Consumers' perceptions about probiotic food products and their effects on purchase intention: A case study of Eastern Mediterranean Region of Turkey

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Abstract

The aim of this study is examining consumers' preferences and behaviors about probiotic foods (PFs) in Turkey, and analysing the relationships between some factors such as consumer perception, knowledge level, income level, and purchase intention. According to the research results, among the PFs, sour milk products such as: cheese, conventional yogurt, and ayran (yogurt drink) were found to be the most frequently consumed probiotics. On the other hand, the consumption level of other common commercial probiotics like probiotic yogurt and supplements were found quite low. It was determined that consumers have a high awareness level of the benefits of PFs and that they consume these products with confidence. According to the analysis results, statistically significant and positive relationships were found between consumers' knowledge level and consumers' perceptions of benefit and necessity. In terms of purchase intention, statistically significant and positive relationships were found between "purchase intention" and some variables such as: "knowledge level", "income level", perceptions of "benefit" and "price sensitivity".

Keywords: Functional foods, Probiotics, Consumer, Behavior.

1. Introduction

The consumption patterns of consumers have changed significantly in the last two decades due to an increase in awareness towards healthy living and healthy nutrition such as organic foods and functional foods (Mesías *et al.*, 2023). Functional foods are a type of food that promises improvement in the physiological functions of the body (Urala and Lahteenmaki, 2003). This concept emerged in Japan in the 1980s, and began to gain acceptance in the western world in the late 1990s (Di Pasquale *et al.*, 2011). In 1991, the functional food regulation named "Foods for Specific Health Uses" (FOSHU) was published by the Ministry of Health, Labor and Welfare (MHLW) in Japan. Within this regulation, new products have been developed, and many products have been put on the market which are proven through clinical trials to be beneficial for health (Iwatani and Yamamoto, 2019). Some of the important functional products could be listed as; low-fat/non-fat dairy products, probiotic dairy products, fatty acids of vitamin/mineral

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or omega-3, and low-lactose/lactose-free dairy products. In particular, probiotic products are considered the most important functional foods by many researchers (Bazhan *et al.*, 2018).

The definition of probiotics is: "foods which contain beneficial live microorganisms that regulate the intestinal microbial balance" (Aksu *et al.*, 2010). Another internationally accepted definition of probiotics is: "live microorganisms that, when administered in adequate amounts, confer a health benefit on the host" (Sanders, 2008). Live microorganisms of probiotics can be consumed by fermented foods or supplements. Even though most of the well known probiotic foods consist of dairy based products such as: yogurt, cheese, ayran, and kefir; there are also other fermented products that naturally contain beneficial probiotic bacterias such as: sauerkraut (pickled cabbage), sour pickles, apple cider vinegar, kombucha, salgam (fermented turnip juice), boza, etc.

Many studies show that the balance of bacteria in the digestive system is related to overall health. Probiotics contribute to the balance of gut bacteria; furthermore, they have been connected to a wide range of proven health benefits (Brown, 2016).

Other than the European Union (EU), the global probiotic market has been growing, especially in dairy based probiotic products and dietary supplements. Projections show that compared to other markets, the probiotic market of the EU has slowed in the recent years. The EU was the biggest market for probiotic yogurt and supplements by 2009. Nowadays, it's the third largest market after China and the US (IPA, 2022).

In 2019, the global functional food market value was around 178 billion USD which includes vitamins and minerals, proteins, amino acids, probiotics, prebiotics, and dietary fibers. The global market value is expected to reach 268 billion USD in 2027 (Statista, 2021).

Specific to the probiotic market for both foods and supplements; the global market continues to grow year by year by around 4% of the Compound Annual Growth Rate (CAGR) which is forecasted for the period of 2019-2024. The global probiotics market value was around 38 billion USD in 2013. This value reached 43.8 billion USD in 2019, and is expected to exceed 55 billion USD by 2024. According to Euromonitor data, the monetary value distribution of probiotic products for 2019 respectively were; functional/fortified (FF) probiotic yogurts (71%) with 31.11 billion USD, sour milk products (16%) with 6.62 billion USD, and supplements (13%) with 6.08 billion USD (IPA, 2020).

The commercial probiotic market is mainly divided into three categories; probiotic yogurt (FF), sour milk products, and probiotic supplements.

Probiotic yogurts (plain, flavored, and drinking yogurts with probiotics) comprise of all variants of dairy-based yogurt with added probiotic strains. The main markets of probiotic yogurt in 2019 respectively were; Asia Pacific (16.9 billion USD), the EU (5.43 billion USD), and North America (3.47 billion USD).

Sour milk products are a subclass of milk products which are produced by pasteurised milk that is fermented with lactic acid bacteria. Some well-known sour milk products could be listed as; conventional yogurt, ayran (yogurt drink), buttermilk, kefir, sour milk, etc. The main markets of sour milk products in 2019 respectively were; the EU with 3.13 billion USD, the Middle East and Africa with 1.84 billion USD, and Asia Pacific with 1.23 billion USD (IPA, 2020).

Another form of probiotics are "supplements" which are products in drug forms including "*saccharomyces boulardii*" probiotics. The US is the number one market for probiotic supplements with 2,25 billion USD in 2019, followed by Asia Pacific with 1.59 billion USD, and the EU with 1.65 billion USD (IPA, 2022).

In terms of the EU, probiotic yogurt, sour-milk products, and the probiotic supplements market size total was around 10.22 billion USD in 2019 (IPA, 2020). Despite that the probiotic market in the EU has slowed down in the recent years, Europe is still one of the largest markets (23.29%) in the world. In terms of consumer preferences, the European probiotic market could be divided into 2 segments of Eastern and Western Europe (IPA, 2020; Mordor Intelligence, 2022). Probiotic yogurt and supplements are mainly in demand in Western Europe. Sour milk products which are produced more traditionally by fermented milk such as; conventional yogurt, ayran, kefir, buttermilk, sourmilk, etc., are mainly

in demand by Eastern European consumers. In 2019 the probiotic yogurt market size of Western Europe (4.28 billion USD) was 3.7 times larger than Eastern Europe (1.16 billion USD), and the probiotic supplement market size of Western Europe (1.16 billion USD) was 2.4 times larger than Eastern Europe (490 million USD). Also, the sour milk products market size of Eastern Europe (2.12 billion USD) was 2.1 times larger than Western Europe (1.01 billion USD).

Turkey has one of the largest populations in Europe which was around 84 million in 2022. Compared to developed countries, Turkey's functional food market size is very limited. The main reason for this situation is similar to Eastern European peoples' preference for probiotic foods. Turkish people value and prefer natural home made foods, or commercial products produced in more traditional ways, like sour milk products. On the other hand, the increase in the sales volume indicates that the market has been growing rapidly because of the increase in urban populations; while the urban population ratio was 77.3% in 2012, this ratio had increased to 93.4% in 2022 (TSI, 2023). Due to the functional foods industry still being an underdeveloped sector in Turkey; there are no separate categories for functional foods or probiotic foods in official records, and accordingly there are no statistical data yet. Nevertheless, it is known that the most advanced category of functional foods in Turkey is dairy based probiotic products (with a 33.5% proportional share among functional foods) such as ayran, kefir, cheese, yogurt and altered milk (milk without lactose). The functional foods market size in Turkey is predicted to be around 462 million USD (Gök and Ulu, 2018; Güven, 2018; Sezgin, 2020).

As a growing market, the purpose of this study is examining Turkish consumers' preferences of probiotic foods, and some possible factors that may affect their purchase intention. Factors such as knowledge level, income level, and perceptions about PFs; and also analysing the affects those variables have on each other. More particularly; the affects of knowledge level on consumer perceptions (H1), and on purchase intention (H2); the affects of consumer perceptions on purchase intention (H3); and the affect of income level on purchase intention (H4).

2. Literature review

The results of some previous studies on the subject are given below.

In a study conducted by Urala and Lahteenmaki (2003) in Finland, the seven factors affecting consumers' willingness to consume functional foods were examined. These factors were; "expected benefit, trust, necessity, medical benefit, risk, healthy nutrition, and taste". According to the results, "expected benefit" was determined as the factor that affects consumer willingness the most.

Yabancı and Şimşek (2007) examined the probiotic product consumption situation among university students in Ankara. The research results indicate that women consume more probiotic products than men, 88.8% of those who consume probiotic products enjoy use, and 84.9% of them think that probiotic products are beneficial.

Viana *et al.* (2008) conducted a study in Brazil to determine consumers' perceptions and approaches towards probiotic foods. Within the study, only 29% of the consumers correctly answered the definition of probiotic foods. The probiotic product consumers think that these products help reduce health problems such as diarrhea and cholesterol problems.

Hailu *et al.* (2009) examined Canadian consumers to determine their evaluations of functional foods specific to probiotics. It was found that consumers prefer functional products approved by the government rather than companies, and they consume functional products mostly because of their contribution to health. It was also determined that male consumers mostly preferred probiotics in pill (supplement) form.

In another study conducted by Jeżewska-Zychowicz (2009) among students in Poland, the attitudes and purchasing tendencies of young consumers towards functional foods were investigated. Within the study, it was observed that although the participants mostly knew functional foods, they did not consume them often. "Perception of benefit" was determined as the most influential factor on students' willingness to consume; and probiotic yogurt was determined to be the most consumed functional food.

Perker and Yalçın (2011) determined that consumers mostly consume probiotic yogurt to

prevent digestive problems, and emphasised the importance of brand and advertising activities in order to increase probiotic yogurt consumption.

Urala *et al.* (2011) carried out a study about consumer perceptions towards functional foods in the United States. According to the research results, only 15% of the respondents heard of functional foods before, and it was concluded that US consumers find functional foods confusing and unreliable.

Annunziata and Vecchio (2013) carried out a study to determine consumers' perspectives on functional foods in Italy, and found that probiotic products are the most important products among functional foods by consumers due to their health benefits.

Bağdatlı and Kundakçı (2013) examined the importance of probiotics in fermented meat products such as sucuk (Turkish fermented sausage), and concluded that in the future, fermented meat products will take a higher place in the global probiotics market.

Carvalho *et al.* (2014) examined consumers' behavior about probiotic products in Brazil. According to the research results, the consumption level was low. Although consumers' perceptions of probiotic products were generally positive, it was suggested that more explanatory information should be added on packages to increase consumption.

Seçer *et al.* (2014) carried out a study at Çukurova University in Turkey to determine the perceptions and attitudes of academics towards functional foods. Within the study, it was discovered that academics did not consume functional foods regularly even though the majority of the them were aware of these foods.

In another study conducted by Gezginç and Gök (2016), a survey was conducted with 148 people in Turkey in order to determine the awareness and attitudes of consumers about functional foods. According to the research results, 50.7% of the participants knew about most functional foods, however they did not know that those products were called functional foods.

Eser (2017) examined consumers' attitudes towards probiotic products in the Çanakkale province of Turkey, and found that approximately 71% of consumers use probiotic products. It was also de-termined that yogurt is consumed the most among probiotic products, and that 10% of consumers regularly consume probiotic products every day.

Altindiş *et al.* (2018) carried out a study among family doctors in Turkey, and identified that around 67% of the participants had a moderate level of knowledge about probiotics. Furthermore, they had various doubts about the safety of probiotics, and emphasised that it is necessary to provide more information on use of probiotics consciously.

Kolady *et al.* (2018) carried out a study among Millennials (Generation Y: born between 1980 and 2000) in South Dakota/USA. The study showed that Millennials have a high awareness about probiotics (88,7%), and are therefore already important consumers of probiotics.

Avila *et al.* (2020) carried out a study in Brazil to analyse consumers' perceptions about probiotic dairy products. The study indicated that high prices are a major obstacle in the consumption of probiotic dairy products especially in developing countries. Therefore, it was found that consumers do not have a clear opinion about probiotic dairy products, and the consumption level was low due to high prices compared with conventional products.

Arora *et al.* (2020) examined consumers awareness and willingness to purchase probiotic food in India. According to the research results, only 55.2% of the people within the study responded to the definition of "probiotic" correctly. The major motivations for purchasing probiotic-based products were health benefits (60%), and taste acceptance (17%). In a similar study carried out by Chammas *et al.* (2019), "health benefits" was identified as the main reason for consumers to purchase functional foods in Lebanon.

Some of the studies listed above were carried out in Turkey (Yabancı and Şimşek, 2007; Seçer *et al.*, 2014; Gezginç and Gök, 2016; Eser, 2017; Altindiş *et al.*, 2018). This study differs from those in several ways such as; the affects of consumer perceptions on purchase intention were examined in more detail, the study was carried out in a regional perspective instead of a local perspective, and it is a pioneering study about the topic in the Eastern Mediterranean Region (TR63) of Turkey.

3. Materials and methods

The main material of this study consists of primary data obtained through the face-to-face survey method of 600 consumers selected randomly who were living in the TR63 Region of Turkey. The TR63 Region is located in the Eastern Mediterranean Region of Turkey which includes the three cities of "Kahramanmaraş", "Hatay", and "Osmaniye". The survey studies were carried out in the central districts, and the number of surveys were distributed proportionally considering the population of the central districts. According to the Turkish Statistical Institute (TSI) data of 2020, the population of the central districts of the cities in the research area, and the number of surveys were as follows; Kahramanmaraş: 664.958 (300 surveys), Hatay: 389.377 (176 surveys), and Osmaniye: 274.420 (124 surveys). The survey studies were carried out in April, May, and September of 2021. Data of the study were analysed by means of the SPSS 21 Statistics Software.

3.1. *Determination of the sample size*

The simple random sampling method was used in order to determine the sample size. In the sampling, P and Q values were determined as 0.50, and the sample size was found as 600 at a 95% level of significance and at a 4% error margin. The formula of the method (Churchill, 1995) is given below;

$$n = (\frac{Z_{x/2}}{d})^2 P.Q$$

P: Positive probability (50%)
Q: 1-P Negative probability (50%)
$Z_{x/2}$: Confidence interval (%95, table value 1.96)
d: Error margin (%4).

$$n = \left(\frac{1.96}{0.04}\right)^2 0.50 * 0.50 = 600 \qquad (1)$$

3.2. *The methods used in data analysis*

3.2.1. *Factor analysis*

Since the concepts cannot be measured directly in social sciences, it is necessary to collect information about many different variables in order to define the relationship between concepts (Sipahi *et al.*, 2010). Factor analysis makes it possible to summarise the information collected from a large number of original variables with a minimal loss of information. Hence, within the study, factor analysis was used to summarise the variables, and to reduce the dimensions (Nakip, 2006). The formula of the factor analysis is given below:

$$Xi = Ai_1 F_1 + Ai_2 F_2 + ... + A_{im} F_m + U_i \qquad (2)$$

Xi: Standardised "*i*" variable

Figure 1 - The research area/ Eastern Mediterranean Region (TR63) of Turkey.

A_{ij}: Standardised multiple regression coefficient in a common "j" factor
F: Common factors
U_i: The unique factor for the "i_{th}" variable
m: The number of common factors.

$$Fi = W_{i1} X_1 + W_{i2} X_2 + ... + W_{ik} X_k \qquad (3)$$

Fi: Estimation of the "i_{th}" factor
Wi: Factor coefficient; weight
k: The number of factors.

3.2.2. *Regression analysis*

Linear regression analysis was used to analyse relationships between dependent and independent variables.

Simple linear regression

Simple linear regression is a model that assesses the relationship between a dependent variable and an independent variable. The simple linear model is expressed using the following equation (Nakip, 2006):

$$Y = \beta_0 + \beta_1 X_i + \epsilon_i \qquad (4)$$

Y: Dependent variable
X_i: Independent (explanatory) variable
β_0: Intercept
β_1: Slope
ϵ_i: Residual (error).

Multiple linear regression

Multiple linear regression analysis is essentially similar to the simple linear model, with the exception that multiple independent variables are used in the model. Therefore, multiple linear regression analysis was used to present the relationships between one dependent variable and more than one independent variable in the model. The mathematical representation of the multiple linear regression is given below (Nakip, 2006):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + ... + \beta_k X_k + \epsilon \qquad (5)$$

Y: Dependent variable
X_1, X_2, X_3, X_k: Independent (explanatory) variables
β_0: Intercept
$\beta_1, \beta_2, \beta_3, \beta_k$: Slopes
ϵ: Residual (error).

Hypotheses of the research

The research includes four main dimensions and several variables. The main dimesions are: relationships between "knowledge level and consumers' perceptions" (I), "knowledge level" and "purchase intention" (II), "consumers' perceptions" and "purchase intention" (III), and "consumers' income level" and "purchase intention" (IV). Hypotheses of the research are listed below:

H1: There are statistically significant relationships between the level of knowledge and perceptions of consumers about probiotic foods.
　H1a: There is a relationship between the level of knowledge and the perception of benefit.
　H1b: There is a relationship between knowledge level and taste sensitivity.
　H1c: There is a relationship between the level of knowledge and price sensitivity.
　H1d: There is a relationship between knowledge level and risk perception.
　H1e: There is a relationship between the level of knowledge and the perception of necessity.

H2: There is a statistically significant relationship between the knowledge level of consumers and their purchase intention.

H3: There are statistically significant relationships between consumers' perceptions of probiotic foods and their purchase intention.
　H3a: There is a relationship between the perception of benefit and purchase intention.
　H3b: There is a relationship between taste sensitivity and purchase intention.
　H3c: There is a relationship between price sensitivity and purchase intention.
　H3d: There is a relationship between risk perception and purchase intention.
　H3e: There is a relationship between the perception of necessity and purchase intention.

H4: There is a statistically significant relationship between consumers' income level and purchase intention.

The reason for making multiple hypotheses is to find relationships in detail between knowledge level and perceptions on purchase intention. In
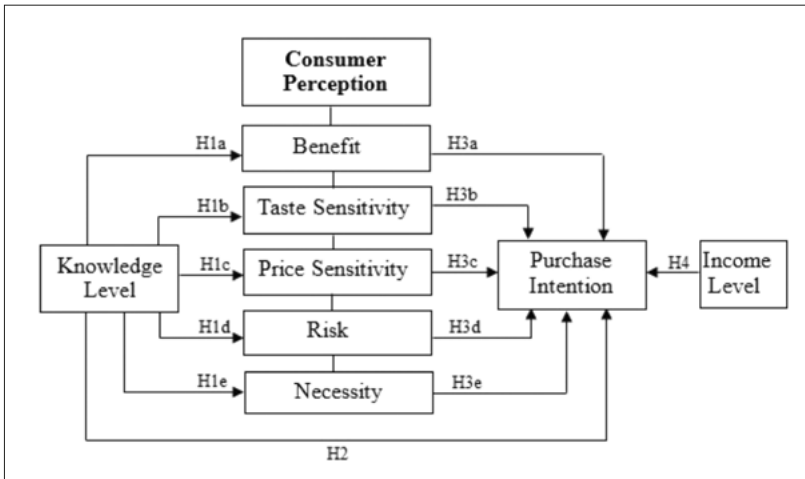
Figure 2 - The model of the research.

other words, finding out if the purchase intention is derived from psychological motivations (perceptions), or is based on knowledge level, or income level. Also, finding out if those variables affect eachother one way or another.

Results and discussion

4.1. *Demographic characteristics of the research area*

Information about the demographic characteristics of the consumers are given in Table 1. Within the study, 51.50% of the consumers were women, 48.50% were men; 65% were married, 35% were single, and 62.50% of consumers were between the ages of 25 and 44. As for the education level of the consumers; 34.70% of them had undergraduate degrees, 28.20% had high school degrees, 19.40% had graduate degrees, and 9.80% had associate degrees. In terms of occupational group distribution; 24.70% of the consumers were teachers or academics, 22.70% were public employees, 18.30% were self-employed, 10% were working in the private sector, and 24.30% were not working (retired, student, unemployed, etc.). The monthly income status of consumers in the research area were; 38.00% between 5001-7000 Turkish Lira (TL), 36.50% less than 5000 TL, and 25.50% above 7000 TL. In terms of household size; 42.70% of them had "2-3" people in their home, and 48.30% of them

had "4-5" people. The average household size was 3.53.

The consumption frequencies of probiotic foods in the research area are given in Table 2. The probiotic products consumed most frequently by consumers in the research area respectively were; "Cheese" (4.75), "Yogurt" (4.11), "Ayran" (4.03), "Apple Vinegar" (3.22), "Sour Pickles" (3.14), and "Sauerkraut" (pickled cabbage) (3.05). On the other hand; "Probiotic Supplements" (1.46), "Boza" (1.26), and "Kombucha" (1.19) were determined as the least consumed products. Simply put, fermented dairy products were found as the consumers' primary choice among probiotic foods. In some other studies, dairy products, especially yogurt were found as the product consumed most frequently (Eser, 2017; Jeżewska-Zychowicz, 2009). Furthermore, consumers' primary preferences in probiotic products in the research area were also found similar to Eastern European consumers' preferences which are mainly based on fermented dairy (sour milk) products (IPA, 2020; Mordor Intelligence, 2022).

Within the research, consumers were asked "*what level of knowledge they think they have about probiotic products*" (self assessment). Accordingly, 20.30% of the consumers stated that they have "very little or no knowledge at all", while more than half of the consumers (58.60%) stated that they have a "good or very good" level of knowledge (Table 3).

Table 1 - Socioeconomic and demographic characteristics of the research area.

Variables		n	%
Gender	Female	309	51,50
	Male	291	48,50
	Total	600	100,00
Marital status	Married	390	65,00
	Single	210	35,00
	Total	600	100,00
Age groups	16-24	68	11,30
	25-34	170	28,30
	35-44	205	34,20
	45-54	109	18,20
	55-64	42	7,00
	65≤	6	1,00
	Total	600	100,00
Education level	Elementary School	7	1,20
	Middle School	40	6,70
	High School	169	28,20
	University (associate degree)	59	9,80
	University (undergraduate)	208	34,70
	University (graduate)	117	19,40
	Total	600	100,00
Occupation	Unemployed	132	24,30
	Education Sector	148	24,70
	Independent Business	110	18,30
	Public Employee	136	22,70
	Private Sector	60	10,00
	Total	600	100,00
*Monthly income (TL)	≤3000	64	10,70
	3001-5000	155	25,80
	5001-7000	228	38,00
	7001-10000	115	19,20
	10000≤	38	6,30
	Total	600	100,00
Household size	1	32	5,30
	2-3	256	42,70
	4-5	290	48,30
	6 ≤	22	3,70
	Total	600	100,00

(*)1 USD=8,87 TL (2021).

The statements in the research model were designed as 5-point Likert scales, and the scale averages were given in Table 4. Consumers' perceptions about probiotics were evaluated in 5 dimensions according to the factor analysis results (Table 5) as; perceptions of "*Benefit, Taste Sensitivity, Price Sensitivity, Risk, and Necessity*". The data of the variables in the research model are given in Table 4. The variables in the model were prepared according to a 5-point likert scale (1=*Strongly Disagree*, 5=*Strongly Agree*).

The likert mean of the variables in the "*Benefit*" scale (B1-B10); which was aimed to establish the consumers' opinions about the benefits of probiotic foods, was determined as "4.27", and it was concluded that consumers' perceptions of benefits from probiotic foods were quite high. In many other studies the benefit perceptions of functional and/or probiotic products were found quite high, and were also observed as the most important factor in consumers' perception and consumption intention (Urala and Lahteenmaki, 2003; Yabancı and Şimşek, 2007; Hailu *et al.*, 2009; Annunziata and Vecchio, 2013; Seçer *et al.*, 2014; Arora *et al.*, 2020).

The likert mean of the variables in the "*Taste Sensitivity*" scale (TS1-TS2), which intended to determine the consumers' sensitivity about the taste of probiotic foods, was identified as "3.31". In this sense, it can be concluded that consumers care about the taste of probiotic foods moderately.

The likert mean of the variables in the "*Price Sensitivity*" scale (PS1-PS2), which aimed to discover the consumers' sensitivity about probiotic food prices, was calculated as "3.72". It was concluded that consumers were relatively sensitive to the prices of probiotic food products. In other words, consumers find probiotic food products expensive, and were willing to buy more if they were affordable. In a different study that took place in the developing country of Brazil, high prices were identified as a major obstacle in the consumption of probiotic products (Avila *et al.*, 2020).

The likert mean of the variables in the "*Risk*" scale (R1-R2) was found as "2.93", which means that consumers' risk perceptions towards probiotic foods were relatively low.

Table 2 - Consumption frequencies of the probiotic foods in the research area.

Product	1		2		3		4		5	
	n	%	n	%	n	%	n	%	n	%
Cheese	8	1,30	4	0,70	12	2,00	83	13,80	493	82,20
Yogurt (conventional)	32	5,30	32	5,30	63	10,50	183	30,50	290	48,40
Ayran	13	2,20	23	3,80	87	14,50	289	48,20	188	31,30
Apple vinegar	104	17,30	88	14,70	104	17,30	181	30,30	122	20,40
Sour pickles	90	15,00	90	15,00	144	24,00	196	32,70	80	13,30
Sauerkraut	103	17,20	99	16,50	135	22,50	192	32,00	71	11,80
Punica syrup	124	20,70	163	27,10	142	23,70	102	17,00	69	11,50
Tarhana	167	27,80	144	24,00	103	17,20	120	20,00	66	11,00
Kefir	219	36,50	84	14,00	86	14,30	126	21,00	85	14,20
Salgam	154	25,70	163	27,20	125	20,80	128	21,30	30	5,00
Altered milk	329	54,90	59	9,80	50	8,30	93	15,50	69	11,50
Probiotic yogurt	349	58,10	76	12,70	54	9,00	88	14,70	33	5,50
Buttermilk	337	56,30	110	18,30	71	11,80	62	10,30	20	3,30
Supplements	489	81,50	22	3,70	38	6,30	25	4,20	26	4,30
Boza	511	85,20	38	6,30	36	6,00	13	2,20	2	0,30
Kombucha	540	90,00	17	2,80	31	5,20	11	1,80	1	0,20

(1): None; (2): Once a month; (3): Once a week; (4): Several times a week; (5): Every day.

Table 3 - Consumers' level of knowledge about probiotic foods (self assessment).

Knowledge level	Frequency (n)	Ratio (%)
I have no knowledge at all	56	9.30
I have very little knowledge	68	11.30
I have an intermediate level of knowledge	125	20.80
I have a good level of knowledge	193	32.20
I have a very good level of knowledge	158	26.40
Total	600	100.00

The likert mean of the variables in the "*Necessity*" scale (N1-N2) was found quite high with "4.44", and it was concluded that consumers find probiotic foods necessary. In another study, consumers' perception of necessity was identified as one of the main factors that affects consumer's behavior about functional foods (Seçer *et al.*, 2014).

In addition to the scales of the consumers' perception in the model, the consumers' purchase intention mean was found as "3.54", and the self-assessed knowledge level mean about probiotic foods was "3.55". In other words, both consumers' willingness to buy and their knowledge levels about probiotics were between medium and high.

The Exploratory Factor Analysis (EFA) was conducted in order to reveal the factor structure, and to determine the construct validity of the Probiotics Perception Scale (PPS) (Bouranta *et al.*, 2022). Hence, "principal components" and "direct oblimin" methods were used. The reason for this is that; the "principal components" method is the most common and easiest method to use in practice, and the "direct oblimin" method is used when considering if there is a relationship between the factors in order to reduce dimensions (Büyüköztürk, 2011). The Kaiser-Meyer-Olkin (KMO) sample adequacy value was found as 0.919, and it was concluded that the sample size was sufficient for the EFA. KMO values above "0.50" are considered sufficient, and values between "0.90-1.00" are

Table 4 - Consumers' statements about probiotic foods in the research model.

Variables	Average (1-5)	S.D.
Benefit		
B1: I think probiotic foods are healthy	4,40	1,042
B2: Probiotic foods strengthen the immune system	4,45	1,005
B3: Probiotic foods help to eliminate digestion problems	4,38	1,012
B4: Probiotic foods help to eliminate negative impacts of antibiotics	4,12	1,085
B5: Probiotic foods help to protect my health	4,36	0,996
B6: I enjoy consuming probiotic foods	4,33	1,018
B7: Probiotic foods help to eliminate negative impacts of unhealthy nutrition	4,27	1,041
B8: Probiotic foods make me feel stronger	4,26	1,030
B9: I trust the information about the health benefits of probiotic foods	4,11	1,036
B10: It is safe to consume probiotic foods	4,04	1,056
Mean	*4,27*	*0,857*
Taste sensitivity		
TS1: I don't purchase a probiotic product that I don't know the taste of	3,61	1,485
TS2: Taste of a food product is as important as it being healthy	3,01	1,596
Mean	*3,31*	*1,275*
Price sensitivity		
PS1: I find probiotic foods expensive	3,67	1,185
PS2: I would purchase more often if they were cheaper	3,78	1,299
Mean	*3,72*	*1,115*
Risk		
R1: They may carry unpredictable risks to health	2,43	1,049
R2: Excessive consmuption can be harmful to health	3,43	1,268
Mean	*2,93*	*0,954*
Necessity		
N1: I think probiotic foods are necessary	4,57	0,891
N2: Probiotic foods are also required for healthy people to consume	4,31	1,122
Mean	*4,44*	*0,862*
Purchase intention		
PI: I purchase probiotic foods	**3,54**	**1,261**
Knowledge level (self assessment)		
KL: I find myself well-informed about probiotic foods	**3,55**	**1,250**

5 Point Likert Scale; 1=Strongly Disagree, 5=Strongly Agree.

classified as "Excellent" (Field, 2009). In addition, the Bartlett Test result was established as; $x^2(153)=6743,415$; $p<0,05$, which indicates that the relationship between the items are large enough for the EFA. As a result of the EFA, it was determined that the 18 items in the probiotics perception scale (PPS) consisted of a 5-dimensional (factored) structure, and that

these 5 factors explain 73.36% of the total variance. Therefore, it was discovered that the PPS showed a valid feature. The distribution of the items according to the factors and their factor loading values are given in Table 5 and Table 6.

According to factor analysis results, the first of the sub-dimensions (*Benefit*) consists of 10 items (B1-B10), the second (*Taste Sensitivity*)

Table 5 - Factor analysis pattern matrix (factor loadings).

Items	Dimensions and factor loadings				
	1	2	3	4	5
B1: I think PFs are healthy	**0,601**	0,010	-0,075	0,013	0,290
B2: PFs strengthen the immune system	**0,685**	0,054	-0,075	0,050	0,334
B3: PFs help to eliminate digestion problems	**0,685**	-0,068	-0,069	0,076	0,275
B4: PFs help to eliminate negative impacts of antibiotics	**0,761**	-0,208	0,007	0,027	-0,015
B5: PFs help to protect my health	**0,786**	0,043	-0,091	0,015	0,153
B6: Consuming PFs makes me feel better mentally	**0,788**	0,070	-0,053	-0,018	0,165
B7: PFs help to eliminate negative impacts of unhealthy nutrition	**0,801**	-0,075	-0,054	0,036	0,133
B8: PFs make me feel stronger	**0,810**	0,087	-0,027	-0,012	0,058
B9: I trust the information about the health benefits of PFs	**0,897**	-0,022	0,004	-0,042	-0,145
B10: It is safe to consume probiotic foods	**0,905**	0,070	0,046	-0,054	-0,244
TS1: I don't purchase a PF that I don't know the taste of	0,174	**0,782**	-0,054	0,173	-0,039
TS2: Taste of a PF is as important as it being healthy	-0,160	**0,847**	0,040	-0,121	0,019
PS1: I find PFs expensive	-0,042	0,112	**-0,902**	0,025	0,005
PS2: I would purchase more often if they were cheaper	0,068	-0,111	**-0,888**	-0,045	-0,072
R1: They may carry unpredictable risks	-0,234	-0,003	-0,112	**0,797**	-0,076
R2: Excessive consmuption can be harmful to health	0,183	0,030	0,119	**0,821**	0,034
N1: I believe PFs are necessary	0,270	0,001	-0,077	-0,153	**0,636**
N2: PFs are also necessary for healthy people to consume	-0,027	-0,024	0,042	0,025	**0,865**

Values over (+/-) 0.40 were taken into consideration.

consists of 2 items (TS1-TS2), the third (*Price Sensitivity*) consists of 2 items (PS1-PS2), the fourth (*Risk*) consists of two items (R1-R2), and the fifth (*Necessity*) consists of 2 items (N1-N2).

The factor loading values of the items were found between "0.601 and 0.905". It was concluded that the items contribute to the factors significantly, since factor loading values of ±0.40 and above are considered ideal (Field, 2009; Bouranta *et al.*, 2022).

4.2. Hypothesis test results

Relationships between knowledge level and consumer perceptions, and purchase intention

The affects of knowledge level on consumer perceptions and purchase intention are given in Table 7. The simple linear regression analysis was performed to determine the affects of "knowledge level" on; "consumer perceptions" (*H1*), and "purchase intention" (*H2*).

According to the regression analysis results, a statistically significant and positive relationship was discovered between the level of knowledge and benefit perception (*H1a*); $F(1, 598) = 91.42$; $p < .001$. It was found that 13% of the variance ($R^2=0.13$) in the dependent variable (benefit) is explained by the independent variable (knowledge level); $\beta= 0.25$, $t(598) = 9.56$, $p < .001$.

A statistically significant and negative relationship was established between the level of knowledge and taste sensitivity (*H1b*); $F(1, 598) = 9.54$; $p < .001$. It was observed that 1.6% of the variance ($R^2=0.016$) in the dependent variable (taste sensitivity) is explained by the independent variable (knowledge level); $\beta= -0.13$, $t(598) = -3.09$, $p < .001$.

There was no statistically significant relationship between the level of knowledge and price sensitivity (*H1c*); $\beta= 0.04$, $t(598) = 0.99$, $p > .001$.

There was no statistically significant relationship between the level of knowledge and risk perception (*H1d*); ($\beta= -0.01$, $t(598) = -0.04$, $p > .001$.

A statistically significant and positive relationship was discovered between the level of knowledge and perception of necessity (*H1e*); $F(1, 598) = 40.89$; $p < .001$; and it was found that 6% of the variance ($R^2=0.06$) in the dependent vari-

Table 6 - Summarized factor analysis results.

Dimensions and Items		Factor loading	Eigen value	Variance (%)	Mean	Cronbach alfa
Benefit	B1: I think PFs are healthy	0,601	7,878	43,768	4,272	0,950
	B2: PFs strengthen the immune system	0,685				
	B3: PFs help to eliminate digestion problems	0,685				
	B4: PFs help to eliminate negative impacts of antibiotics	0,761				
	B5: PFs help to protect my health	0,786				
	B6: Consuming PFs makes me feel better mentally	0,788				
	B7: PFs help to eliminate negative impacts of unhealthy nutrition	0,801				
	B8: PFs make me feel stronger	0,810				
	B9: I trust the information about the health benefits of PFs	0,897				
	B10: It is safe to consume probiotic foods	0,905				
Taste	TS1: I don't purchase a PF that I don't know the taste of	0,782	1,668	9,269	3,309	0,640
	TS2: Taste of a PF is as important as it being healthy	0,847				
Price	PS1: I find PFs expensive	-0,902	1,429	7,937	3,725	0,759
	PS2: I would purchase more often if they were cheaper	-0,888				
Risk	R1: They may carry unpredictable risks	0,797	1,210	6,722	2,926	0,614
	R2: Excessive consmuption can be harmful to health	0,821				
Necessity	N1: I believe PFs are necessary	0,636	1,019	5,661	4,436	0,619
	N2: PFs are also necessary for healthy people to consume	0,865				
KMO = 0,919						

able (necessity) is explained by the independent variable (knowledge level); β=0.17, t (598) = 6.39, $p < .001$.

In terms of knowledge level and purchase intention (*H2*); a statistically significant and positive relationship was identified between those two variables; F (1, 598) = 114.93; $p < .001$, and 16% of the variance (R^2=0.16) in the dependent variable (purchase intention) is explained by the independent variable (knowledge level); β= 0.40, t (598) = 10.72, $p < .001$.

In conclusion; consumers' knowledge level has a positive affect on perceptions of benefit, necessity, and purchase intention, and has a negative affect on taste sensitivity. That is to say, as consumers' level of knowledge increases, their perceptions of benefit, necessity, and purchase intention increase, while their sensitivity to taste decreases at a low rate (1.6%).

In addition, consumers' knowledge level has no affect on either price sensitivity or risk perception. Consumers' level of knowledge mostly affects the purchase intention (16%) and the benefit perception (13%) among the variables in the model.

The affects of consumer perceptions and income level on purchase intention

The multiple linear regression analysis was performed to determine the affects of "*Consumer Perceptions*" (*H3*) and "*Income Level*" (*H4*) on "*Purchase Intention*". The regression analysis results are given in Table 8.

According to the analysis results, a statisti-

Table 7 - Affects of knowledge level on consumer perceptions and purchase intention.

Hypos.	Variables	Variance explained (R2)	Coefficient (β)	Std. error	t	Sig	Result
H1a	Knowldege→Benefit	0,133	0,250	0,026	9,562	0,000	Accepted
H1b	Knowldege→Taste	0,016	-0,128	0,041	-3,088	0,000	Accepted
H1c	Knowldege→Price	0,002	0,036	0,036	0,987	0,324	Rejected
H1d	Knowldege→Risk	0,000	-0,013	0,031	-0,406	0,685	Rejected
H1e	Knowldege→Necessity	0,064	0,174	0,027	6,394	0,000	Accepted
H2	Knowldege→Purchase	0,161	0,405	0,038	10,721	0,000	Accepted

Independent variable: Knowledge Level.

cally significant regression model was obtained (F (6, 593) = 51,22; p < .001), and the model explains 33% of the total variance ($R^2_{adjusted}$ = 0.335). Whereas; the "*Benefit*" independent variable explains the "*Purchase Intention*" dependent variable as statistically significant with a positive sign; *B*= 0.67, *t* (593) = 10.75, *p* < .001 (*H3a*). The "*Taste Sensitivity*" independent variable explains the "*Purchase Intention*" dependent variable as statistically significant with a negative sign; B= -0.24, t (593) = -6.97, p < .001 (*H3b*). The "*Price Sensitivity*" independent variable explains the "*Purchase Intention*" dependent variable as statistically significant with a positive sign; B= 0.24, t (593) = 6.06, p < .001 (*H3c*). There were no statistically significant relationships between "*Risk*" and "*Purchase Intention*" variables; *B*= 0.01, *t* (593) = 0.19, *p* >.001 (*H3d*), or between "*Necessity*" and "*Purchase Intention*" variables; B= -0.03, t (593) = -2.19, p >.001 (*H3e*). Finally, the "*Income Level*" independent variable explains the "*Purchase Intention*" dependent variable as statistically significant with a positive sign; B= 0.09, t (593) = 2.12, p < .05 (*H4*).

In conclusion, while the consumers' perceptions of "*Benefit*" and "*Price Sensitivity*" affect the "*Purchase Intention*" statistically significantly in a positive way; the perception of "*Taste Sensitivity*" affects "*Purchase Intention*" in a negative way. On the other hand, the perceptions of "*Risk*" and "*Necessity*" do not have a statistically significant affect on "*Purchase Intention*". Meanwhile, it was found that the "*Income Level*" of the consumer has a statistically significant and positive affect on "*Purchase Intention*". Simply put, consumers' willingness to purchase probiotics increases as their perception of benefit increases; and they are inclined to purchase more if probiotic prices are less expensive. On the contrary, an increase in consumer's sensitivity to the flavor, affects purchase intention negatively. In terms of the "*Income Level*", as could be expected, the willingness to purchase

Table 8 - Affects of consumer perceptions and income level on purchase intention.

Hypos.	Variable	Variance explained (Adjusted R2)	Coefficient (β)	Std. error	t	Sig.	Result
H3a	Benefit→Purchase		0,669	0,062	10,746	0,000	Accepted
H3b	Taste→Purchase		-0,237	0,034	-6,970	0,000	Accepted
H3c	Price→Purchase	0,335	0,244	0,040	6,063	0,000	Accepted
H3d	Risk→Purchase		0,009	0,045	0,193	0,847	Rejected
H3e	Necessity→Purchase		-0,032	0,060	-2,192	0,079	Rejected
H4	Income→Purchase		0,088	0,042	2,118	0,035	Accepted

*Dependent: Purchase Intention.

probiotic products is higher among high-income consumer groups.

As a general assessment about consumer purchase intention for PFs: variances of the variables in the model; "knowledge level" (Table 7), "consumer perceptions", and "income level" (Table 8), all together explain 49,6% of consumers' purchase intention. In other words, 50,4% of the consumer purchase intention is explained by different variables which could be a subject for another study.

5. Conclusions

Globally, the dietary habits of consumers have been changing significantly since the early 2000's due to an increase in orientation towards healthy living and healthy nutrition. Therefore, the demand for healthy diet types; especially organic and functional foods, increased significantly and these products have found special places on the market shelves. In terms of market share and consumer preferences, probiotic foods are considered the most important functional food group, and the global market volume of probiotics has been increasing rapidly.

In this study, consumer preferences and perceptions about probiotic products were examined in three cities located in the Eastern Mediterranean Region of Turkey. The research results indicate that similar to Eastern European consumers, sour milk products which are produced by conventional fermentation methods, were found consumed most frequently in the research area. On the other hand, the consumption frequencies of probiotic yogurt which is enriched by probiotic bacteria strains, and probiotic supplements which are other common forms of probiotics, were found quite low. The main reason for the majority is that consumers in Turkey are biased about foods produced with new food technologies. In general they consider conventional food products healthier compared to other kinds of products such as supplements, functionally fortified foods, GMOs, etc. In order to to encourage consumption of other commercial probiotics, informative marketing efforts could be useful, and informational notes about the benefits of those products could be added to packages.

Another major finding of the research is that consumers are willing to consume more probiotic food products if they were less expensive. Specific to dairy products; in recent years prices have increased significantly in Turkey due to an increase in milk production costs related to high inflation, and agricultural subsidies becoming insufficient to cover production costs. In order to decrease the production costs of milk and dairy products, and to increase the production amount, it is important to support animal breeders financially through revised and sufficient subsidies.

In terms of knowledge level, more than half of the consumers' (58.60%) declare themselves to have a good or very good level of knowledge about probiotics. The consumers' knowledge level (3.55) statistically affects the perceptions of benefit, necessity, taste sensitivity, and consumers' willingness to purchase.

In terms of consumer perceptions about probiotics, consumers' approach to probiotics are quite positive. Consumers' perception of necessity (4.44) and awareness about benefits of probiotics were especially found significantly high (4.27); and this situation directly affects their behaviour and purchase intention positively. Besides, consumers' risk perception about probiotics was found slightly low (2.93). However, some studies indicate that excessive use of probiotics may cause health problems. They could also be harmful to people who are allergic or intolerant of dairy products and lactose. In terms of raising awareness about the risks of overuse, informative notes could be added to product packaging.

In addition, as a growing market, Turkey has a great potential for a probiotic market, however there is no database related to the production amount, market demand, etc. In order to make a healthy market forecast, and to reveal the real potential and demand of the market accurately; it is necessary to build up a statistical database specifically for functional foods and probiotics.

Acknowledgements

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