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ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

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# Knowledge Levels and Attitudes of Nutrition and Dietetics Department Students Towards Probiotic Products: The Example of Burdur Mehmet Akif Ersoy University: Cross-Sectional Study

## Beslenme ve Diyetetik Bölümü Öğrencilerinin Probiyotik Ürünlere Karşı Bilgi Düzeyleri ve Tutumları: Burdur Mehmet Akif Ersoy Üniversitesi Örneği: Kesitsel Çalışma

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**ABSTRACT Objective:** Functional foods are foods that beneficially affect one or more functions in the body beyond their adequate nutritional effects. This study is aimed to reveal the knowledge levels and attitudes of undergraduate students in the department of nutrition and dietetics about probiotics and their products with survey data. **Material and Methods:** The questions of the survey were prepared after the researchers searched the literature on relevant subjects and the data were obtained with an online survey collection tool (Google forms). The survey form consists of 3 parts including sociodemographic information, knowledge of probiotic products and consumption of probiotic foods, and opinions about probiotic products of students. The study was conducted in accordance with the Helsinki Declaration Principles. **Results:** This study was carried out with the voluntary participation of 221 of 274 students in Department of Nutrition and Dietetics at Burdur Mehmet Akif Ersoy University. As a result of the study, statistically significant ($p<0.05$) results were obtained between the grade levels of students and their consumption of probiotic foods and their attitudes towards probiotic foods. When the students were asked about 16 different effects of probiotics, it was determined that they did not know much about the currently revealed effects of probiotics. **Conclusion:** Obtained results showed that the students had knowledge about the effects of probiotics on health, their knowledge and attitudes towards probiotic products changed positively with their grade level; however, they did not have enough knowledge about current developments.

**Keywords:** Probiotics; surveys and questionnaires; students; knowledge; attitude

**ÖZET Amaç:** Fonksiyonel besinler, iyileştirilmiş sağlık ve esenlik durumu ve/veya hastalık riskinin azaltılması ile ilgili bir şekilde, yeterli beslenme etkilerinin ötesinde vücuttaki bir veya daha fazla hedef işlevi faydalı bir şekilde etkileyen besinlerdir. Bu çalışmada, beslenme ve diyetetik bölümü lisans öğrencilerinin probiyotik ve probiyotik ürünler ile ilgili bilgi düzeylerinin ve tutumlarının anket verileriyle ortaya çıkarılması amaçlanmıştır. **Gereç ve Yöntemler:** Anket soruları, araştırmacılar tarafından ilgili konularda literatür taraması yapıldıktan sonra hazırlanmıştır ve veriler çevrim içi anket toplama aracı (Google formları) ile toplanmıştır. Anket formu sosyodemografik bilgiler, probiyotik ürünler ve probiyotik besinlerin tüketimine ilişkin bilgiler ve öğrencilerin probiyotik ürünlere ilişkin görüşleri olmak üzere 3 bölümden oluşmaktadır. Çalışma, Helsinki Deklarasyonu prensiplerine uygun olarak yapılmıştır. **Bulgular:** Bu çalışma, Burdur Mehmet Akif Ersoy Üniversitesi Beslenme ve Diyetetik Bölümünde öğrenim gören 274 öğrenciden 221'inin gönüllü katılımıyla gerçekleştirilmiştir. Araştırma sonucunda, öğrencilerin sınıf düzeyleri ile probiyotik besin tüketimleri ve probiyotik besinlere yönelik tutumları arasında istatistiksel olarak anlamlı ($p<0,05$) sonuçlar elde edilmiştir. Öğrencilere probiyotiklerin 16 farklı etkisi sorulduğunda, probiyotiklerin şu anda ortaya çıkan etkileri hakkında yeterince bilgiye sahip olmadıkları belirlendi. **Sonuç:** Elde edilen sonuçlar, öğrencilerin probiyotiklerin sağlık üzerindeki etkileri hakkında bilgi sahibi olduklarını, probiyotik ürünlere yönelik bilgi ve tutumlarının sınıf düzeyine göre olumlu yönde değiştiğini, ancak güncel gelişmeler hakkında yeterli bilgiye sahip olmadıklarını göstermektedir.

**Anahtar Kelimeler:** Probiyotikler; sörveyler ve anketler; öğrenciler; bilgi; tutum

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The term functional foods are used for foods that naturally contain these components in their structure, or that are enriched and fortified with healthy components, or that are made functional by the removal of components that have harmful effects on health.[1,2] Functional foods include foods with reduced sugar/fat, enriched with plant sterols, and added bioactive components, as well as foods containing probiotic bacteria with beneficial effects on health.[3]

The word probiotic, one of the functional foods, has been used first in 1974 in the sense of 'for life' and was later changed to its current definition by the Food and Agriculture Organization as "living microorganisms that, when consumed in adequate amounts, provide health benefits."[4] In order for probiotics to have a functional effect, they must be taken orally in sufficient amounts, reach the gut and maintain their properties by colonizing the gut. In addition, in order to be included in the definition of probiotic, the product must be resistant to stomach acid and bile salts, produce antimicrobial substances, and show antagonistic effects against pathogenic bacteria.[5]

Probiotic bacteria found naturally in fermented foods such as yogurt and kefir are widely used in the food and pharmaceutical industry in the form of capsules, drops, and powders as supplements. They are also involved in the cosmetics industry.[6,7]

Due to the increasing awareness of the public about the health effects of probiotics, the global market in this field is also growing. While the global probiotic market size was approximately 36 billion USD in 2013, this value reached approximately 58.1 billion USD in 2021 and is expected to reach 111.2 billion USD in 2030. The increasing prominence of preventive healthcare is among the major factors propelling the demand for probiotics across the globe.[8]

Undergraduate students studying in the departments of health sciences, especially in the department of nutrition and dietetics, take courses on healthy nutrition and functional foods that contribute to healthy nutrition. They are members of the professional group that promotes the use of these nutrients in promoting the health of individuals after graduation. For this reason, in this study, it is aimed to reveal the knowledge levels and attitudes of undergraduate students in the department of nutrition and dietetics, who are educated on functional nutrition, about probiotics and their products.

## MATERIAL AND METHOD

### METHOD AND SAMPLING OF THE RESEARCH

The research was conducted to determine the knowledge levels and attitudes of undergraduate students studying in the Department of Nutrition and Dietetics at Burdur Mehmet Akif Ersoy University, Faculty of Health Sciences, between March 02-31, 2022. The research population consists of the students (n=274) in the Department of Nutrition and Dietetics at Burdur Mehmet Akif Ersoy University. In this study, whether or not the students participated in the study was determined on a voluntary basis. A total of 221 (80.7%) students participated in the study.

The study was performed in accordance with the principles of the Declaration of Helsinki. All procedures were approved by the Non-Interventional Clinical Research Ethics Committee of Burdur Mehmet Akif Ersoy University (date: March 02, 2022, no: 2022/566). Before starting the research, the students were informed about the study, and a questionnaire was applied to the students who read and accepted the voluntary consent form.

### COLLECTION OF RESEARCH DATA

The questions of the survey were prepared after the researchers searched the literature on the relevant subjects and the data were obtained with the online survey collection tool (Google forms). The questionnaire form consists of 3 parts including the sociodemographic information, knowledge of probiotic products and consumption of probiotic foods, and opinions about probiotic products of students. While the information about the probiotic products in the 2nd part of the questionnaire was created in the form of multiple-choice options and open-ended questions, the consumption status of probiotic foods was formed in the form of a table containing the frequency and amount of consumption of probiotic foods. In the 3rd part of the questionnaire, the questions containing the opinions about the probiotic products were prepared

on a 3-point Likert type scale as "I agree", "I do not agree" and "I am undecided."

### STATISTICAL ANALYSIS

Evaluation of the data obtained in the study was carried out using the SPSS 26.0 (SPSS Inc., Chicago, IL, USA) package program. While number (n) and percentage (%) rates are given for categorical data, mean (x) standard deviation (SD) values are given for numerical data. Average monthly income of students is given as mean (x) standard error (SE). Pearson chi-square test and Fischer exact test were used in statistical analyzes for categorical data. $p<0.05$ was considered statistically significant in all analyses.

## RESULTS

The mean ages of the female and male students participating in the study were 20.5±0.2, and 21.0±0.7 years, respectively. While the mean body mass index (BMI) values of 221 students participating in the study were 21.4±3.3 kg/cm$^2$, the mean BMI values of female students were 21.2±0.2 kg/cm$^2$ and the mean BMI values of male students were 23.2±0.9 kg/cm$^2$. The average monthly income of the students is 1591±121.7 and 2572±681.7 TL (Turkish Liras) for men and women, respectively (Table 1). Of the students participating in the study were 31.2% (n=69) in first grade, 21.3% (n=47) in 2$^{nd}$ grade, 25.8% (n=57)

**TABLE 1:** Sociodemographic characteristics of students.

| | Woman | | Man | | Total | |
|---|---|---|---|---|---|---|
| | X | SD | X | SD | X | SD |
| Age (year) | 20.5 | 0.2 | 21.0 | 0.7 | 20.6 | 2.4 |
| Weight (kg) | 57.6 | 0.7 | 73.3 | 3.1 | 59.1 | 11.0 |
| Height (cm) | 164.8 | 0.4 | 177.5 | 1.0 | 166.1 | 7.0 |
| BMI (kg/cm$^{2)}$ | 21.2 | 0.2 | 23.2 | 0.9 | 21.4 | 3.3 |
| Monthly income (TL) | 1591.1 | 121.7* | 2572.7 | 681.7* | 1688.8 | 129.6* |
| | n | % | n | % | n | % |
| Grade | | | | | | |
| First grade | 62 | 31.2 | 7 | 31.8 | 69 | 31.2 |
| Second grade | 40 | 20.1 | 7 | 31.8 | 47 | 21.3 |
| Third grade | 52 | 26.1 | 5 | 22.7 | 57 | 25.8 |
| Fourth grade | 45 | 22.6 | 3 | 13.7 | 48 | 21.7 |
| Housing status | | | | | | |
| I'm living with my family | 14 | 7.0 | 4 | 18.2 | 18 | 8.1 |
| I live in a government dormitory | 56 | 28.1 | 5 | 22.7 | 61 | 27.6 |
| I live in a private dormitory | 37 | 18.6 | 2 | 9.1 | 39 | 17.6 |
| I'm living at home with my friends | 52 | 26.1 | 4 | 18.2 | 56 | 25.3 |
| I live alone at home | 33 | 16.6 | 7 | 31.8 | 40 | 18.1 |
| Apart-other | 7 | 3.5 | - | - | 7 | 3.2 |
| Diagnosed disease | | | | | | |
| No | 169 | 84.9 | 21 | 95.5 | 190 | 86.0 |
| Yes | 30 | 15.1 | 1 | 4.5 | 31 | 14.0 |
| Smoking status | | | | | | |
| No | 161 | 80.9 | 14 | 63.6 | 175 | 79.2 |
| Yes | 32 | 16.1 | 7 | 31.8 | 39 | 17.6 |
| I used to smoke, quit | 6 | 3.0 | 1 | 4.5 | 7 | 3.2 |
| Alcohol use status | | | | | | |
| No | 145 | 72.9 | 12 | 54.5 | 157 | 71.0 |
| Yes | 54 | 27.1 | 10 | 45.5 | 64 | 29.0 |
| TOTAL | 199 | 100.0 | 22 | 100.0 | 221 | 100.0 |

% column percentage is given. *Given as standard error; SD: Standard deviation; BMI: Body mass index; TL: Turkish liras.

in 3rd grade and 21.7% (n=48) in 4th grade. 25.3% (n=56), 18.1% (n=40), and 8.1% (n=18) of the remaining students stated that they are living in a home with their friends, alone, and with their family, respectively. While 86.0% (n=190) of the students did not have a disease diagnosed by a doctor, 15.1% (n=30) of female students and 4.5% (n=1) of male students had a diagnosed disease. It was determined that most of the diseases diagnosed in female students were anemia and allergic asthma. 17.6% (n=39) of the students stated that they consumed cigarettes and 29.0% (n=64) of them consumed alcoholic beverages (Table 1).

The consumption status of probiotic foods and their attitudes towards probiotic foods of the students participating in the study are shown in Table 2. To the question "How much do you know about the concept of probiotics", the first-grade students answered "not" at the level of 67.8% (n=21), "less" at the level of 71.0% (n=22) and "high" at the level of 2.9% (n=1). On the other hand, the 4th-grade students answered to this question as 9.7% (n=3) "less", 25.0% (n=30) "moderate", and 40.0% (n=14) "high." Students' level of knowledge about the grade they are studying and the concept of probiotics is statistically significant, which is expected ($p<0.05$). 23.5% of first-graders, 22.9% of 2nd-graders, 27.7% of 3rd-graders, and 25.9% of 4th-graders answered "yes" to the question "Do you consume foods containing probiotics?" While 59.1% of the first-graders stated that they were not sure, this rate was 6.8% in the 4th-grades ($p<0.05$). When asked whether probiotic foods are effective on health, 24.6% of first-graders, 22.0% of 2nd-graders, 28.3% of 3rd-graders, and 25.1% of 4th-graders answered "Yes, I think it is beneficial" ($p<0.05$). While 31.0% of first-graders, 20.7% of 2nd-graders, 31.0% of 3rd-graders, and 17.2% of 4th-graders stated that they did not experience any health benefits as a result of consuming probiotic foods, 24.7% of first-graders and 21.4% of 2nd-graders, 27.3% of the 3rd-graders and 26.6% of the 4th-graders stated that they experienced health benefits ($p<0.05$).

While 33.3% of the first-year students stated that they would not recommend foods and supplements containing probiotics to the people around them, 17.6% stated that they would and 63.1% stated that they did not have enough ideas to make a recommendation. Among the 4th-graders, the rate of those who recommend it to the people around them is 29.4%, and the rate of those who say they do not have enough ideas to make suggestions is 4.6% ($p<0.05$). Considering the rate of those who consume probiotic-containing products most frequently in the morning meal, 64.3% were first-graders, 14.3% were 3rd-graders, and 21.4% were 4th-graders. When we look at the rate of those who consume it in the evening meal, 24.4% are first-graders, 23.5% are 2nd-graders, 32.9% are 3rd-graders, and 20.7% are 4th-graders ($p<0.05$). 13.3% of those who said yes to the question of whether there is any probiotic product you know other than food or nutritional supplements are first-graders, 26.7% 2nd-graders, 33.3% 3rd-graders, and 26.7% 4th-graders. The difference between the question of any known product other than food or nutritional supplement and the education period of the students was not statistically significant ($p>0.05$).

The frequency of students' consumption of probiotic foods is shown in Table 3. Looking at the frequency of kefir consumption, 56.5% of the first-graders, 31.9% of the 2nd-graders, 31.9% of the 3rd-graders and 27.1% of the 4th-graders stated that they never consume kefir. 1.4% of first-graders, 14.9% of 2nd-graders, 14.9% of 3rd-graders, and 8.3% of 4th-graders stated that they consume kefir once a day ($p<0.05$). It was determined that the average consumption amount of the student's consuming kefir was 205.5±11.8 mL. Considering the frequency of yogurt consumption, 44.9% of the first-graders, 31.9% of the 2nd-graders, 43.9% of the 3rd-graders, and 45.8% of the 4th-graders declared that they consume yogurt once a day. There was no statistically significant difference between the frequency of yogurt consumption and grade ($p>0.05$). The average consumption of yogurt by the students was 183.3±5.9 mL. At the grade level, 20.3% of the first-graders, 17.0% of the 2nd-graders, 17.5% of the 3rd-graders, and 8.3% of the 4th-graders never consume tarhana which is sundried food made of curd, tomato, and flour. 24.6% of the first-graders, 23.4% of the 2nd-graders, 43.9% of the 3rd-graders, and 45.8% of the 4th-graders expressed that they consume tarhana 2-3 times a week ($p>0.05$). It was determined that the av-

**TABLE 2:** Consumption status of probiotic foods and attitudes towards probiotic foods.

| | First grade | | Second grade | | Third grade | | Fourth grade | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n | % | p value |
| How much do you know about the concept of probiotics? | | | | | | | | | | | |
| Never | 21 | 67.8 | 5 | 16.1 | 5 | 16.1 | - | - | 31 | 100.0 | <0.001 |
| Low | 22 | 71.0 | 3 | 9.7 | 3 | 9.7 | 3 | 9.7 | 31 | 100.0 | |
| Moderate | 25 | 20.8 | 33 | 27.5 | 32 | 26.7 | 30 | 25.0 | 120 | 100.0 | |
| High | 1 | 2.9 | 5 | 14.3 | 15 | 42.9 | 14 | 40.0 | 35 | 100.0 | |
| Very high | - | - | 1 | 25.0 | 2 | 50.0 | 1 | 25.0 | 4 | 100.0 | |
| Do you consume foods containing probiotics? | | | | | | | | | | | |
| Yes | 39 | 23.5 | 38 | 22.9 | 46 | 27.7 | 43 | 25.9 | 166 | 100.0 | <0.001 |
| No | 4 | 36.4 | 2 | 18.2 | 3 | 27.3 | 2 | 18.2 | 11 | 100.0 | |
| I'm not sure | 26 | 59.1 | 7 | 15.9 | 8 | 18.2 | 3 | 6.8 | 44 | 100.0 | |
| Do you think probiotic foods are effective on health? | | | | | | | | | | | |
| Yes, I think it is beneficial for health | 47 | 24.6 | 42 | 22.0 | 54 | 28.3 | 48 | 25.1 | 191 | 100.0 | <0.001 |
| No, I think it is harmful to health | 1 | 100.0 | - | - | - | - | - | - | 1 | 100.0 | |
| I don't think it has any beneficial or harmful effects on health | 21 | 72.4 | 5 | 17.2 | 3 | 10.3 | - | - | 29 | 100.0 | |
| Did you experience any health benefits as a result of consuming probiotic foods? | | | | | | | | | | | |
| No | 9 | 31.0 | 6 | 20.7 | 9 | 31.0 | 5 | 17.2 | 29 | 100.0 | 0.003 |
| Yes | 38 | 24.7 | 33 | 21.4 | 42 | 27.3 | 41 | 26.6 | 154 | 100.0 | |
| No idea | 22 | 57.9 | 8 | 21.1 | 6 | 15.8 | 2 | 5.3 | 38 | 100.0 | |
| TOTAL | 69 | 31.2 | 47 | 21.3 | 57 | 25.8 | 48 | 21.7 | 221 | 100.0 | |
| Do you recommend people around you consume foods or supplements containing probiotics? | | | | | | | | | | | |
| No | 1 | 33.3 | 1 | 33.3 | 1 | 33.3 | - | - | 3 | 100.0 | <0.001 |
| Yes | 27 | 17.6 | 34 | 22.2 | 47 | 30.7 | 45 | 29.4 | 153 | 100.0 | |
| I don't have enough ideas to suggest | 41 | 63.1 | 12 | 18.5 | 9 | 13.8 | 3 | 4.6 | 65 | 100.0 | |
| At which meal do you most often consume foods containing probiotics? | | | | | | | | | | | |
| Breakfast | 9 | 64.3 | - | - | 2 | 14.3 | 3 | 21.4 | 14 | 100.0 | <0.001 |
| Lunch | 9 | 39.1 | 5 | 21.7 | 6 | 26.1 | 3 | 13.0 | 23 | 100.0 | |
| Dinner | 20 | 24.4 | 18 | 22.0 | 27 | 32.9 | 17 | 20.7 | 82 | 100.0 | |
| Snack | 10 | 14.7 | 16 | 23.5 | 18 | 26.5 | 24 | 35.3 | 68 | 100.0 | |
| Total | 48 | 25.7 | 39 | 20.9 | 53 | 28.3 | 47 | 25.1 | 187 | 100.0 | |

*Multiple options marked.

*continue →*

**TABLE 2:** Consumption status of probiotic foods and attitudes towards probiotic foods *(continued)*.

| | First grade | | Second grade | | Third grade | | Fourth grade | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n | % | p value |
| What are your reasons if you do not consume foods containing probiotics? | | | | | | | | | | | |
| Not knowing probiotic foods | 9 | 42.9 | 5 | 35.7 | 5 | 33.3 | - | - | 19 | 35.8 | - |
| To consider not natural | - | - | - | - | - | - | - | - | - | - | |
| Not needing | 3 | 14.3 | 4 | 28.6 | 3 | 20 | 1 | 33.3 | 11 | 20.7 | |
| Finding expensive | 4 | 19.0 | 2 | 14.3 | 4 | 26.7 | 2 | 66.7 | 12 | 22.6 | |
| Finding it tasteless | - | - | 2 | 14.3 | 2 | 13.3 | - | - | 4 | 7.5 | |
| Not knowing the benefits of probiotics | 5 | 23.8 | 1 | 7.1 | 1 | 6.7 | - | - | 7 | 13.2 | |
| Not believing in the positive effect | - | - | - | - | - | - | - | - | - | - | |
| Total | 21 | 100.0 | 14 | 100.0 | 15 | 100.0 | 3 | 100.0 | 53 | 100.0 | |
| Do you know of any probiotic products other than food or nutritional supplements? | | | | | | | | | | | |
| No | 67 | 32.5 | 43 | 20.9 | 52 | 25.2 | 44 | 21.4 | 206 | 100.0 | 0,430 |
| Yes | 2 | 13.3 | 4 | 26.7 | 5 | 33.3 | 4 | 26.7 | 15 | 100.0 | |
| Have you ever used these products? | | | | | | | | | | | |
| No | 69 | 100.0 | 46 | 97.9 | 56 | 98.2 | 46 | 95.8 | 217 | 98.2 | - |
| Yes | - | - | 1 | 2.1 | 1 | 1.8 | 2 | 4.2 | 4 | 1.8 | |
| What are your reasons if you do not consume supplements containing probiotics? | | | | | | | | | | | |
| Not knowing probiotic supplements | 15 | 34.9 | 9 | 20.9 | 8 | 21.0 | 3 | 7.5 | 35 | 21.3 | - |
| To consider not natural | 10 | 23.3 | 13 | 30.2 | 14 | 36.8 | 16 | 40.0 | 53 | 32.3 | |
| Not needing | 8 | 18.6 | 9 | 20.9 | 6 | 15.8 | 13 | 32.5 | 36 | 22.0 | |
| Finding expensive | 5 | 11.5 | 7 | 16.3 | 7 | 18.4 | 7 | 17.5 | 26 | 15.9 | |
| Finding it tasteless | 2 | 4.7 | 2 | 4.7 | 1 | 2.6 | 1 | 2.5 | 6 | 3.7 | |
| Not knowing the benefits of probiotics | 2 | 4.7 | 1 | 2.3 | 1 | 2.6 | - | - | 4 | 2.4 | |
| Not believing in the positive effect | 1 | 2.3 | 2 | 4.7 | 1 | 2.6 | - | - | 4 | 2.4 | |
| Total | 43 | 100.0 | 43 | 100.0 | 38 | 100.0 | 40 | 100.0 | 164 | 100.0 | |

*Multiple options marked.

**TABLE 3:** Frequency of students' consumption of probiotic foods.

| | | Never | | Once a day | | 2-3 times a day | | Once a week | | 2-3 times a week | | Once a month | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Food** | **Grade** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **p value** |
| Kefir | 1 | 39 | 56.5 | 1 | 1.4 | - | - | 7 | 10.1 | 10 | 14.5 | 12 | 17.4 | 0,01 |
| | 2 | 15 | 31.9 | 7 | 14.9 | - | - | 12 | 25.5 | 1 | 2.1 | 12 | 25.5 | |
| | 3 | 26 | 31.9 | 7 | 14.9 | 1 | 1.8 | 12 | 21.1 | 9 | 15.8 | 6 | 10.5 | |
| | 4 | 13 | 27.1 | 4 | 8.3 | 2 | 4.2 | 9 | 18.8 | 10 | 20.8 | 10 | 20.8 | |
| Yogurt | 1 | 1 | 1.4 | 31 | 44.9 | 10 | 14.5 | 11 | 15.9 | 16 | 23.2 | - | - | 0.51 |
| | 2 | - | - | 15 | 31.9 | 11 | 23.4 | 7 | 14.9 | 14 | 29.8 | - | - | |
| | 3 | - | - | 25 | 43.9 | 12 | 21.1 | 4 | 7.0 | 15 | 26.3 | 1 | 1.8 | |
| | 4 | - | - | 22 | 45.8 | 10 | 20.8 | 2 | 4.2 | 14 | 29.2 | - | - | |
| Probiotic yogurt | 1 | 54 | 78.3 | 2 | 2.9 | - | - | 5 | 7.2 | 2 | 2.9 | 6 | 8.7 | - |
| | 2 | 24 | 51.1 | 7 | 14.9 | 1 | 2.1 | 6 | 12.8 | 5 | 10.6 | 4 | 8.5 | |
| | 3 | 37 | 64.9 | 1 | 1.8 | 2 | 3.5 | 8 | 14.0 | 6 | 10.5 | 3 | 5.3 | |
| | 4 | 32 | 66.7 | 2 | 4.2 | 1 | 2.1 | 2 | 4.2 | 3 | 6.3 | 8 | 16.7 | |
| Probiotic milk | 1 | 52 | 75.4 | 4 | 5.8 | - | - | 3 | 4.3 | 3 | 4.3 | 7 | 10.1 | 0.83 |
| | 2 | 35 | 74.5 | 2 | 4.3 | - | - | 3 | 6.4 | 4 | 8.5 | 3 | 6.4 | |
| | 3 | 44 | 77.2 | 1 | 1.8 | 1 | 1.8 | 4 | 7.0 | 4 | 7.0 | 3 | 5.3 | |
| | 4 | 39 | 81.3 | - | - | 2 | 0.9 | 11 | 5.0 | 13 | 5.9 | 18 | 8.1 | |
| Ayran | 1 | 2 | 2.9 | 18 | 26.1 | 9 | 13.0 | 16 | 23.2 | 22 | 31.9 | 2 | 2.9 | - |
| | 2 | 2 | 4.3 | 10 | 21.3 | 7 | 14.9 | 12 | 25.5 | 15 | 31.9 | 1 | 2.1 | |
| | 3 | 1 | 1.8 | 14 | 24.6 | 4 | 7.0 | 13 | 22.8 | 23 | 40.4 | 2 | 3.5 | |
| | 4 | - | - | 6 | 12.5 | 6 | 12.5 | 13 | 27.1 | 22 | 45.8 | 1 | 2.1 | |
| Tarhana | 1 | 14 | 20.3 | 10 | 14.5 | - | - | 17 | 24.6 | 17 | 24.6 | 11 | 15.9 | 0.17 |
| | 2 | 8 | 17.0 | 5 | 10.6 | 2 | 4.3 | 11 | 23.4 | 11 | 23.4 | 10 | 21.3 | |
| | 3 | 10 | 17.5 | 3 | 5.3 | 1 | 1.8 | 12 | 21.1 | 25 | 43.9 | 6 | 10.5 | |
| | 4 | 4 | 8.3 | 2 | 4.2 | 2 | 4.2 | 12 | 25.0 | 22 | 45.8 | 6 | 12.5 | |
| Pickle | 1 | 7 | 10.1 | 10 | 14.5 | 4 | 5.8 | 24 | 34.8 | 19 | 27.5 | 5 | 7.2 | 0.07 |
| | 2 | 5 | 10.6 | 6 | 12.8 | 8 | 17.0 | 7 | 14.9 | 19 | 40.4 | 5 | 7.2 | |
| | 3 | 4 | 7.0 | 9 | 15.8 | 2 | 3.5 | 9 | 15.8 | 30 | 52.6 | 3 | 5.3 | |
| | 4 | 1 | 2.1 | 5 | 10.4 | 3 | 6.3 | 14 | 29.2 | 21 | 43.8 | 4 | 8.3 | |

*continue →*

**TABLE 3:** Frequency of students' consumption of probiotic foods *(continued)*.

| | | Never | | Once a day | | 2-3 times a day | | Once a week | | 2-3 times a week | | Once a month | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Food** | **Grade** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **p value** |
| Turnip juice | 1 | 40 | 58.0 | 5 | 7.2 | - | - | 7 | 10.1 | 5 | 7.2 | 12 | 17.4 | 0.01 |
| | 2 | 25 | 53.2 | 3 | 6.4 | 2 | 4.3 | 4 | 8.5 | 4 | 8.5 | 9 | 19.1 | |
| | 3 | 34 | 59.6 | 1 | 1.8 | - | - | 7 | 12.3 | 3 | 5.3 | 12 | 21.1 | |
| | 4 | 23 | 47.9 | - | - | 2 | 4.2 | - | - | 13 | 27.1 | 10 | 20.8 | |
| Pomegranate syrup | 1 | 12 | 17.4 | 11 | 15.9 | 4 | 5.8 | 18 | 26.1 | 20 | 29.0 | 4 | 5.8 | 0.01 |
| | 2 | 12 | 25.5 | 12 | 25.5 | 4 | 8.5 | 4 | 8.5 | 11 | 23.4 | 4 | 8.5 | |
| | 3 | 16 | 28.1 | 8 | 14.0 | - | - | 9 | 15.8 | 14 | 24.6 | 10 | 17.5 | |
| | 4 | 10 | 20.8 | 2 | 4.2 | 3 | 6.3 | 5 | 10.4 | 21 | 43.8 | 7 | 14.6 | |
| Vinegar | 1 | 35 | 50.7 | 6 | 8.7 | 2 | 2.9 | 7 | 10.1 | 14 | 20.3 | 5 | 7.2 | 0.20 |
| | 2 | 22 | 46.8 | 6 | 12.8 | 3 | 6.4 | 4 | 8.5 | 6 | 12.8 | 6 | 12.8 | |
| | 3 | 25 | 43.9 | 5 | 8.8 | - | - | 11 | 19.3 | 9 | 15.8 | 7 | 12.3 | |
| | 4 | 22 | 45.8 | 2 | 4.2 | 1 | 2.1 | 2 | 4.2 | 16 | 33.3 | 5 | 10.4 | |
| Wine | 1 | 61 | 88.4 | - | - | - | - | 6 | 8.7 | 2 | 2.9 | 6 | 8.7 | 0.01 |
| | 2 | 35 | 74.5 | 4 | 8.5 | - | - | 2 | 4.3 | 1 | 2.1 | 5 | 10.6 | |
| | 3 | 42 | 73.7 | - | - | - | - | 4 | 7.0 | 3 | 5.3 | 8 | 14.0 | |
| | 4 | 32 | 66.7 | - | - | - | - | 2 | 4.2 | 6 | 12.5 | 8 | 16.7 | |
| Heat-treated sausage | 1 | 29 | 42.0 | 5 | 7.2 | 1 | 1.4 | 15 | 21.7 | 11 | 15.9 | 8 | 11.6 | 0.21 |
| | 2 | 24 | 51.1 | 4 | 8.5 | 1 | 2.1 | 6 | 12.8 | 11 | 23.4 | 1 | 2.1 | |
| | 3 | 31 | 54.4 | 2 | 3.5 | 1 | 1.8 | 9 | 15.8 | 9 | 15.8 | 5 | 8.8 | |
| | 4 | 24 | 50.0 | - | - | 3 | 6.3 | 5 | 10.4 | 7 | 14.6 | 9 | 18.8 | |
| Fermented sausage | 1 | 44 | 63.8 | 2 | 2.9 | 1 | 1.4 | 9 | 13.0 | 6 | 8.7 | 7 | 10.1 | 0.05 |
| | 2 | 30 | 63.8 | 4 | 8.5 | 1 | 2.1 | 3 | 6.4 | 7 | 14.9 | 2 | 4.3 | |
| | 3 | 25 | 43.9 | 2 | 3.5 | 1 | 1.8 | 8 | 14.0 | 11 | 19.3 | 10 | 17.5 | |
| | 4 | 20 | 41.7 | 1 | 2.1 | 3 | 6.3 | 3 | 6.3 | 14 | 29.2 | 7 | 14.6 | |
| Sourdough bread | 1 | 29 | 42.0 | 12 | 17.4 | 2 | 2.9 | 10 | 14.5 | 7 | 10.1 | 9 | 13.0 | 0.01 |
| | 2 | 23 | 48.9 | 9 | 19.1 | 5 | 10.6 | 6 | 12.8 | 2 | 4.3 | 2 | 4.3 | |
| | 3 | 33 | 57.9 | 1 | 1.8 | 3 | 5.3 | 7 | 12.3 | 8 | 14.0 | 5 | 8.8 | |
| | 4 | 27 | 56.3 | 2 | 4.2 | - | - | 4 | 8.3 | 9 | 18.8 | 6 | 12.5 | |

erage consumption of the students who consumed tarhana was 194.2±72.6 mL. When the turnip juice consumption of the students was checked, it was revealed that 58.0% of the first-graders, 53.2% of the 2nd-graders, 59.6% of the 3rd-graders and 47.9% of the 4th-graders never consumed turnip juice. However, 7.2% of the first-graders, 8.5% of the 2nd-graders, 5.3% of the 3rd-graders and 27.1% of the 4th-graders stated that they consume turnip juice 2-3 times a week, and the average consumption of the students who consumed turnip juice was 203.4±96.6 mL.

The students' thoughts on probiotic foods are shown in Figure 1a, Figure 1b and Figure 1c. It is seen that the rate of agreeing with the idea that "probiotics strengthen the immune system" is higher in the 4th graders, and the rate of "I am undecided" (I am not sure) is higher in the first graders. The majority of those who disagree with the idea that "probiotics can fight against infections" are first-year students. While first-graders strongly "I am disagreed" with the idea of "probiotics treat constipation", it seems that the majority of those who chose "I agree" was third and 4th-graders. It was determined that those who were "I am undecided" (I am not sure) for the thought "probiotics should be used in all cancer types" showed a similar distribution in all classes. Similarly, the rate of 3rd and 4th graders was higher among those who "I agree" with the idea that "probiotics should be used in all types of cancer." It is determined that all graders marked the option "I agree" and "I am undecided" (I am not sure) at the same rate for the option "probiotics should be used to protect skin health." Among those who "I do not agree" with this idea, the rate of first-graders was higher. It is seen that all graders marked the "agree", "I do not agree" and "I am undecided" options in similar proportions to the idea that "probiotics should also be used to gain or lose weight." The rate of "agreeing" with the idea "probiotics should be used together with antibiotics" is lower than the rate of "disagreement" and "undecided" in the 4th graders.




FIGURE 1a: The students' thoughts on probiotic foods.

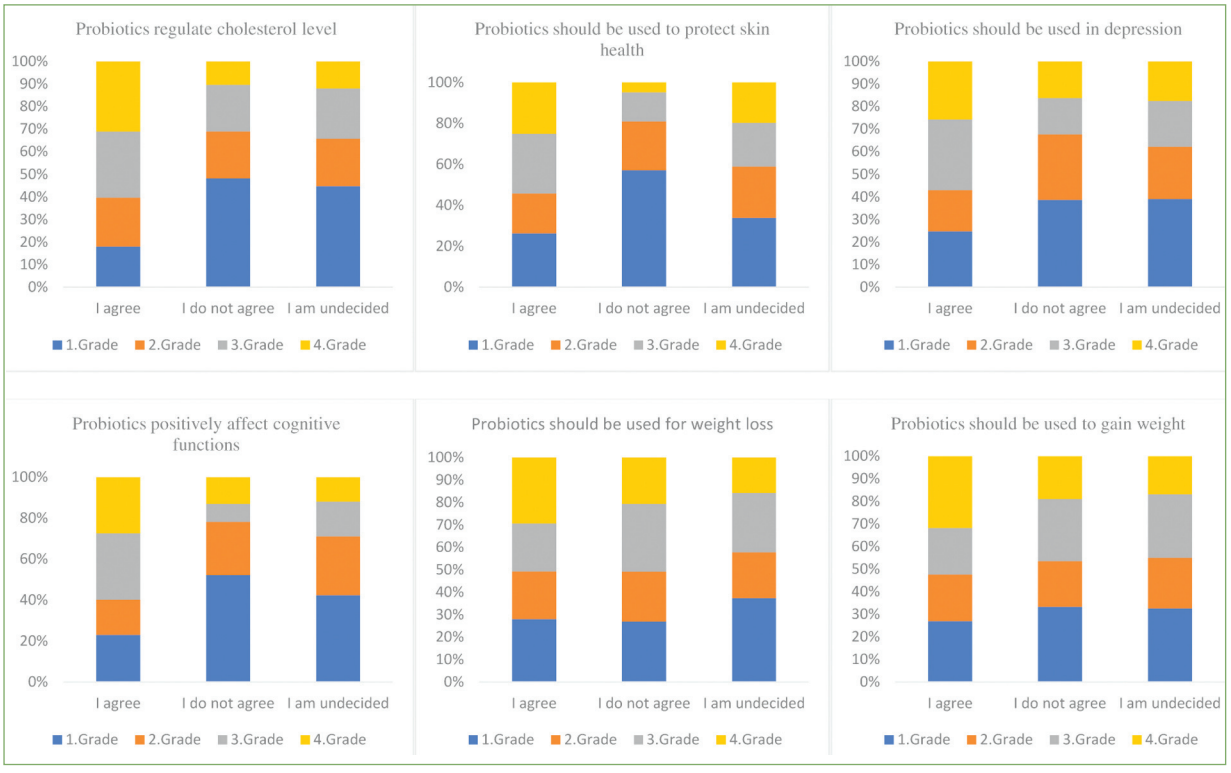



FIGURE 1b: The students' thoughts on probiotic foods.

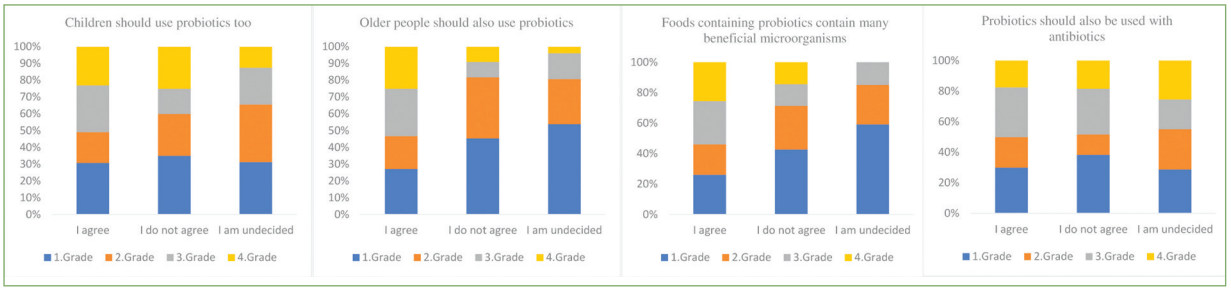



FIGURE 1c: The students' thoughts on probiotic foods.

Among those who "agree" with this idea, the rate of 3rd graders is the highest.

## DISCUSSION

Consumption of probiotic foods has prompted promising outcomes in countless clinical studies to lead to promising results as a therapeutic option for the treatment, prevention and control of various disorders and diseases such as gastrointestinal diseases, allergies, urogenital infections, *Helicobacter pylori* infection, inflammatory bowel syndrome and diarrhea, and colon cancer.[9-14]

Probiotics have wider applications in the food and fermentation industry as non-pharmacological approaches for health management. As a result of the increase in scientific studies revealing the effects of probiotics and the increase in the awareness and interest of the society on probiotics, probiotics have begun to be adapted to many different areas besides the food matrix. Awareness of the health effects of probiotics is higher among those who are educated on this subject, especially among students. In this study, the attitudes and opinions of university students studying in the field of nutrition and diet to-

wards probiotic foods and the frequency of consumption of probiotic foods were examined.

The students in the department of nutrition and dietetics usually take core compulsory courses in the first year, vocational courses in the 2nd and 3rd years, and professional practice courses in the 4th year. For this reason, it is expected that students' knowledge levels and attitudes about the concept of probiotics will improve depending on the increase in grade level. In this study, statistically significant ($p<0.05$) results were obtained between the grade levels of the students and their consumption of probiotic foods, and their attitudes towards probiotic foods. The difference between the question "do you know of any probiotic products other than food or nutritional supplements" and the grade levels of the students was not only statistically significant. The use of probiotics outside of food or nutritional supplements is a very current concept. Especially in the field of cosmetics, there are studies showing the effectiveness of probiotics in the left years.[15-17] In a study conducted on university students' consumption of probiotic products, it was determined that 40.0% of male students and 69.2% of female students had knowledge about probiotic products, and 29.2% of male students and 42.5% of female students consumed probiotic products. Students who do not consume probiotic products as the reasons for not consuming these products; stated that they did not know (43.5%), they thought it was not natural (19.5%), they did not need it (14.9%), and these products are expensive (12.9%) and tasteless (8.5%).[18]

In the study of Zemzemoğlu et al 55.6% of the students answered "yes I know" and 44.4% answered "no I don't know" to the question "do you know what a probiotic is?"[19] It has been reported that 68.6% of the students who answered the question "what is your level of knowledge about probiotics" have "moderate" and 25.4% "low" knowledge level. In the study, 82.4% of the students answered "yes" to the question "do you consume probiotic food." Among those who marked yes, the question of "what has an effect on consumption" was answered by 51.6% as "on recommendation", 24.6% as "due to health problems" and 11.8% as "effect of advertisements." In addition, it was determined that 84.3% of the students answered "yes" to the question "if your answer is yes, did you experience health benefits?" In the study conducted by Şengün et al it was found that 63.9% of the participants consumed probiotic food because it was beneficial for the digestive system.[20] Horasan et al on the other hand, reported that 73.8% of students consume probiotic foods because of their beneficial effects on the digestive system.[21] In this study, the majority of students declared that consuming probiotic foods would be beneficial for their health. It can be said that this study contains similar results to the findings obtained in studies carried out on university students.

Since the colonization of probiotics in the intestine is temporary, it is recommended to consume probiotics regularly in order to maintain their protective effects in the intestine.[22] In the current study, it was observed that the students consumed other probiotic-containing foods besides probiotic yogurt, milk and buttermilk and turnip, wine, and sourdough bread, but the daily consumption rates of probiotic-containing foods other than yogurt and buttermilk were quite low. Meybodi and Mortazavian stated that although probiotic foods containing high levels of live microorganisms are superior to supplements, supplements are preferred because of their more effective properties for specific therapeutic applications.[23] When the consumption levels of students consuming probiotic foods were considered, it was revealed that 38% once a day, 24% once a week, 15.9% 2-3 times a day, 12.6% rarely, and 9.4% 1-3 times a month. However, in this study, all probiotic foods were evaluated together, not separately.[21] Similarly, it was reported in a study conducted by Zeren that the frequency of consumption of probiotic food was at the rate of 24.4% once a day, 23.3% rarely, 19.8% once a week, 17.4% 1-3 times a month and 15.1% 2-3 times a day.[24] In a study conducted by Demirel on the level of knowledge and consumption of probiotic foods among university students with and without nutrition education, it was determined that the students in the department of nutrition and dietetics consumes average 49.9 g buttermilk, 61.5 g milk, 52.3 g yogurt, 8.9 g kefir, 3.4 g turnip juice, 1.8 g pomegranate syrup, 2.7 g tarhana, 4.7 g pickles and 1.8 g probiotic added yogurt.[25]

In the current study, students were asked about 16 different characteristics defined related to probiotics and their opinions are shown in Figure 1. The answers given by the students to the questions of probiotics can be used in skin health and depression, can be used to gain and lose weight, and can be used together with antibiotics are similar to each other. This situation was interpreted, as the newly identified effects of probiotics were not sufficiently understood by the students. Pehlivan stated that the knowledge level of the participants was quite low in a study in which he investigated the thoughts of adult individuals against probiotic foods.[26] Men gave significantly more correct answers than women did to the statement "They keep the microorganisms living in the oral cavity in balance." In addition, it was reported that male participants gave correct answers at higher rates to the statements "Probiotics are live microorganisms that provide beneficial effects on health when taken in sufficient quantities", "Probiotics increase the risk of developing cancer types" and "Probiotics help to enhance the immune system." Özgül et al evaluated the opinions of adult individuals against probiotic foods. It was observed that adults chose the option "Probiotics can be used for weight loss" and "Probiotics can be used together with antibiotics" at lower rates.[27] Similar to the results of this study, it is seen in other studies in the literature that current developments related to probiotics are not sufficiently understood.

## CONCLUSION

The concept of probiotic, which emerged in the middle of the 20th century, continues to increase its currency today. Due to the increase in probiotic awareness, probiotic added products are given more place in the food industry and their consumption is increasing rapidly. In addition, although probiotics have been used in other sectors such as the cosmetics and pharmaceutical industry in recent years, the level of awareness and use of new developments is not very high yet. The students in the department of nutrition and dietetics will graduate by learning the principles of adequate and balanced nutrition. It is important for them to be able to effectively transfer these skills gained during their studentship to individuals and society. This study was carried out to measure the knowledge and attitude levels of the students in the department of nutrition and dietetics about probiotics and their products, as well as to determine the relationship between the grade level and the knowledge level. In the current study, it was revealed that the students who were the subject of the survey had knowledge about the effects of probiotics on health, their knowledge and attitudes towards probiotic products changed positively with their grade level; however, they did not have enough knowledge about current developments. This result showed that the students in the department of nutrition and dietetics should be informed more about the current developments in probiotics and their products and more scientific activities should be organized on the subject.

These obtained data will both support the studies to be carried out in the field of education and will also help the probiotic sector in the process of developing new products and informing the public about them.

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***Conflict of Interest***

*No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.*

***Authorship Contributions***

***Idea/Concept:*** *Ahmet Hulusi Dinçoğlu, Mustafa Özgür;* ***Design:*** *Ahmet Hulusi Dinçoğlu, Mustafa Özgür;* ***Control/Supervision:*** *Ahmet Hulusi Dinçoğlu;* ***Data Collection and/or Processing:*** *Ahmet Hulusi Dinçoğlu, Mustafa Özgür;* ***Analysis and/or Interpretation:*** *Ahmet Hulusi Dinçoğlu, Mustafa Özgür;* ***Literature Review:*** *Ahmet Hulusi Dinçoğlu, Mustafa Özgür;* ***Writing the Article:*** *Ahmet Hulusi Dinçoğlu, Mustafa Özgür;* ***Critical Review:*** *Ahmet Hulusi Dinçoğlu.*

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