the protection of health. About 4% of the human body forms minerals. These are found in the body in salts, compounds or ionic form. Minerals with a daily requirement of more than 50 mg are called macrominerals and those underneath are called microminerals (trace elements).

1. Main macrominerals: calcium (Ca), phosphorus (P), potassium (K), magnesium (Mg), sodium (Na), chlorine (Cl)
2. Main microminerals (trace minerals): iron (Fe), zinc (Zn), iodine (I), selenium (Se), copper (Cu), manganese (Mn)(38).

2.4.11.2.1. Calcium (Ca)

The name of calcium comes from the word calx which means lime in Latin and it is the fifth most abundant element on the earth. Milk and milk products are the best source of calcium. The absorption of calcium in milk and its products is high. Egg yolk, cereals, dry legumes and oil seeds are also good sources of calcium.

Adequate calcium intake is important for healthy skeletal and dental development in infants and young people, and for the protection of bone and dental health in adults, the risk of fracture of the bones for elderly people or prevention of osteoporosis (44).

2.4.11.2.2. Phosphorus (P)

Phosphorus is the most common chemical element in human body after calcium. Phosphorus, calcium and protein-rich foods are common. Although phosphorus is found in almost every food, the richest source is organ meat, egg, seafood, milk and milk products with high protein content. People who are sufficiently fed for calcium and protein are also fed enough for phosphorus. Phosphorus; It is found in the structure of the enzymes involved in the metabolism of nutrients and formation of bones and teeth together with calcium and is required for cell operation.

2.4.11.2.3. Magnesium (Mg)

Magnesium is the fourth most common mineral in the body. It is also considered as the iron of plant world when it is located in the structure of chlorophyll which gives green color to plants (44). Dried legumes, oilseeds, unrefined cereals and dark green leafy vegetables are important sources of magnesium. Magnesium is a cofactor for more than 300 enzymes in the body, although there is very little in the body, it is necessary for biochemical reactions (51).

2.4.11.2.4. Sodium (Na) -Potassium (K) and Chlorine (Cl)

Sodium, potassium and chlorine are essential minerals for human health. They are important and vital ions that play a role in many physiological and pathophysiological events in the body (52). Na, K and Chlorine are found in all body fluids and tissues. Na and Chlorine are primarily in the extracellular fluid and blood plasma; potassium is mainly present in the cell. 2% of the body mineral content is sodium, 5% is potassium and 3% is chlorine. Sodium, chlorine and potassium are found in all body fluids and tissues. The most important tasks of these elements in the body body balance, acid-base balance and muscle work is to provide. Salt is the most basic source of sodium and chlorine. In addition, each nutrient contains sodium in certain proportions. Potassium needs can easily be met with a diet where milk, meat, cereals, fresh vegetables and fruits are sufficiently taken. Minerals are excreted from the body with urine, feces and perspiration. Therefore, in the case of severe diarrhea and vomiting, when exposed to heat or after a heavy training, these minerals should be replaced with sweating (37, 53). Studies have shown that the ratio of sodium and potassium to each other and its balance are important on blood pressure. It was found that the increase in potassium balanced the high sodium level and thus affected blood pressure (54).

2.4.11.2.5. Iron(Fe)

The iron symbol is Fe and it is a very important mineral for healthy life. An adult human body has an average of 3-5 grams of iron. Most of the iron is found in hemoglobin in blood and red blood cells. It is the building block of hemoglobin, myoglobulin, cytochrome and many enzymes carrying oxygen in blood. It plays a role in brain development and immune system. Iron deficiency anemia due to iron

deficiency is one of the most common and known diseases in the world. It is involved in biochemical oxidation in cells (38).

Iron is found in both animal and vegetable foods. Meat, chicken, fish and offal, iron form is called both-iron. The iron in these nutrients is so called hemoglobin and myoglobin. The dark red color in animal tissues provides hemoglobin. As the color of the flesh becomes darker, the amount of hem-iron increases. Because of the lack of hemoglobin in plant-derived foods, the iron form in their structure is both non-iron. Dried legumes, dried fruits (especially raisins, dried apricots, dates), molasses, green leafy vegetables, nuts, pistachios, sesame, tahini, molasses are both non-iron rich in foods such as. Heme iron is highly bioavailable (15%-35%) and dietary factors have little effect on its absorption, but absorption of nonheme iron is much lower (2%-20%) in the body. If iron intake is limited or inadequate because of poor dietary intake, iron deficiency anemia may ocur (55).

2.4.11.2.6. Zinc (Zn)

Zinc, which has important physiological effects on plants and animals and plays a role in many biological functions, is one of the essential trace elements and is a micronutrient that is important in human nutrition. Zinc is the second most common trace element in the human body after iron and is necessary for the function of more than 300 enzymes in the body. Lack of zinc is a common element among people with low socio-economic levels, and zinc deficiency is a common problem in countries dominated by grain-based nutrition. Symptoms such as retardation of growth, deficiency of sexual organs, lack of resistance to certain diseases, late healing, taste and odor are observed in the low intake and deficiency of zinc (56,57).

Table 2.4.11.2.1. Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Minerals(50)

Life Stage	Calcium	Chromium	Copper	Fluoride	Iodine	Iron	Magnesium	Manganese	Molybdenum	Phosphorus	Selenium	Zinc	Potassium	Sodium	Chloride
Group	**(mg/d)**	**(µg/d)**	**(µg/d)**	**(mg/d)**	**(µg/d)**	**(mg/d)**	**(mg/d)**	**(mg/d)**	**(µg/d)**	**(mg/d)**	**(µg/d)**	**(mg/d)**	**(g/d)**	**(g/d)**	**(g/d)**
Infants															
0–6 mo	200*	0.2*	200*	0.01*	110*	0.27*	30*	0.003*	2*	100*	15*	2*	0.4*	0.12*	0.18*
6–12 mo	260*	5.5*	220*	0.5*	130*	**11**	75*	0.6*	3*	275*	20*	**3**	0.7*	0.37*	0.57*
Children															
1–3 y	**700**	11*	**340**	0.7*	**90**	**7**	**80**	1.2*	**17**	**460**	**20**	**3**	3.0*	1.0*	1.5*
4–8 y	**1**	15*	**440**	1*	**90**	**10**	**130**	1.5*	**22**	**500**	**30**	**5**	3.8*	1.2*	1.9*
Males															
9–13 y	**1,3**	25*	**700**	2*	**120**	**8**	**240**	1.9*	**34**	**1,25**	**40**	**8**	4.5*	1.5*	2.3*
14–18 y	**1,3**	35*	**890**	3*	**150**	**11**	**410**	2.2*	**43**	**1,25**	**55**	**11**	4.7*	1.5*	2.3*
19–30 y	**1**	35*	**900**	4*	**150**	**8**	**400**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.5*	2.3*
31–50 y	**1**	35*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.5*	2.3*
51–70 y	**1**	30*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.3*	2.0*
> 70 y	**1,2**	30*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.2*	1.8*
Females															
9–13 y	**1,3**	21*	**700**	2*	**120**	**8**	**240**	1.6*	**34**	**1,25**	**40**	**8**	4.5*	1.5*	2.3*
14–18 y	**1,3**	24*	**890**	3*	**150**	**15**	**360**	1.6*	**43**	**1,25**	**55**	**9**	4.7*	1.5*	2.3*
19–30 y	**1**	25*	**900**	3*	**150**	**18**	**310**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.5*	2.3*
31–50 y	**1**	25*	**900**	3*	**150**	**18**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.5*	2.3*
51–70 y	**1,2**	20*	**900**	3*	**150**	**8**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.3*	2.0*
> 70 y	**1,2**	20*	**900**	3*	**150**	**8**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.2*	1.8*
Pregnancy															
14–18 y	**1,3**	29*	**1**	3*	**220**	**27**	**400**	2.0*	**50**	**1,25**	**60**	**12**	4.7*	1.5*	2.3*
19–30 y	**1**	30*	**1**	3*	**220**	**27**	**350**	2.0*	**50**	**700**	**60**	**11**	4.7*	1.5*	2.3*
31–50 y	**1**	30*	**1**	3*	**220**	**27**	**360**	2.0*	**50**	**700**	**60**	**11**	4.7*	1.5*	2.3*
Lactation															
14–18 y	**1,3**	44*	**1,3**	3*	**290**	**10**	**360**	2.6*	**50**	**1,25**	**70**	**13**	5.1*	1.5*	2.3*
19–30 y	**1**	45*	**1,3**	3*	**290**	**9**	**310**	2.6*	**50**	**700**	**70**	**12**	5.1*	1.5*	2.3*
31–50 y	**1**	45*	**1,3**	3*	**290**	**9**	**320**	2.6*	**50**	**700**	**70**	**12**	5.1*	1.5*	2.3*

2.5. Functional Food Market and Product Trends in the World

Food choice behaviour is driven by the optimisation of both nutrition and enjoyment derived from food choices. However, food choice is not just one dimensional, but a complex human behaviour influenced by many interrelating factors. Nowadays consumers are driving the demand for products that aim to promote better health, increase longevity and prevent the onset of chronic diseases. Health-conscious consumers demands fresh, real, avoidance of certain substances, inclusion of positives, high quality, close to the farm, and, for some, ethical practices or humane treatment (58). According to Sloan (2006) top 10 Trends in the sector of functional foods (59):

➢ Children at risk: a growing number of children are struggling with obesity, high blood pressure and three types of diabetes. The future challenge is to develop healthier foods for children.

➢ Low-calorie foods: in order to avoid obesity, consumer awareness of the importance of low-calorie foods and drinks is growing.

➢ Phytochemicals: sales of antioxidants in the USA increased by 20% in 2007. Four out of every ten consumers say that they eat fruit and vegetables to avoid getting ill.

➢ Multiple benefits: Functional foods are expected to solve several issues at the same time. They have to be effective in the case of obesity, to prevent the development of high cholesterol levels and to develop protection against heart diseases.

➢ Healthy fats: due to the growing popularity of omega-3 fatty acids, consumers are opting for Functional Food Marketing – The Hungarian Market Case 45 healthier oils. They avoid the consumption of unhealthy types of fat.

➢ Mature matters: in almost every affluent society the population ages and the number of elderly people is growing. Their demand for functional foods is increasing.

➢ Gl, gluten and grains: low GI products will gain more and more popularity in the future. Gluten-free products will become more common in restaurants. The multifaceted health benefits of whole-grain products are gaining universal recognition.

➢ Natural solutions: sales of organic food are expected to increase.

➢ Boosting performance: a lot of consumers are very concerned about their energy level and eat functional food to gain extra energy

➢ Fun favourites: almost every consumer expects healthier versions of their favourite foods, such as beverages made with 100% real fruit juice and calorie-burning soft drinks.

Advances in food and medical science as well as changing consumer demand, acceptance and demographics are fueling growth in functional food market in the worldwide. The main market for functional foods is Asia Pacific. Revenues for the field of functional foods in Asia and the Pacific islands constitute as much as 34% of total revenue worldwide. This is not surprising, given that Japan alone is one of the main markets for functional foods. The population in Japan is aging faster than in any other part of the world. Senior consumers are more interested in maintaining a healthy lifestyle, willing to spend money on products which are benefial for health. The aggregate of Asia Pacific covers a vast territory, which includes the various countries where the market for functional foods is growing rapidly, as, for example, China, South Korea and Malaysia. For this reason, the revenues for the field of functional foods in the Asian countries are so crucial in the world.

The second largest market in the world is the North America, substantially consisting of the U.S. and Canada. These two countries alone reach 25% of total revenue worldwide. Especially in the U.S. government focuses on preventing food properties and spends a lot of money on research in this field. Their marketing is favored by a legislative approach as well as a very permissive advertising. In addition to that the growth of the sector is boosted by the size of the territory and the population. These factors contribute to the high revenue.

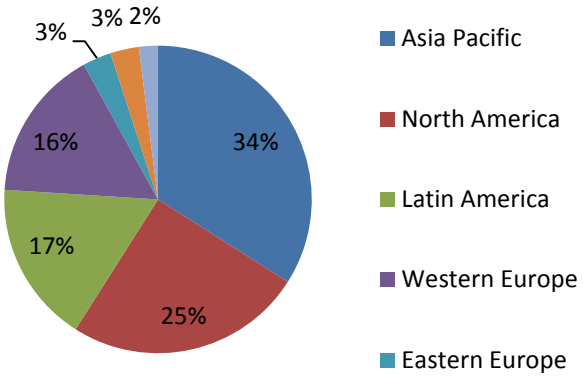

Figure 2.5.1. Percentage breakdown of total revenue worldwide (60)

The demand for functional foods in Europe changes from country to country. It is affected by culture and culinary tradition. It is clearly seen that there are differences between functional food consumers' percentage across the European countries. Functional foods are more popular in the Central and Northern European countries when compared to Southern European countries. Western Europe has a wide range of functional foods. The variety of functional foods is able to meet the specific needs of particular groups of consumers. This has led to the development of a profitable market, which is 16% of total revenue worldwide. The main market of functional foods in the Western Europe is UK with 20% of total revenues, followed by Germany with 14% and France with 13%, Spain with %12 Italy with 11% of total revenues respectively.

In South America, the term and production of functional foods are "new".Although the marketing of functional foods in South America started very recently the revenues for this sector are really high which make up 17% of total revenue worldwide. Therefore functional food market seems very promising in South America (60,61).

Howaver Turkey's functional food market size is still low compared to European countries, it has increased in past years. It is determined that functional food market in Turkey in 2007 reached 420 million TL by growing 18.3% compared to the previous year and captured the %20 growth rate in 2010. Between 2012 and 2017, growth rate was highest in Turkey compared to important international markets (62, 63).

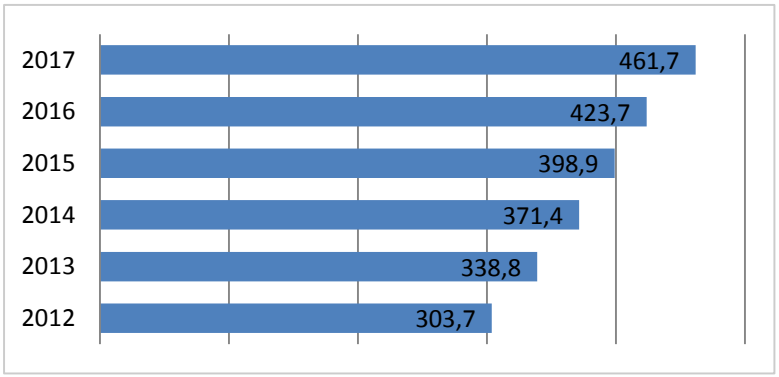

Figure 2.5.2. Functional food sales in Turkey between 2012 and 2017 (63)

Although they are often not aware of "Functional Food" or similar terms, express considerable interest in the concept. In the United Kingdom, France and Germany, up to 75% of the consumers have not heard the term "Functional Food", but more than 50% of them would agree to increased functional ingredients in specific food products (64).

Health and other health-related factors will play a more and more essential role in food consumption in the years to come. The consumers' needs are getting more refined and product requirements are getting more complex therefore functional food market is constantly changing. Dairy products such as kefir, probiotic yoghurt, energy-reduced milk, protein milk dominate the functional food market in terms of revenue in 2018, followed by the bakery and cereals category. Other major product segments include meat, fish and eggs, soy products, and fats and oils. New developments across the bakery and cereals sector is anticipated to bode well for the market. Functional snacks such as cereal bars, energy bars, protein bars, and nutrition bars are expected to achieve significantly growth in the market (65,66).

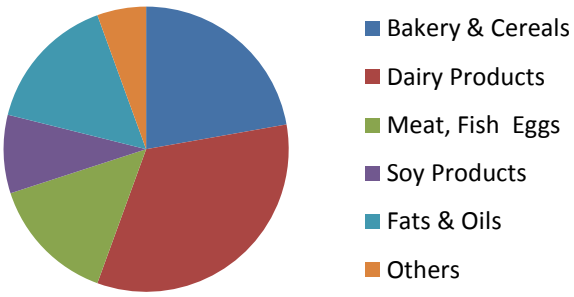

Figure 2.5.3. Global Functional Foods market share, by product, 2018 (66)

3. MATERIAL AND METHOD

The study was carried out in Yeditepe University, Faculty of Health Sciences, Department of Nutrition and Dietetics. The approval of the required Ethics Committee was taken by Istanbul Bahçeşehir University Clinical Research Ethics Committee on 06.12.2017.

The sample of the study consists of 1st and 4th year students in Nutrition and Dietetics Department, which is studying in Yeditepe University Faculty of Health Sciences between January 2018 and February 2018. Participation in the study is voluntary and the date of the study is; The number of students willing to participate voluntarily is 99. 91 of the 99 participants were female and 8 were male. The age range is 17-25.

The volunteer consent form was distributed to the students of the Faculty of Health Sciences who planned to participate in the study between June 2018-November 2018 before the information and awareness survey for the functional foods. A total of 99 students who agreed to participate in the study were asked to complete the questionnaire in a complete and correct manner. The questionnaire used in the study was composed of 4 parts. The first part consists of 6 questions to determine the demographic characteristics of the students and 4 questions about functional food. In the second part, there are 28 functional food sections and the section on measuring the consumption frequency. Section 3 consists of 18 judgments that measure the status of functional foods to participate in health claims. In the last chapter, opinions about whether or not to prefer functional foods are given.

In section 2 participants were given 5-point Likert Scale to choose most appropriate option for 28 functional food as " I've never heard and used, I heard but never used, I've tried a few times but I don't use it, I rarely use it. Results were evaulated 5, 4, 3, 2, 1 points respectively according to answers. In section 3, 18 for functional foods for the judiciary, one of the options I agree or disagree is asked to mark the options that are suitable for them, in the last part, whether or not they prefer 22 functional foods.

When evaluating the findings obtained in this study, IBM SPSS Statistics 22 for statistical analysis (SPSS IBM, Turkey) programs were used. In the evaluation of the study data, Chi Square test, Fisherers Exact test, Fisher Freeman Halton test and Continuity (Yates) Correction were used to compare descriptive statistical methods (Mean, Standard deviation, frequency) as well as qualitative data. Significance was evaluated as $p < 0.05$.

4.FINDINGS

The study was carried out with a total of 99 students, 8 of whom (8.1%) were male and 91 (91.9%) were female, aged between 17 and 25 years, between January 2018 and February 2018. The average age of the students is 20.88±2.21 years.

Table 4.1. General characteristics distribution

		n	%
Age *Min-Max, Ort±SS*		17-25	20,88±2,21
Gender	**Male**	8	8,1
	Female	91	91,9
Grade	**1st grade**	55	55,6
	4th grade	44	44,4
Marital Status	**Single**	97	98
	Married	2	2
Residence	**With my family**	44	44,4
	Student house	37	37,4
	Dormitory	18	18,2
Monthly earning	**<800 TL**	16	16,2
	800 TL-2500 TL	35	35,4
	2500-5000 TL	26	26,3
	>5000 TL	22	22,2
Control over health	**Very**	36	36,4
	Middle	60	60,6
	Low	3	3
Hear the term functional food	**Yes**	43	43,4
	No	28	28,3
	I'm not sure	28	28,3
The first place where the term functional food is heard (n=43)	**TV**	1	2,3
	Newspapers and magazines	2	4,7
	Internet	2	4,7
	Health workers	1	2,3
	Neighborhood / Friends	2	4,7
	School/University	32	74,4
	Shopping at the market	1	2,3
	I dont remember	2	4,7
How do you define functional foods (n=43)	**Making food products beneficial to the body by various methods**	22	51,2
	Functional products	16	37,2
	Useful products for the body	3	7
	Natural products	2	4,7

The ages of the students ranged from 17 to 25, with an average of 20.88±2.21 years. While 8.1% of the students were male, 91.9% were female. 55.6% of the students were first grade and 44.4% of them were 4th grade. While 98% is single,% 2 is married. 44.4% live in the family, 37.4% in the student house and 18.2% in the dormitory. The monthly income of 16.2% is below 800 TL, 35.4% is between 800 and 2500 TL, 26.3% is between 2500 and 5000 TL and 22.2% is over 5000 TL. 36.4% have much control over their health, 60.6% have moderate and 3% have low levels of control.

43.4% of the students heard the term functional food, 28.3% had not heard and 28.3% were unsure. 74.4% heard the term functional food for the first time at school / university, while 4.7% were heard in the newspaper magazine publications, 4.7% from the internet, 4.7% from their close friends / friends and 2.3% from their grocery stores and 4.7%. si does not remember. 51.2% defined functional food as making food products beneficial to the body by different methods ", 37.2% defined as' functional products tanım, 7% as uda beneficial products and 4.7% as natural products.

The distribution of food consumption frequencies of students is shown in Table 2.

Table 4.2. Distribution of Funtional Food Consumption Frequencies

	I've never heard of it and never used it	I heard, but never used	I've tried a few times but I don't use	I rarely use / occasionally	I use it often
	n (%)	n (%)	n (%)	n (%)	n (%)
Energy Reduced Milk	31 (%31,3)	33 (%33,3)	9 (%9,1)	16 (%16,2)	10 (%10,1)
High Protein Milk	5 (%5,1)	51 (%51,5)	16 (%16,2)	16 (%16,2)	11 (%11,1)
Vitamin, mineral supplemented milk	18 (%18,2)	54 (%54,5)	13 (%13,1)	9 (%9,1)	5 (%5,1)
Dietary fiber biscuits with increased fiber content	5 (%5,1)	11 (%11,1)	24 (%24,2)	33 (%33,3)	26 (%26,3)
Energy-reduced cheese	36 (%36,4)	35 (%35,4)	9 (%9,1)	15 (%15,2)	4 (%4)
Energy-reduced yogurt	39 (%39,4)	31 (%31,3)	10 (%10,1)	15 (%15,2)	4 (%4)
Sports foods	7 (%7,1)	65 (%65,7)	11 (%11,1)	10 (%10,1)	6 (%6,1)
Yoghurt to help digestion (probiotic yoghurt)	5 (%5,1)	25 (%25,3)	17 (%17,2)	32 (%32,3)	20 (%20,2)
Probiotic milk /kefir	14 (%14,1)	35 (%35,4)	20 (%20,2)	20 (%20,2)	10 (%10,1)
Green tea	1 (%1)	6 (%6,1)	7 (%7,1)	35 (%35,4)	50 (%50,5)
Digestive teas (laxative)	12 (%12,1)	33 (%33,3)	22 (%22,2)	17 (%17,2)	15 (%15,2)
Omega 3-added oil	10 (%10,1)	44 (%44,4)	24 (%24,2)	13 (%13,1)	8 (%8,1)
Energy drinks	4 (%4)	46 (%46,5)	31 (%31,3)	11 (%11,1)	7 (%7,1)
Whole-grain cereals, muesli	1 (%1)	6 (%6,1)	15 (%15,2)	46 (%46,5)	31 (%31,3)
Dark chocolate	3 (%3)	4 (%4)	17 (%17,2)	41 (%41,4)	34 (%34,3)
Soybean	4 (%4)	49 (%49,5)	35 (%35,4)	10 (%10,1)	1 (%1)
Ginseng	17 (%17,2)	55 (%55,6)	18 (%18,2)	4 (%4)	5 (%5,1)
Mineral water	1 (%1)	5 (%5,1)	13 (%13,1)	38 (%38,4)	42 (%42,4)
Teeth whitening chewing gum	27 (%27,3)	52 (%52,5)	10 (%10,1)	6 (%6,1)	4 (%4)
Bread enriched with vitamins and minerals	17 (%17,2)	25 (%25,3)	18 (%18,2)	24 (%24,2)	15 (%15,2)
Sodium Reduced Salt	13 (%13,1)	46 (%46,5)	19 (%19,2)	15 (%15,2)	6 (%6,1)
Cholesterol-lowering margarines	42 (%42,4)	48 (%48,5)	5 (%5,1)	3 (%3)	1 (%1)
Omega 3 / selenium enriched eggs	42 (%42,4)	33 (%33,3)	8 (%8,1)	6 (%6,1)	10 (%10,1)
Salmon	2 (%2)	15 (%15,2)	18 (%18,2)	39 (%39,4)	25 (%25,3)
Tomato	2 (%2)	3 (%3)	2 (%2)	12 (%12,1)	80 (%80,8)
Red berries (blackberry, raspberry, strawberry, raspberry)	1 (%1)	2 (%2)	6 (%6,1)	35 (%35,4)	55 (%55,6)
Garlic	1 (%1)	7 (%7,1)	10 (%10,1)	40 (%40,4)	41 (%41,4)
Ginger	2 (%2)	8 (%8,1)	24 (%24,2)	44 (%44,4)	21 (%21,2)

Students' participation in the items related to functional foods is shown in Table 3.

Table 4.3. Distribution of participation statuses in functional foods

	I agree	I dont agree
	n (%)	n (%)
Functional foods are healthy foods	68 (%68,7)	31 (%31,3)
People become healthier if they consume functional food	50 (%50,5)	49 (%49,5)
Regular use of functional foods improves quality of life	65 (%65,7)	34 (%34,3)
Functional foods are low calorie	40 (%40,4)	59 (%59,6)
Functional foods reduce the risk of obesity	48 (%48,5)	51 (%51,5)
Functional foods have a debilitating effect	32 (%32,3)	67 (%67,7)
The food should be used if the taste is poor but functional	33 (%33,3)	66 (%66,7)
Functional foods are superior products based on the foundations of science	56 (%56,6)	43 (%43,4)
Functional food consumption can significantly protect people from diseases	50 (%50,5)	49 (%49,5)
It is safe to consume functional foods	57 (%57,6)	42 (%42,4)
Functional foods fulfill what they promise	49 (%49,5)	50 (%50,5)
I don't think the benefits of functional food products are overrated	48 (%48,5)	51 (%51,5)
Development of functional food market should be supported by the authorities	52 (%52,5)	47 (%47,5)
I find functional foods delicious	48 (%48,5)	51 (%51,5)
I find functional food prices too expensive	71 (%71,7)	28 (%28,3)
I'm not bothered to pay more money to functional foods than to other foods	28 (%28,3)	71 (%71,7)
It is not appropriate for children to consume functional foods	40 (%40,4)	59 (%59,6)
Functional foods can be harmful to health when over-consumed (n=98)	78 (%79,6)	20 (%20,4)

The reasons why students prefer functional foods are distributed as seen in Table 4.

Table 4.4. Distribution of reasons to prefer functional foods

	n (%)
Doctor or nutritionist for advice	21 (%21,4)
I'm curious / interested	39 (%39,8)
Because they are popular	10 (%10,2)
I like the taste	18 (%18,4)
I received advice about my environment	19 (%19,4)
To delay aging	6 (%6,1)
To improve my physical performance	19 (%19,4)
Not need medical treatment	17 (%17,3)
To help weaken	14 (%14,3)
Cholesterol, blood pressure, heart disease, diabetes, cancer to prevent diseases such as	20 (%20,4)
To strengthen my digestive system	34 (%34,7)
To improve my mental state	13 (%13,3)
For bone health	18 (%18,4)

The reasons why students do not prefer functional foods are distributed as seen in Table 5

Table 4.5. Distribution of reasons for not preferring functional foods

	n (%)
I am not aware of the product	30 (%30,6)
I don't know enough about the function of the product	41 (%41,8)
I don't think it's useful for	11 (%11,2)
Seeing as unnecessary for a healthy person	16 (%16,3)
For not liking your taste	6 (%6,1)
I thought it was overrated.	21 (%21,4)
Not easy to find	7 (%7,1)
Because it is expensive	12 (%12,2)
I don't think it's safe.	10 (%10,2)

Table 4.6. Evaluation of functional food terms between classes and defining functional foods

		1st grade	4th grade	p
		n (%)	n (%)	
Hearing Functional Food Term	**Yes**	9 (%16,4)	34 (%77,3)	[1]**0,000***
	No	24 (%43,6)	4 (%9,1)	
	I am not sure	22 (%40)	6 (%13,6)	
How do you define functional foods	**Making food products beneficial to the body by various methods**	5 (%55,6)	17 (%50)	[2]**0,635**
	Functional products	3 (%33,3)	13 (%38,2)	
	Useful products for the body	0 (%0)	3 (%8,8)	
	Natural products	1 (%11,1)	1 (%2,9)	

[1]*Ki-kare test* [2]*Fisher freeman halton test *p<0.05*

The rate of hearing the functional food term of 4th grade students (77.3%) was found to be significantly higher than the first grade students (16.4%) (p: 0.000; p <0.05).

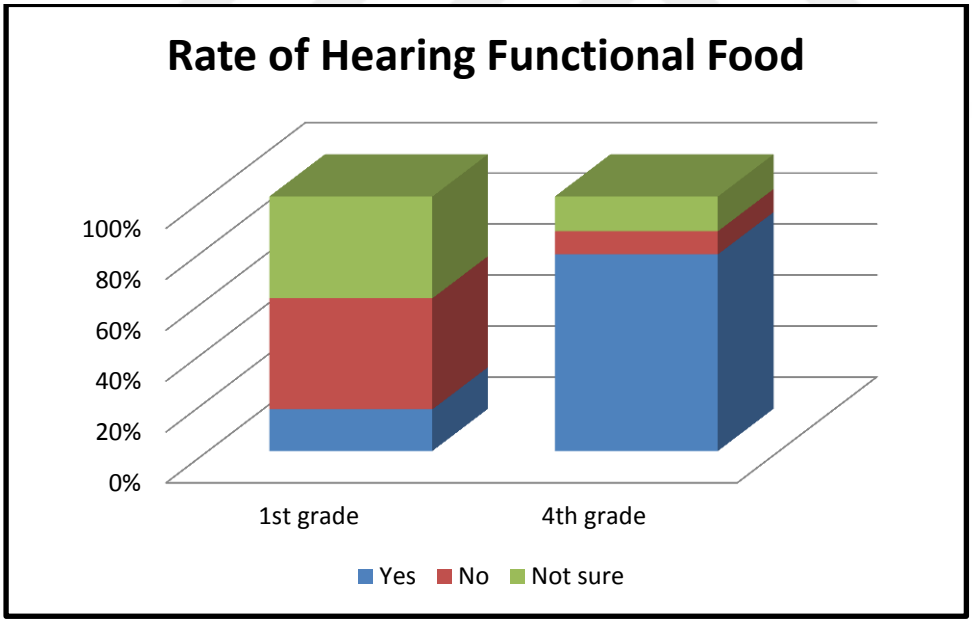

Figure 4.1. The rate of hearing the functional food term of 1st and 4th grade students

There was no statistically significant difference between the classes in terms of distribution rates of functional foods (p> 0.05).

Table 4.7. Evaluation of consumption frequencies of functional foods among classes

	1st grade	4th grade	p
	Ort±SS (median)	Ort±SS (median)	
Energy Reduced Milk	1,96±1,14 (2)	2,95±1,4 (3)	0,000*
High Protein Milk	2,38±0,91 (2)	3,25±1,2 (3)	0,000*
Vitamin, mineral added milk	1,98±0,78 (2)	2,66±1,18 (2)	0,003*
Dietary fiber biscuits with increased fiber content	3,76±1,09 (4)	3,5±1,19 (3)	0,218
Energy-reduced cheese	2±1,25 (2)	2,34±1,1 (2)	0,047*
Energy-reduced yoghurt	1,84±1,1 (1)	2,5±1,25 (2)	0,003*
Sports foods	2,25±0,8 (2)	2,64±1,14 (2)	0,095
Yoghurt to help digestion(probiotic)	3,04±1,19 (3)	3,8±1,11 (4)	0,002*
Probiotic milk /kefir	2,25±0,99 (2)	3,41±1,19 (4)	0,000*
Green tea	4,33±0,84 (5)	4,23±1,01 (5)	0,795
Digestive teas(laxative)	3,02±1,3 (3)	2,75±1,22 (2)	0,281
Omega 3-added oil	2,65±1,02 (2)	2,64±1,18 (2)	0,806
Energy drink	2,73±0,89 (3)	2,68±1,07 (2)	0,626
Whole-grain cereals, muesli	4,13±0,84 (4)	3,86±0,95 (4)	0,159
Dark chocolate	4,13±0,82 (4)	3,84±1,14 (4)	0,317
Soybean	2,51±0,74 (2)	2,59±0,82 (3)	0,616
Ginseng	2,13±0,92 (2)	2,39±0,99 (2)	0,162
Mineral Water	4,31±0,77 (4)	3,98±1,05 (4)	0,141
Teeth whitening chewing gum	1,93±0,86 (2)	2,25±1,12 (2)	0,187
Bread enriched with vitamins and minerals	2,98±1,38 (3)	2,91±1,31 (3)	0,787
Sodium reduced salt	2,71±1,13 (2)	2,34±1,01 (2)	0,096
Cholesterol-lowering margarines	1,67±0,67 (2)	1,77±0,91 (2)	0,891
Omega 3 / selenium enriched eggs	1,95±1,3 (2)	2,25±1,28 (2)	0,119
Salmon	3,78±1,03 (4)	3,61±1,13 (4)	0,491
Tomato	4,73±0,73 (5)	4,59±0,95 (5)	0,412
Red berries	4,51±0,69 (5)	4,32±0,88 (5)	0,287
Garlic	4,24±0,77 (4)	4,02±1,11 (4)	0,609
Ginger	3,55±0,88 (4)	4±0,99 (4)	0,010*

Mann Whitney U Test *$p<0.05$

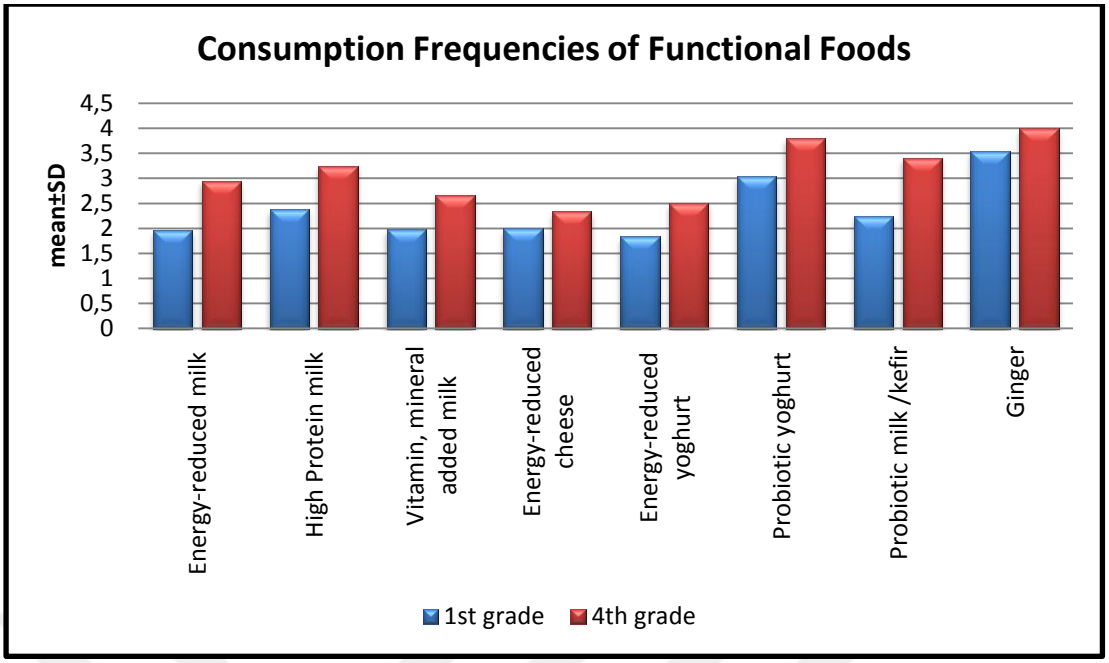

Figure 4.2. Evaluation graphic of consumption frequencies of functional foods among classes

Energy-reduced milk consumption ratio of 4th grade students was found to be statistically higher than 1st grade students(p:0.000; p<0.05).

High Protein milk/kefir consumption ratio of 4th grade students was found to be statistically higher than 1st grade students(p:0.000; p<0.05).

Vitamin, mineral added milk consumption ratio of 4th grade students was found to be statistically higher than 1st grade students(p:0.003; p<0.05).

Energy-reduced cheese consumption ratio of 4th grade students was found to be statistically higher than 1st grade students(p:0.047; p<0.05).

Energy-reduced yoghurt consumption ratio of 4th grade students was found to be statistically higher than 1st grade students(p:0.003; p<0.05).

Probiotic yoghurt consumption ratio of 4th grade students was found to be statistically higher than 1st grade students(p:0.002; p<0.05).

Probiotic milk/kefir consumption ratio of 4th grade students was found to be statistically higher than 1st grade students(p:0.002; p<0.05).

Ginger consumption ratio of 4th grade students was found to be statistically higher than 1st grade students(p:0.010; p<0.05).

There was no statistically significant difference between the classes in terms of the use of other nutrients (p>0.05)

Table 4.8. Evaluation of participation status among classrooms related to functional foods

		1st grade	4th grade	p
		n (%)	n (%)	
Functional foods are healthy foods	**I agree**	31 (%56,4)	37 (%84,1)	**[1]0,006***
	I dont agree	24 (%43,6)	7 (%15,9)	
People become healthier if they consume functional food	**I agree**	26 (%47,3)	24 (%54,5)	**[2]0,472**
	I dont agree	29 (%52,7)	20 (%45,5)	
Regular use of functional foods improves quality of life	**I agree**	28 (%50,9)	37 (%84,1)	**[1]0,001***
	I dont agree	27 (%49,1)	7 (%15,9)	
Functional foods are low calorie	**I agree**	28 (%50,9)	12 (%27,3)	**[1]0,030***
	I dont agree	27 (%49,1)	32 (%72,7)	
Functional foods reduce the risk of obesity	**I agree**	24 (%43,6)	24 (%54,5)	**[2]0,280**
	I dont agree	31 (%56,4)	20 (%45,5)	
Functional foods have a debilitating effect	**I agree**	14 (%25,5)	18 (%40,9)	**[1]0,156**
	I dont agree	41 (%74,5)	26 (%59,1)	
The food should be used if the taste is poor but functional	**I agree**	15 (%27,3)	18 (%40,9)	**[1]0,224**
	I dont agree	40 (%72,7)	26 (%59,1)	
Functional foods are superior products based on the foundations of science	**I agree**	30 (%54,5)	26 (%59,1)	**[1]0,803**
	I dont agree	25 (%45,5)	18 (%40,9)	
Functional food consumption can significantly protect people from diseases	**I agree**	29 (%52,7)	21 (%47,7)	**[2]0,621**
	I dont agree	26 (%47,3)	23 (%52,3)	
It is safe to consume functional foods	**I agree**	28 (%50,9)	29 (%65,9)	**[1]0,195**
	I dont agree	27 (%49,1)	15 (%34,1)	
Functional foods fulfill what they promise	**I agree**	25 (%45,5)	24 (%54,5)	**[2]0,369**
	I dont agree	30 (%54,5)	20 (%45,5)	
I don't think the benefits of functional food products are overrated	**I agree**	21 (%38,2)	27 (%61,4)	**[1]0,037***
	I dont agree	34 (%61,8)	17 (%38,6)	
Development of functional food market should be supported by the authorities	**I agree**	27 (%49,1)	25 (%56,8)	**[1]0,574**
	I dont agree	28 (%50,9)	19 (%43,2)	
I find functional foods delicious	**I agree**	22 (%40)	26 (%59,1)	**[1]0,092**
	I dont agree	33 (%60)	18 (%40,9)	
I find functional food prices too expensive	**I agree**	41 (%74,5)	30 (%68,2)	**[1]0,635**
	I dont agree	14 (%25,5)	14 (%31,8)	
I'm not bothered to pay more money to functional foods than to other foods	**I agree**	7 (%12,7)	21 (%47,7)	**[1]0,000***
	I dont agree	48 (%87,3)	23 (%52,3)	
It is not appropriate for children to consume functional foods	**I agree**	30 (%54,5)	10 (%22,7)	**[1]0,003***
	I dont agree	25 (%45,5)	34 (%77,3)	
Functional foods can be harmful to health when over-consumed	**I agree**	50 (%90,9)	28 (%65,1)	**[1]0,004***
	I dont agree	5 (%9,1)	15 (%34,9)	

*[1]Continuity (yates)correction [2]Ki-kare test *p<0.05*

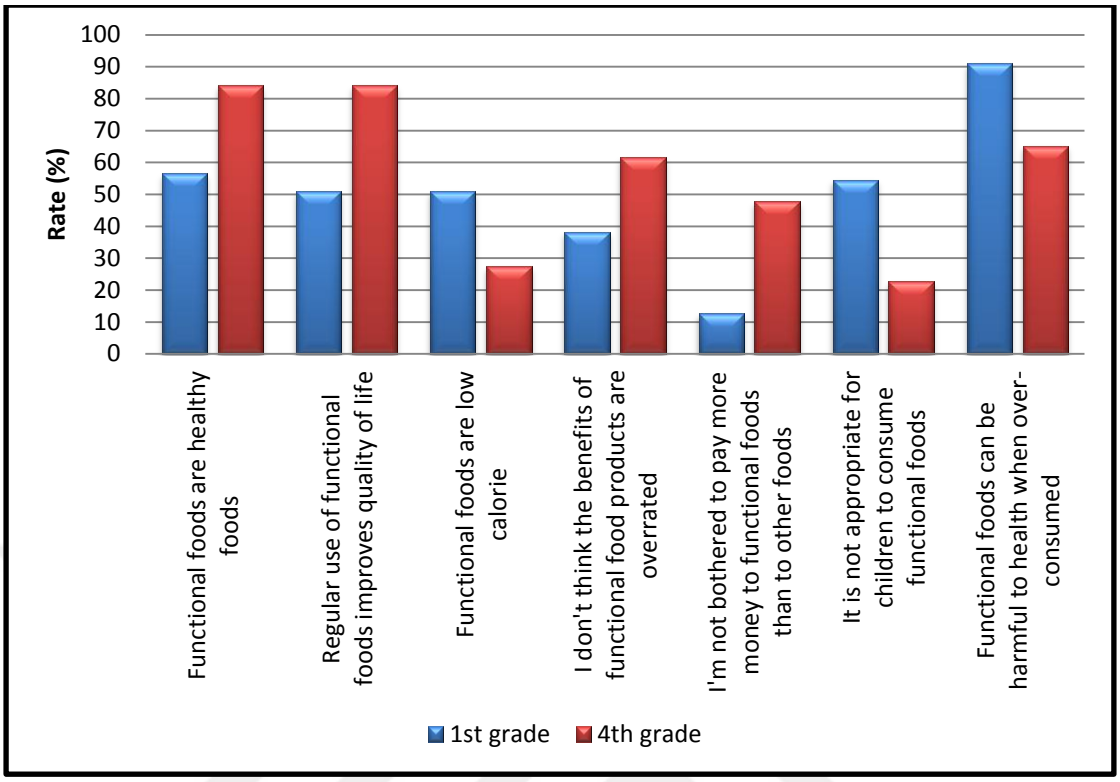

Figure 4.3. Evaluation graphic of participation status among classrooms related to functional foods

The rate of participation of 1st grade students in the claim that functional foods are healthy foods (56.4%) was found to be statistically lower than the 4th grade students (84.1%) (p: 0.006; p <0.05).

Grade 1 students' olarak regular use of functional foods improves quality of life (50,9%) was found to be statistically lower than 4th grade students (84.1%) (p: 0.001; p <0.05).

The participation rate of the first year students to the claim that uştur functional foods are low calorie (50,9%) was found to be significantly higher than the fourth grade students (27,3%) (p: 0.030; p <0.05).

The rate of participation of the 1st grade students in the claim that (I do not think that the benefit of functional food products is overestimated oran was found to be significantly lower (38,2%) than the 4th grade students (61,4%) (p: 0.037; p <0.05).

The participation rate of the first year students to the claim that I am not bothered to pay more food to the functional foods than other foods (12,7%) was found to be statistically lower than the fourth grade students (47,7%) (p: 0.000; p <0.05).

The 1st grade students' participation rate was 54,5% and the fourth grade students (22,7%) were found to be statistically significant (p: 0.003; p <0.05).

The rate of participation of 1st grade students in the claim that (Functional foods can be harmful to health when over-consumed. 1 was found to be statistically significant (90,9%) and grade 4 (65,1%) was statistically significantly higher (p: 0.004; p <0.05). There was no statistically significant difference between the classes in terms of the rates of participation in functional foods related to other claims (p> 0.05).

Table 4.9. Evaluation of reasons to prefer functional foods among classes

	1st grade	4th grade	p
	n (%)	n (%)	
Doctor or nutritionist for advice	8 (%14,5)	13 (%30,2)	[1]**0,103**
I'm curious / interested	14 (%25,5)	25 (%58,1)	[1]**0,002***
Because they are popular	3 (%5,5)	7 (%16,3)	[2]**0,100**
I like the taste	9 (%16,4)	9 (%20,9)	[1]**0,752**
I received advice about my environment	7 (%12,7)	12 (%27,9)	[1]**0,103**
To delay aging	1 (%1,8)	5 (%11,6)	[2]**0,084**
To improve my physical performance	7 (%12,7)	12 (%27,9)	[1]**0,103**
To avoid medical treatment	6 (%10,9)	11 (%25,6)	[1]**0,102**
To help weaken	6 (%10,9)	8 (%18,6)	[1]**0,430**
To prevent diseases such as cholesterol, blood pressure, heart disease, diabetes, cancer	3 (%5,5)	17 (%39,5)	[1]**0,000***
To strengthen my digestive system	11 (%20)	23 (%53,5)	[1]**0,001***
To improve my mental state	4 (%7,3)	9 (%20,9)	[1]**0,093**
For bone health	8 (%14,5)	10 (%23,3)	[1]**0,400**

*[1]Continuity (yates) correction [2]Fisher's exact test *p<0.05*

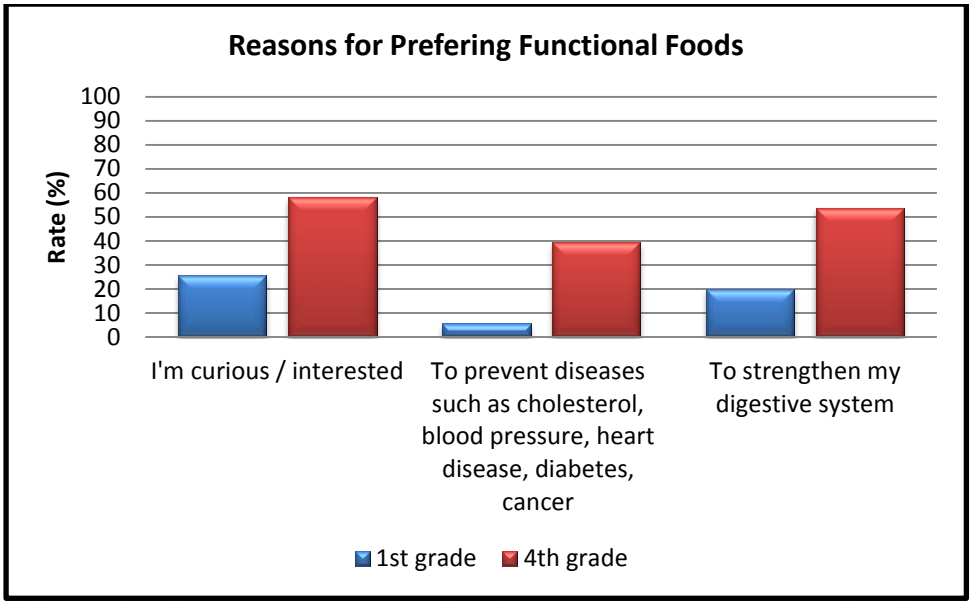

Figure 4.4. Evaluation graphic of reasons to prefer functional foods among classes

As the first year students wondered / interested in functional foods (25,5%), grade 4 students (58,1%) were found to be statistically significant (p: 0.002; p <0.05).

The rate of preference of 1st grade students for protection of functional foods from diseases such as cholesterol, blood pressure, heart diseases, diabetes and cancer was found to be statistically lower (5,5%) and lower than 4th grade students (39,5%) (p: 0.000; p <0.05).).

Table 4.10. Evaluation of reasons for not preferring functional foods among classes

	1st grade	4th grade	p
	n (%)	n (%)	
I am not aware of the products	23 (%41,8)	7 (%16,3)	[1]**0,012***
I don't know enough about the function of the products	30 (%54,5)	11 (%25,6)	[1]**0,007***
I don't think they are useful	7 (%12,7)	4 (%9,3)	[2]**0,751**
Seeing as unnecessary for a healthy person	8 (%14,5)	8 (%18,6)	[1]**0,792**
I don't like their taste	2 (%3,6)	4 (%9,3)	[2]**0,400**
I think they are overrated.	8 (%14,5)	13 (%30,2)	[1]**0,103**
Not easy to find	1 (%1,8)	6 (%14)	[2]**0,041***
Because they are expensive	1 (%1,8)	11 (%25,6)	[1]**0,001***
I don't think they are safe.	8 (%14,5)	2 (%4,7)	[2]**0,178**

*[1]Continuity (yates) correction [2]Fisher's exact test *p<0.05*

The preference rate of first grade students for strengthening the digestive system (20%) was found to be statistically lower than the fourth grade students (53,5%) (p: 0.001; p <0.05).

There was no statistically significant difference between the classes in terms of the ratio of the other preferred foods (p> 0.05).

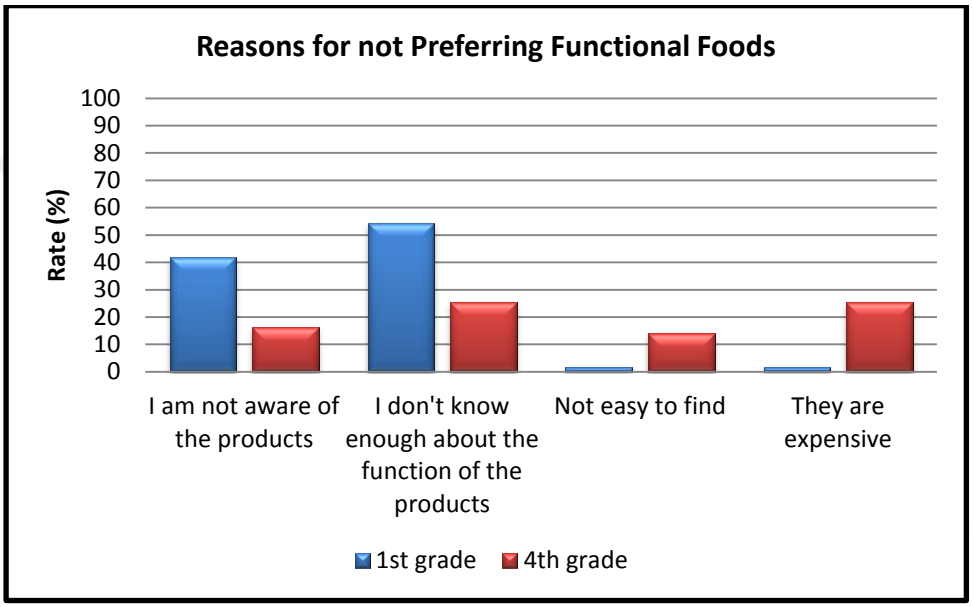

Figure 4.5. Evaluation graphic of reasons for not preferring functional foods among classes

Since the functional foods of the first year students were not aware of the product, the rate of not choosing was higher (41,8%), and it was found to be statistically higher than the fourth grade students (16,3%) (p: 0.012; p <0.05).

Since the functional foods of the 1st year students did not have enough knowledge about the function of the product, the rate of not choosing was higher (54,5%), and it was found to be significantly higher than the 4th grade students (25.6%) (p: 0.007; p <0.05).

Since the 1st grade students were not able to obtain functional foods easily, the rate of not being preferred (1,8%) was found to be statistically lower than the fourth grade students (14%) (p: 0.041; p <0.05).

Since the functional foods of the 1st year students were expensive, the rate of non-preference was found to be statistically lower (1,8%) than the fourth grade students (25,6%) (p: 0.001; p <0.05).

There was no statistically significant difference between the classes in terms of the rate of other non-preferred foods (p> 0.05).

Statistical Analysis

When evaluating the results obtained in the statistical study, IBM SPSS Statistics 22 for statistical analysis (SPSS IBM, Turkey) programs were used.

In the evaluation of the study data, Chi Square test, Fisherers Exact test, Fisher Freeman Halton test and Continuity (Yates) Correction were used to compare descriptive statistical methods (Mean, Standard deviation, frequency) as well as qualitative data. Significance was evaluated at p <0.05.

5. DISCUSSION AND CONCLUSION

The study, which was approved by the on 06.12.2013 by Bahçeşehir University Clinical Research Ethics Committee, was carried out in the nutrition and Dietetics Department of Yeditepe University Faculty of Health Sciences. and 4. 99 students who enrolled in the class in the concept of functional food, ownership, reasons for the consumption of functional food, functional foods and their consumption for a positive conclusion to participate in the event for comparison purposes and to determine the frequency of January 2018 February 2018 was held between the dates of the program and the data obtained by the data form for information were analyzed by using SPSS Statistics 22.

Of the 99 participants who agreed to participate in the study voluntarily, 8 (8.1%) were male and 91 (91.9%) were female. it was found that the age of the students varied between 17-25 and the average age was 20.88±2.21. This numerical difference between female participants and male participants is related to the higher number of female students studying at Yeditepe University Faculty of Health Sciences Nutrition and Dietetics Department than male students. 55 (55.6%) of the students were in the first class and 44 (44.4%) were in the 4th grade.

In a study conducted in the US, 73% of Americans considered that food and nutrition played a role in the protection and development of health, 62% thought exercise and 39% had an effect on family health.

In the studies conducted in many different countries and consumer demographics, the majority of consumers were found to be foreign to the concept of functional food. In a study conducted in Germany, the UK, Poland and Spain; 20,7% of consumers in Germany, 19.1% of consumers in Poland, 33% of Spain and 10.7% of those in the UK stated that they heard the term functional food (60). Besides, some of the consumers who know that they know the functional foods have not been able to give examples towards functional food products and brands. According to a study by Dölekoğlu et al. On the women in Adana, Antalya and Mersin, the women who were surveyed were asked whether they knew the üzerinde functional foods önce without any explanation. Only 4,6% of respondents said that they knew what functional foods meant. In a study conducted in Adana, 50,7% of the participants stated that they knew the foods in the questionnaire, but they did not know that they were called functional

food and 18.9% did not know the functional foods (2). In a study conducted in Italy by Vicentini et al. More than 75% of consumers in the UK, Germany and France have never heard of the term " functional food ", but more than 50% of them have been fed to products in the functional food category even if they don't know it. given. The reason for this rate is that the rate of inin functional is not familiar and not used in product promotion. In addition, studies show the existence of a relationship between functional food consumption and education (67). In a US study, it was found that functional food consumers were highly educated; It has been seen that the richness of information about functional foods is related to education. In another study conducted in Finland, there are findings that consumers with higher education levels are more positive towards functional foods and are looking for more nutrients that benefit health. The increase in the level of education brings with it many behavioral changes such as healthy nutrition in food purchasing behavior, flexibility against new products and tendency to ready food consumption (2,68). When the study is examined according to educational level, 16,4% of first year students and 77.3% of 4th grade students have previously heard and are familiar with the term functional food. In this case, the rate of hearing the functional food term of 4th grade students was found to be statistically significantly higher than the first year students who have not yet received sufficient academic education. At the same time, 74,4% of the students who stated that they had heard of the definition of functional food stated that they heard this definition for the first time at the school / university.

Dairy products are the most preferred products in the world functional food market with 53%. This category includes yoghurt products, probiotic, prebiotics and fermented milk drinks that relax intestinal functions. In the second place, 40% of all wheat and high-fiber products are included. In the functional food industry in Turkey; food groups such as milk and milk products, biscuits / crackers and herbal teas come to the fore (69). In a study conducted in Germany, Poland, Spain and the UK said that 3 out of 4 consumers previously used functional food products. Functional milk and milk products, which are the most preferred functional nutrients, are followed by functional baked foods, functional beverages and fiber cereals (2, 70). In the study, the most preferred functional products were bittter chocolate, fiber-rich biscuit and cereals/mueslis, probiotic yoğurt and natural foods such as tomatoes, red berries, ginger, garlic, green tea and mineral water. Students stated that 26.3% of the students

used often fiber-enriched biscuits/crackers, 31.3% fiber-enriched breakfast cereals/mueslis, 20.2% probiotic yogurt, 50.5% green tea, 42.4% mineral water, 34.3% bitter chocolate, 80.8% tomates, 55.6% red berries, 41.4% garlic, 21.2% ginger. Students stated that 33.3% of the students used rarely fiber-enriched biscuits/crackers, 46.5% fiber-enriched breakfast cereals/mueslis, 32.3% probiotic yoghurt, 35.4% green tea, 38.4% mineral water, 41.4% bitter chocolate, 12.1% tomato, 35.4% red berries, 40.4% garlic, 44.4% ginger. The least preferred functional foods were energy-reduced yogurt, energy-reduced cheese, ginseng, teeth whitening gums, cholesterol-lowering margarines and omega 3/selenium enriched eggs.
Students stated that 39,4% of students never heard and never used energy-reduced yogurt, 36.4% energy-reduced cheese, 17.2%, ginseng, 27.3 %, teeth whitening gum, 42.4% cholesterol-lowering margarine, 42.4% Omega 3 / selenium enriched eggs. Students stated that 31,3% of students heard, but never used energy-reduced yogurt, 35,4% energy-reduced cheese, 55,6%, ginseng, 52,5%, teeth whitening gum, 48,5% cholesterol-loweringmargarine, 33,3% Omega 3 / selenium enriched eggs. Consumption ratios of functional products such as energy-reduced milk, high protein milk, vitamin-mineral added milk, energy-reduced cheese, energy-reduced yogurt, probiotic yoghurt, probiotic milk/kefir and ginger found to be statistically higher in 4th grade students than 1st grade students. No significant difference was found between the classes in terms of the use of other functional products.

The general judgments and perceptions in the society for functional foods are one of the most important factors determining the behaviors of consumers towards functional food products (71). In this study, the attitudes of some consumers to determine their positive and negative attitudes towards functional foods were examined. Functional foods are healthy foods, regular use of functional foods improves quality of life and it is safe to consume functional foods; the most selected negative judgments find functional foods expensive and functional foods can be detrimental to health if they are over-consumed. 1st grade students 56,4% of the are functional foods, 50,9% of them use functional foods on a regular basis improves the quality of life, 50,9% of them are safe to consume functional foods, 74,5% find functional foods expensive and 90,9% functional foods can be harmful to health when over-consumed and 84,1% of the 4th grade students are healthy foods, 84,1% use of functional foods on a regular basis improves the quality of life, 65%, 9 are safe to

consume functional foods, 68,2% find functional foods expensive and 65,1% stated that they participated in the statement that functional foods could be harmful to health when consumed excessively. In terms of percentages, functional foods of 1st grade students are low calorie, it is not appropriate for children to consume functional foods and functional foods can be harmful to health when consumed excessively. Percentages of participation in expressions are significantly higher than 4th grade students; functional foods are healthy foods, regular use of functional foods improves quality of life, I don't think the benefit of functional food products is overrated, it is seen that the percentage of participating in the expression of functional foods is not uncomfortable to pay more than other foods and the percentages are significantly lower.

However it is not always easy to understand the level of knowledge gained by the consumer in respect of these foods and the reasons behind the decision to buy/not to buy, generally the driving forces of the consumption of functional foods are; better customer attitudes to wellbeing and health-consciousness, intensive marketing campaigns and the symptoms of obesity and obesity-related diseases (60,72). In a study conducted in the province of Adana, consumers consumed the most functional foods; Among the reasons for not choosing the product are the reasons for not choosing the product, correcting the digestive problems, healthy bone development and energy supply, and the reasons for the high price (62). Those who tend to prefer functional foods are generally well-educated, well-informed and have high-class material levels (72). In the study, the most preferred reasons for preferring functional foods were the ones I was curious about / interested in. They had options for protection from diseases such as cholesterol, blood pressure, heart disease, diabetes, cancer and to strengthen my digestive system. 25.5% of the first year students wondered / interested in 5.5%, cholesterol, blood pressure, heart disease, diabetes, cancer, such as protection from diseases, 20% of the digestive system to strengthen the functional foods that they prefer, 4th grade 58.1% of the students stated that they were interested / interested and 39.5% of them preferred functional foods in order to protect against cholesterol, blood pressure, heart diseases, diabetes, cancer and 53.5% of them to strengthen the digestive system. When the percentages were examined, it was observed that the preference ratio of the 1st grade students to the functional foods was significantly lower than the 4th grade students in order to protect from the

diseases such as cholesterol, blood pressure, heart diseases, diabetes, cancer and strengthen the digestive system.

Since I am not aware of the product, the most preferred reasons for not opting for functional foods are because I do not know enough about the function of the product, because I think the functions of the products are exaggerated and because they are expensive. 41.8% of the first year students did not know the product, 54.5% did not know enough about the function of the product, 14.5% thought that the functions of the products were exaggerated, 1.8% because they found the products expensive; While the students of the fourth year, 16.3% were not aware of the product, 25.6% did not know enough about the function of the product, 30.2% thought that the functions of the products were exaggerated, and 25.6% of the products were expensive. When the percentages of the 1st grade students were not aware of the functional foods and they did not know enough about the function of the product, the rate of not choosing was significantly higher than the 4th grade students, It was found that the rate of non-preferred was significantly lower than the 4th grade students, because it was not easy to obtain and expensive.

6.SUGGESTIONS

Functional foods generate one of the most promising and dynamically developing segments of food industry. Although in many countries most of the consumers are still not familiar to ‘‘functional food’’ or similar phrasing, they show a high agreement to the concept because consumers more and more believe that foods contribute directly to their health. The functional food field can develop significantly in the positive direction and contribute to the health of people. In the future, these type of foods can play an important role in the fight against common diseases of today, such as obesity and cancer. The functional food market development is influenced by the degree of culture, education and acceptance of functional food. It is essential to gain a better understanding of the people’s demand and eating habits to buy functional foods before product development. Due to the limited consumers’ knowledge, education and awareness of the health effects of newly developed functional ingredients, there are strong needs for specific information and communication activities to consumers in this respect. In the last years consumer demands in the food consumption has changed considerably and development and commerce of functional food products is complex, expensive and risky therefore demands of the consumers should be taken into consideration in the innovation processes of functional products.

Functional foods, completely constituted by adding bioactive substances which obtained from natural nutrients and plants, don’t have negative impacts in terms of health. But functional foods mustn’t be considered as miracle foods and should be consumed within a balanced diet that includes a variety of foods in order to benefit from its positive impacts on our health. Claims of functional foods can only be possible if they are consumed in the right scope and quantities. To achieve the goal of food intakes in a context of a healthy diet, to optimize health and to reduce the risk of potentially preventable diseases, consulting services about taking of proper functional foods should be offered to consumers. Otherwise, there is a risk of nutrition disorder emergence. While considering the health utility of a certain food, apart from its macro and micro-nutritional elements we have to consider its physiological active ingredients or herbal additives.

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8.1. Informed Consent Form

This study, which I requested for your participation, is a research

The aim of this study was to compare the Nutritional Status and Knowledge and Awareness Levels of Functional Foods in Grades 1 and 4 of the Department of Nutrition and Dietetics at Yeditepe University.
You will definitely not be asked about your experience. In general, your habits and approaches about nutrition will be discussed.

Information such as age, educational status, etc. will not be shared with any other person. The information to be obtained will have direct access to the original medical records of the Ethics Committee, the institution and other health authorities. However, this information will be kept confidential by signing this voluntary consent form.

You may refuse to participate in this study. At any stage of the study, you may opt out of your consent.

You will not be charged any fee for your participation in the research and you will not be charged any fees for your participation. After you have completed the informed consent form and agreed to contribute to this research, you are required to fill in the questionnaires that you will be asked to fill.

It is aimed to measure the awareness of the students about functional foods by observing the changes of the Nutrition and Dietetics Department's Nutritional Status and Information and awareness of Functional Foods with education.

Researcher: Dyt. Prof. Dr. Başak KARAKAYA
Yeditepe University Graduate School of Health Sciences
Nutrition and Dietetics student
Advisor: Assistant Professor Hülya DEMİR
Yeditepe University, Institute of Health Sciences, Department of Nutrition and Dietetics Lecturer

I have read all the explanations in the Informed Voluntary Form. The explanations regarding the above mentioned subject and the purpose of the research were done by the dietician mentioned above.
I know that I can voluntarily participate in the research, and when I want to, without being justified or justified. I have read all the explanations in the form of Söz I am on m. The explanations regarding the above mentioned subject and the purpose of the research were done by the dietician mentioned above.

Name,Surname :

8.2. Survey

Date:

Signature:

1. Your age…

2.Gender

1. Female
2. Male

3.Your class

1. 1st grade
2. 4th grade

4. Your marital status

1. Single
2. Married

5. Where do you live?

1. With my family
2. Student house
3. Dormitory

6. Your Monthly Income

1. <800 TL
2. 800 TL - 2.500 TL
3. 2.500 – 5.000 TL
4. > 5.000 TL

7. How much control do you think you have on your own health?

1. Very
2. Middle
3. Low

8. Have you ever heard the term Functional Food?

1. Yes
2. No
3. I am not sure

9. Where did you first hear about it? (If you have not heard or are not sure, please go to question 11)

1. TV
2. Newspapers and magazines
3. Internet
4. Health workers
5. Neighborhood / Friends
6. School/University
7. Shopping at the market
8. I dont remember

10.How would you describe functional foods?

1. Making food products beneficial to the body by various methods
2. Functional products
3. Useful products for the body
4. Natural product

11.Choose the following foods according to your consumption frequency

	I've never heard of it and never used it	I heard, but never used	I've tried a few times but I don't use	I rarely use / occasionally	I use it often
Energy Reduced Milk					
High Protein Milk					
Vitamin, mineral supplemented milk					
Dietary fiber biscuits with increased fiber content					
Energy-reduced cheese					
Energy-reduced yogurt					
Sports foods					
Yoghurt to help digestion (Probiotic yogurt)					
Probiotic milk/kefir					
Green tea					
Digestive teas (laxative)					
Omega 3-added oil					
Energy drinks					

Whole-grain cereals, muesli					
Dark chocolate					
Soybean					
Ginseng					
Mineral water					
Teeth whitening chewing gum					
Bread enriched with vitamins and minerals					
Sodium reduced salt					
Cholesterol-lowering margarines					
Omega 3 / selenium enriched eggs					
salmon					
Tomato					
Red berries (blackberry, raspberry, strawberry, raspberry)					
Garlic					
Ginger					

12. Check the following items related to functional foods as disagree / disagree.

	I agree	I don’t agree
Functional foods are healthy foods		
People become healthier if they consume functional food		
Regular use of functional foods improves quality of life		
Functional foods are low calorie		
Functional foods reduce the risk of obesity		
Functional foods have a debilitating effect		
The food should be used if the taste is poor but functional		
Functional foods are superior products based on the foundations of science		
Functional food consumption can significantly protect people from diseases		
It is safe to consume functional foods		
Functional foods fulfill what they promise,		
I don't think the benefits of functional food products are overrated		
Development of functional food market should be supported by the authorities		
I find functional foods delicious		
I find functional food prices too expensive		
I'm not bothered to pay more money to functional foods than to other foods		
It is not appropriate for children to consume functional foods		
Functional foods can be harmful to health when over-consumed		

13. Why do you prefer functional food?

Doctor or nutritionist for advice	
I'm curious / interested	
Because they are popular	
I like the taste	
I received advice about my environment	
To delay aging	
To improve my physical performance	
To avoid medical treatment	
To help weaken	
Cholesterol, blood pressure, heart disease, diabetes, cancer to prevent diseases such as	
To strengthen my digestive system	
To improve my mental state	
For bone health	

14. If you do not prefer functional foods, why not?

I am not aware of the product	
I don't know enough about the function of the product	
I don't think it's useful for	
Not necessary for a healthy person	
For not liking your taste	
I thought it was overrated.	
I can’t provide easy	

8.3. Ethics Committee Approval

T.C.
BAHÇEŞEHİR ÜNİVERSİTESİ REKTÖRLÜĞÜ
Klinik Araştırmalar Etik Kurulu

Sayı : 22481095-020-1916 19/12/2017

Konu : Karar Örneği

SAYIN BAŞAK KARAKAYA

Araştırmacısı olduğunuz, **"Yeditepe Üniversitesi Beslenme ve Diyetetik Bölümü 1. ve 4. Sınıf Öğrencilerinin Fonksiyonel Gıdalara Yönelik Bilgi ve Farkındalık Düzeylerinin ve Tüketim Sıklıklarının Karşılaştırılması"** isimli çalışmanız ile ilgili, Klinik Araştırmalar Etik Kurulu karar örneği ektedir.

Gereğini bilgilerinize rica ederim.

Prof.Dr. Nazire Efser Yeşim AFŞAR
FAK
Komisyon Başkanı

EK :
Karar Örneği

/ 1
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8.4. Cirruculum Vitae

Personal Informations

Name	**Başak**	**Surname**	**Karakaya**
Place of place	Ankara	Date of birth	10.01.1991
Nationality	TC	Nationality Number	16075026692
E-mail	dyt.basakkarakaya@hotmail.com	Phone Number	05353445452

Education

Degree	**Department**	**School**	**Graduation Date**
PHD	-	-	-
Master	Nutrition and Dietetics	Yeditepe University	2015-still
Bachelor	Nutrition and Dietetics	Yeditepe University	2015
High School	Sciences	Metin Nuran Çakallıklı Anatolian High School	2009

Foreign Languages	**Level and Exam Grades**
English	Upper Intermediate (YDS 2016-80)
Spanish	Beginner

Work Experiences

Position	**Place**	**Duration**
Dietitian	Nutrifit Sağlıklı Beslenme ve Diyet Danışmanlığı	02.2018- still
Dietitian	Pendik Hospital	04.2016- 11.2016

Computer Skills

Program	**Level**
Microsoft Office	Upper Intermediate
SPSS	Intermediate
BEBİS	Intermediate