





# Evaluation of Attitudes and Knowledge Levels of Medical Faculty Students about Probiotics

## Tıp Fakültesi Öğrencilerinin Probiyotikler Hakkındaki Tutum ve Bilgi Düzeylerinin Değerlendirilmesi

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### ÖZET

**Amaç:** Probiyotikler pek çok hastalığın önlenmesi ve tedavisinde kanıtlanmış yararları olan nispeten yan etkileri az olan doğal ürünlerdir. Çalışmanın amacı, tıp öğrencilerinin probiyotikler hakkında bilgi, tutum ve kullanım alışkanlıklarının değerlendirilmesidir.

**Gereçler ve Yöntem:** Bu tanımlayıcı tipteki çalışmanın evrenini bir tıp fakültesinin 2019-2020 eğitim dönemi son sınıf öğrencileri oluşturdu. Katılımcılara çalışma hakkında ön bilgi verilip, sözlü onamları alındı. Çalışmaya katılacak öğrencilere araştırmacılar tarafından hazırlanan sosyodemografik bilgiler, probiyotik besin tüketimi ve probiyotikler hakkındaki bilgi düzeylerini değerlendiren literatür doğrultusunda hazırlanan bir anket formu uygulandı.

**Bulgular:** Çalışmaya katılan 229 öğrencinin (%78,4) yaş ortalaması 24,24±1,61 yıl olup %58,1'i kadındı. Öğrencilerin %92,6'sı probiyotik terimini, %44,1'i probiyotikli besinlerin içerdiği mikroorganizmaları bildiğini belirtti. Katılımcıların %54,2'si probiyotik içerikli besinleri kullanmıyordu. Probiyotik besin tüketimini etkileyen en sık sebepler "sindirim sistemine faydaları" (%42,4) ve "bağışıklık sistemini güçlendirmesi" (%26,6) iken probiyotik tüketmeme nedeninin "ihtiyaç duymamak" olduğu tespit edildi. Öğrencilerin %51,5'i probiyotik tüketimini çevrelerine ve hastalarına önerdiklerini ve en sık öneri nedeninin kabızlık şikayeti (%73,4) olduğunu ifade ettiler. Katılımcıların probiyotik bilgi düzeyi ortalama puanı 52,41±8,70 (20-76) olarak bulundu. Erkek öğrencilerin bilgi düzeyi (51,34±9,05) ile kadın öğrencilerin bilgi düzeyleri (53,26±8,38) arasında istatistiksel olarak anlamlı ilişki yoktu (p=0,101). Probiyotikleri sık kullananların bilgi düzeyi (57,03±13,22) hiç kullanmayanlara (46,11±6,80) göre daha yüksek tespit edildi (p<0,001).

**Sonuç:** Tıp Fakültesi son sınıf öğrencilerinin probiyotik bilgi düzeyleri, kendi tüketimleri ve hastalarına önerme tutumları orta düzeyde bulundu. Sağlıklı veya hasta bireylerin doğru probiyotikli gıdaları tüketmeleri, konu hakkında eğitim almış hekimlerin tavsiyeleri ile olmalıdır.

**Anahtar Kelimeler:** Probiyotik, Tıp Öğrencisi, Bilgi, Tutum

### ABSTRACT

**Aim:** Probiotics are natural products with proven benefits in the prevention and treatment of many diseases, with relatively few side effects. The study aimed to assess medical students' knowledge, attitudes and usage habits about probiotics.

**Materials and Methods:** This descriptive study comprised final-year medical students in the academic year 2019-2020. Preliminary information about the study was given to the participants, and their verbal consent was obtained. A questionnaire prepared by the researchers in line with the literature evaluating socio-demographic characteristics, probiotic food consumption and knowledge about probiotics was applied to the participants.

**Results:** The mean age of 229 students (78.4%) who participated in the study was 24.24±1.61 years and 58.1% were female. Of the participants, 92.6% stated that they knew the term 'probiotic', 44.1% indicated that they knew the microorganism content of probiotic foods, and 54.2% did not consume probiotic-containing foods. The most common reasons for taking probiotics were 'digestive benefits' (42.4%) and 'boosting the immune system' (26.6%), while the most common reason for not taking probiotics was 'not needed'. In the study, 51.5% of students said they would recommend probiotic foods to their peers and patients, and the most common reason for recommendation was constipation (73.4%). The participants had a mean probiotic knowledge score of 52.41±8.70 (20-76) points. There was no relationship between male students' (51.34±9.05) and female students' knowledge levels (53.26±8.38) (p=0.101).

**Conclusion:** The level of knowledge about probiotics, the consumption of probiotics and the attitude towards recommending probiotics among the Faculty of Medicine senior students were found to be moderate. Consumption of probiotics by healthy or sick people should be done on the advice of trained physicians

**Keywords:** Probiotic, Medical Student, Knowledge, Attitude

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## INTRODUCTION

The World Health Organization defines probiotics as live microorganisms that are beneficial for the host's health when consumed in sufficient amounts (1). The term probiotic is derived from "pro" (for) and "bios" (life) (2). The microorganism species used as probiotics are mainly *Lactobacillus*, *Bifidobacterium*, *Streptococcus thermophilus*; some *Lactococcus*, *Leuconostoc* and *Pediococcus* species; specific beneficial strains of *Escherichia coli*, *Bacillus lacterosporus*, *Bacillus subtilis*, *Bacillus coagulans*, *Propionibacterium* species and non-pathogenic yeast *Saccharomyces boulardii* (1). Probiotics are foods or products that naturally or artificially contain microorganisms with a positive effect on the consumer's health (3). Physicians increasingly recognize the benefits of probiotic foods on human health and nutrition. Probiotics offer remarkable potential for the prevention and management of infective diseases such as *Helicobacter pylori* infections, bacterial gastroenteritis, urinary tract infections, microbial vaginosis infections, and non-infective diseases such as inflammatory bowel diseases, irritable bowel syndrome, colon cancer and breast cancer. They are also helpful in treating recurrent childhood infections such as diarrhea and upper respiratory tract infections, especially in infants aged 4-11 months (4-6). In addition to foods with natural probiotics, the number and type of probiotic-added foods and beverages available to consumers and marketed as beneficial for health has increased significantly.

Despite studies supporting the use of probiotics, the consumption of probiotics and the frequency with which doctors recommend them to patients is still low (7-9). This may be due to a lack of knowledge about probiotics and their benefits among both health professionals and consumers. A previous study conducted in Turkey showed that more than half of the physicians had a moderate level of general knowledge about probiotics and were not sure about their contribution to health (7). Studies conducted on probiotics in university students revealed that 49.5 - 63.2% of the students had knowledge about probiotics, and only half consumed probiotic foods (10-12).

Medical students who will become future doctors require adequate knowledge of probiotics. This knowledge will enable them to manage their diet and provide appropriate recommendations to their patients when necessary. When the literature was reviewed, research on the extent of medical students' knowledge regarding probiotics was scarce. This study aimed to determine the dietary habits of junior doctors, the frequency with which they consume probiotic-containing foods, and to assess their knowledge, attitudes and habits regarding probiotics.

## MATERIALS AND METHOD

The population of this descriptive study consisted of final-year students at a medical school in the 2019-2020

**Table 1.** Socio-demographic characteristics of the participants

	Mean±SD	Min-max
Age (years)	24.24±1.61	20-36
	<b>n</b>	<b>%</b>
<b>Gender</b>		
Male	96	41.9
Female	133	58.1
<b>Mother education level*</b>		
Literate	11	4.8
Primary school	99	43.2
High school	64	27.9
University	52	22.7
<b>Father education level</b>		
Literate	5	2.1
Primary school	59	25.8
High school	49	21.4
University	116	50.7
<b>Income level</b>		
Income higher than expenses	64	28.0
Income and expenses are equal to each other	134	58.5
Income lower than expenses	31	13.5
<b>Place of residence</b>		
Homestay	71	31.0
At home with friends	70	30.6
Home alone	64	27.9
Dormitory	10	4.4
Other	14	6.1
<b>Chronic disease status</b>		
Has a chronic disease	39	17.0
None	190	83.0

\* Three people did not answer this question

academic year. It was planned to reach all intern doctors who volunteered to participate in the study. Participants were given preliminary information about the study, and their verbal consent was obtained. The participants completed a socio-demographic information form and a questionnaire designed to evaluate their knowledge, attitudes, and consumption of probiotic foods in accordance with the relevant literature. When the completed questionnaires were examined, three questionnaires were cancelled due to missing information, and the study was completed with 229 participants.

**Ethics committee approval:** Approval for the study was obtained from the Pharmaceutical and Non-Medical Device Research Ethics Committee (2019/1806).

**Socio-demographic data form:** The form consists of 13 questions about the participants' age, gender, height, weight, parental education and chronic diseases.

**Probiotic knowledge and attitude questionnaire:** This form, designed in accordance with the literature on the subject, includes 11 questions on the recognition of natural and supplemental probiotic foods, the frequency of consumption of probiotic foods, and a Likert-type attitude questionnaire

consisting of 20 statements to measure the level of knowledge about probiotic foods (13). The statements prepared for knowledge and attitudes towards probiotics were answered using a five-point Likert scale (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree), seven of which are reversed, and scored between 0 and 4. In the tables, the 'strongly disagree and disagree' options and 'strongly agree and agree' options are combined for ease of presentation. The higher the score obtained from the questionnaire, the higher the level of knowledge about probiotics. The scores varied between 20 and 80. Individuals were considered to have a high level of knowledge if they scored above the average score (40 points).

#### Statistical Analysis

Statistical Package for Social Sciences for Windows (SPSS) 24.0 program was used for statistical analysis. Descriptive statistics for continuous variables were expressed as mean and standard deviation, and descriptive statistics for categorical data were expressed as frequencies and percentages. The Chi-square test was used to compare categorical data. Independent samples t-test and one-way ANOVA test were

**Table 2.** Knowledge, Attitudes and Habits about Probiotics

Knowing what the term probiotic is...	n (%)		
Knows	212	(92.6)	
Does not know	17	(7.4)	
<b>Knowledge of the content of microorganisms in probiotic foods</b>			
Knows	101	(44.1)	
Does not know	128	(55.9)	
<b>Consumption of probiotic-containing foods</b>			
I've never heard of or used it before	9	(4.0)	
Heard of it but never used it	63	(27.5)	
Tried several times	52	(22.7)	
Rarely/Sometimes	71	(31.0)	
Frequently	34	(14.8)	
<b>Reason for probiotic food consumption*</b>			
Benefits for digestive system	97	(42.4)	
Thinking that it strengthens the immune system	61	(26.6)	
Taste	45	(19.7)	
Advertisements	23	(10.0)	
Thinking it is protective against cancer	22	(9.6)	
Others	11	(4.8)	
<b>Recommendation of probiotic foods</b>			
Recommend	118	(51.5)	
Not recommend	19	(8.3)	
Undecided	92	(40.2)	
<b>Conditions when probiotic foods are recommended*</b>			
Constipation	168 (73.4)	Cancer	46 (20.1)
Diarrhea	115 (50.2)	Allergies	30 (13.1)
Irritable bowel syndrome	110 (48.0)	Hyperlipidemic	21 (9.2)
Frequent infections	100 (43.7)	Urogenital infections	14 (6.1)
Lactose intolerance	49 (21.4)	Acute pancreatitis	6 (2.6)
<b>Reasons not to consume probiotic foods (n=141)</b>			
I don't need it	61(43.3)	I do not find it natural	15(10.6)
I find it expensive	23(16.3)	I find it unpalatable	12(8.6)
I don't know why	16(11.3)	Other...	14(9.9)

\* More than one option was chosen

used to compare quantitative data that met the assumption of normal distribution. The Mann-Whitney U test was used for paired groups that did not meet the assumption of normal distribution, and the Kruskal-Wallis test was used for groups of more than two. The existence of a statistical relationship between two variables was tested using the Pearson correlation test.

**RESULTS**

The mean age of 229 (229/292; 78.4%) students was 24.24±1.61 years old and 58.1% (n=133) were female. Table 1 shows the socio-demographic characteristics of the participants. Of the participants, 92.6% (n=212) knew the term probiotic, and 44.1% (n=101) knew the microorganisms found in probiotic foods. No significant relationship existed between the term probiotic and the knowledge of the microorganisms contained in these foods and gender (p>0.05). Only 14.8% of the participants consumed probiotic foods often. 31.0% consumed them rarely, and more than half never consumed them. There was no statistically significant relationship between probiotic consumption and gender (p=0.588). The most common reasons for taking probiotics were 'digestive benefits' (42.4%) and 'to boost immunity' (26.6%). The most frequently cited reason for not taking probiotics (43.3%) was that they 'did not feel the need'. While 51.5% of students

recommended probiotic foods to their friends and patients, the most common reasons for recommending probiotics were 'constipation' (73.4%), 'diarrhea' (50.2%) and 'irritable bowel syndrome' (48.0%) (Table 2). The answers given to the form prepared following the literature on the level of knowledge of probiotics are listed in Table 3.

The mean probiotic knowledge score of the participants was 52.41±8.70 (20-76) points. The knowledge score of male students (51.34±9.05 points) was lower than that of female students (53.26±8.38 points), but there was no statistically significant relationship between them (p=0.101). There was no significant relationship between knowledge of probiotics and maternal and paternal education or income (p>0.05). Knowledge among frequent probiotic users (57.03±13.22 points) was statistically higher than never-users (46.11±6.80 points) (p<0.001). Those who recommended probiotics to family members and patients (54.75±8.97 points) had higher knowledge than those who did not (47.21±11.34 points) (p=0.001) (Table 4).

**DISCUSSION**

Probiotics are live microorganisms shown to have health benefits when consumed in sufficient quantities (1). Various studies have demonstrated the effectiveness of these microorganisms in preventing and controlling various diseases,

**Table 3.** Probiotics knowledge questionnaire

	<b>Disagree</b>	<b>Neither agree nor disagree</b>	<b>Agree</b>	<b>Score (points)</b>
	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	<b>Mean±SD</b>
1 Contains elements beneficial to health	12(5.2)	30(13.1)	187(81.7)	2.95±0.8
2 It helps strengthen the immune system.	10(4.4)	30(13.1)	189(82.5)	2.96±0.7
3* It does not affect the regulation of the digestive system.	190(83.0)	28(12.2)	11(4.8)	3.05±0.7
4 Contains a high number of microorganisms.	21(9.2)	48(21.0)	160(69.8)	2.67±0.8
5 No discomfort similar to milk consumption	28(12.2)	109(47.6)	92(40.2)	2.31±0.7
6 Supports bone development.	22(9.6)	40(17.5)	167(72.9)	2.71±0.7
7* It has no therapeutic effect.	118(51.5)	65(28.4)	46(20.1)	2.40±0.9
8 It facilitates the digestion of the consumed foods.	16(7.0)	39(17.0)	174(76.0)	2.79±0.7
9* It causes cancer.	185(80.8)	27(11.8)	17(7.4)	3.07±0.9
10 It prevents pathogens from settling in the intestine.	44(19.2)	58(25.3)	127(55.5)	2.37±1.0
11 It is good for antibiotic-induced diarrhea.	27(11.8)	75(32.8)	127(55.4)	2.55±0.9
12* It causes allergic diseases.	91(39.7)	106(46.3)	32(14.0)	2.34±0.8
13 It keeps the microorganisms in the oral cavity in balance.	25(10.9)	61(26.7)	143(62.4)	2.57±0.8
14* It helps lose weight.	57(24.9)	72(31.4)	100(43.7)	3.22±0.9
15 Synthesizes vitamins (B12, folic acid).	41(17.9)	77(33.6)	111(48.5)	2.34±0.9
16 Supports bone development by increasing calcium absorption.	22(9.6)	63(27.5)	144(62.9)	2.59±0.7
17* Negatively affects oral and dental health.	163(71.2)	42(18.3)	24(10.5)	2.80±0.9
18 Regulates bowel function in the elderly.	13(5.7)	26(11.3)	190(83.0)	2.88±0.7
19* It is not safe for use in children.	109(47.6)	90(39.3)	30(13.1)	2.43±0.9
20 It keeps the microorganisms living in the intestines in balance.	13(5.7)	34(14.8)	182(79.5)	2.91±0.7

\* Reverse coded expressions

**Table 4.** Comparison of participants' probiotic knowledge with socio-demographic characteristics

	Mean±SD	p
<b>Gender</b>		
Male	51.34±9.05	0.101*
Female	53.26±8.38	
<b>Income level</b>		
Income lower than expenses	51.23±6.11	0.572**
Income and expenses are equal to each other	52.37±9.51	
Income higher than expenses	53.22±7.99	
<b>Father education level</b>		
Literate	45.20±13.46	0.130**
Primary school	53.98±7.86	
High School	52.47±8.60	
University	51.98±8.83	
<b>Mother education level</b>		
Literate	48.45±12.16	0.216**
Primary school	53.43±8.76	
High School	51.47±8.41	
University	52.87±8.17	
<b>Chronic disease status</b>		
Has a chronic disease	53.23±9.01	0.542*
None	52.29±8.65	
<b>Knowing what the term probiotic is...</b>		
Knows	52.90±8.47	0.006*
Does not know	46.94±9.85	
<b>Knowing the microorganism content of probiotic foods</b>		
Knows	53.63±8.74	0.068*
Does not know	51.52±8.59	
<b>Consumption of probiotic-containing foods</b>		
I've never heard of or used it before	46.11±6.80	0.001**
Heard of it but never used it	50.44±7.00	
Tried several times	51.73±7.88	
Rarely/Sometimes	53.37±7.07	
Frequently	57.03±13.22	
<b>Recommendation of probiotic foods</b>		
Recommend	54.75±8.97	0.001**
Not recommend	47.21±11.34	
Undecided	50.59±6.68	

\*independent T testi \*\*Oneway Anova

such as gastrointestinal disorders, cancers, immune system disorders, hypertension, allergies, atopic eczema and obesity (4, 5, 14). Despite the abundance of data supporting the health benefits of probiotics and the increasing availability of natural/fortified probiotic foods, consumption of these products remains below recommended levels. This discrepancy may be due to a lack of knowledge among doctors or a lack of trust in probiotics.

Physicians' and other healthcare professionals' knowledge of probiotics and the beneficial effects of different probiotic products is an important area for research. In this regard, the present study was considered an essential contribution to the literature. Almost all final-year medical students who participated in the study knew what probiotics were. However, over half of them had never used probiotics, and only half recommended them to their peers and patients. This shows that although students are theoretically aware of probiotics, they do not make sufficient use of this information in their

daily lives.

In a study conducted in Iran to emphasize the importance of probiotics in health promotion, three-quarters of health sciences students correctly defined the term probiotic, and more than half of them knew the beneficial effects of probiotics on health (15). Another study conducted on university students found that half of the students had knowledge about probiotic foods (16). A survey on probiotics involving healthcare professionals and university students in India demonstrated that medical students had a higher knowledge of probiotics compared to dietetics and pharmacy students. (17). This supports the idea that medical students have a theoretically high level of knowledge about probiotics.

Female students were more familiar with the term 'probiotic food' than male students, according to Koçak and Kalkan (16). However, in another study conducted at a medical faculty (17), no difference was found between the knowledge levels of male and female students. In this study, male and female intern

doctors exhibited similar levels of knowledge regarding the term 'probiotic' and the microorganisms contained in these foods.

In studies conducted throughout the country, the frequency of probiotic consumption has been reported to range between 45% and 52% (18, 19). Natural probiotics, such as milk, yoghurt, vinegar, pickles, and probiotic-added yoghurts are frequently consumed in society. Additionally, sachet/drop forms of probiotics sold in pharmacies are also popular choices (7,18,19). Most medical faculty students also stated yoghurt and other dairy products are commonly available probiotic products (15). Women have more knowledge about probiotic-containing products than men and are more likely to consume probiotics (20). Again, the frequency of probiotic consumption was higher in those with higher education levels and socio-economic status (21). A study of food technology students found that only a third (of the students) consumed probiotic products (11). Gender was not a determining factor in the frequency of probiotic consumption, as evidenced by Koçak's study (16). The present study found that more than half of the participants did not consume probiotic foods, and there was no discernible relationship between socio-demographic factors such as gender or income level and probiotic food consumption. This lack of association could be attributed to the study's focus on medical students with similar levels of knowledge.

In a study evaluating the knowledge and consumption of probiotic foods among adults, 64.5% of participants reported familiarity with the term 'probiotic food', while 73.6% reported actual consumption of such foods. Only 21% of them reported receiving information about probiotic foods from healthcare professionals (22). A Canadian study from 2001 revealed that only one-third of family physicians recommended probiotics to their patients after antibiotic use (23). However, a subsequent primary care study in 2015 reported a significant shift, with three-quarters of family doctors recommending probiotics to their patients for various reasons (24). Similarly, the majority of family physicians in our country recommend probiotics to their patients, with more than half suggesting these products, particularly for infants and children (7). Healthcare professionals acknowledge the valuable role of probiotics in clinical medicine and recommend their use based on research findings. (8,25). Over time, as the literature continues to expand, there is an increasing trend among doctors recommending probiotics. This study found that students' overall knowledge of probiotics was above average, and there was no significant difference in knowledge levels between male and female students. In contrast, a prior study at a different medical school reported that half of the participants demonstrated a high level of general knowledge about probiotics, with female students having a higher level of knowledge than males (15). Additionally, another study suggested that as students' monthly income increases, their level of knowledge about probiotic products increases (26). In a study involving 1066 healthcare professionals from 30 countries, most participants' knowledge of probiotics was defined as fair or good, and the

knowledge levels of male and female participants were found to be similar (9).

As a result, this study revealed that although the probiotic knowledge levels of senior medical students were high, their personal consumption habits and attitudes towards recommending probiotics to patients were moderate. With relatively few side effects, probiotics have demonstrated significant benefits in preventing and treating various diseases. People should take the appropriate probiotic foods as recommended by trained doctors and healthcare professionals, whether they are healthy or sick.

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