

Traditional versus probiotic products: the influence of socio-economic factors on probiotic product consumption in Turkey

Ahmet Duran Çelik¹  Tuğçe Sarıoğlu^{1*} 

¹Department of Agriculture Economics, Faculty of Agriculture, Hatay Mustafa Kemal University, Hatay, Türkiye. E-mail: tkiziltug@mku.edu.tr.

*Corresponding author.

ABSTRACT: This study investigated the impact of socio-economic factors on the consumption of probiotic products in the Eastern Mediterranean region of Turkey, specifically focusing on three categories: probiotic yogurt and milk, traditional fermented dairy products, and probiotic supplements. Based on surveys conducted with 600 participants from the cities of Kahramanmaraş, Hatay, and Osmaniye, logistic regression analysis was employed to explore relationships between socio-economic characteristics and probiotic consumption patterns. Findings revealed that education level and gender significantly influenced the likelihood of consuming probiotic products. Traditional products such as fermented yogurt, ayran, and cheese exhibit the highest consumption rates, driven by cost-effectiveness and cultural preferences. Probiotic supplements; however, are less commonly used, primarily among individuals with higher educational attainment. This research underscores the importance of consumer awareness about the health benefits of probiotics and highlighted the dominance of traditional products in the region's dietary habits. These findings provided valuable insights for market strategies targeting probiotic product consumption in Turkey.

Key words: functional foods, consumer behavior, purchase intention, traditional fermented dairy products, Eastern Mediterranean region.

Produtos tradicionais versus probióticos: a influência de fatores socioeconômicos no consumo de produtos probióticos na Turquia

RESUMO: Este estudo investiga o impacto dos fatores socioeconômico no consumo de produtos probióticos na região do Mediterrâneo Oriental, da Turquia. O estudo temfoco específico em três categorias: iogurte e leite probióticos, produtos lácteos fermentados tradicionais e suplementos probióticos. Deste modo, com base em pesquisas realizadas com 600 participantes das cidades de Kahramanmaraş, Hatay e Osmaniye, foi utilizada uma análise de regressão logística para explorar as relações entre as características socioeconômico e os padrões de consumo de probióticos. Os resultados revelam que o nível de educação e o gênero sexual influenciam significativamente a probabilidade de consumo de produtos probióticos. Além disso, produtos tradicionais como iogurte fermentado, ayran e queijo apresentam as taxas de consumo mais elevadas, impulsionadas pela relação custo-benefício e pelas preferências culturais. Os suplementos probióticos, no entanto, são menos utilizados, principalmente entre indivíduos com maior nível de escolaridade. O estudo busca ressaltar a importância da conscientização do consumidor sobre os benefícios dos probióticos para a saúde e destaca o domínio dos produtos tradicionais nos hábitos alimentares da região. Essas descobertas fornecem informações valiosas para estratégias de mercado voltadas para o consumo de produtos probióticos na Turquia.

Palavras-chave: alimentos funcionais, comportamento do consumidor, intenção de compra, produtos lácteos fermentados tradicionais, região do Mediterrâneo Oriental.

INTRODUCTION

Functional foods are a type of food presented with the promise of improving the body's physiological functions (URALA & LAHTENMAKI, 2007). The International Life Sciences Institute (ILSI) defines functional foods as "foods containing various components aiming to improve health status or reduce the risk of certain diseases" (BOLUDA & CAPILLA, 2017). This concept originated in Japan in the 1980s and began to gain acceptance in the Western world by the late 1990s (DI PASQUALE et al., 2011). In 1991, Japan's Ministry of Health, Labor, and Welfare (MHLW) introduced a functional food regulation called "Foods

for Specified Health Uses" (FOSHU). Under this regulation, numerous new products clinically proven to have health benefits were developed and introduced to the market (IWATANI & YAMAMOTO, 2019).

Dairy products hold a significant place among functional food types. The most important functional products include full-fat/low-fat dairy products, probiotic dairy products, vitamin/mineral or omega-3 fatty acid-enriched products, and low-lactose/lactose-free dairy products. Notably, probiotic products are considered the most important functional products by many researchers (BAZHAN et al., 2018).

Probiotics are commonly defined as "foods containing beneficial live microorganisms

that help maintain the microbial equilibrium of the intestines” (AKSU et al., 2010). A widely recognized international definition further described probiotics as “live microorganisms which, when consumed in adequate quantities, provide a health advantage to the host” (SANDERS, 2008). These live microorganisms can be ingested through fermented foods or dietary supplements. Although, many well-known probiotic products are dairy-based such as yogurt, cheese, ayran, and kefir; various other fermented foods naturally contain beneficial probiotic bacteria, including sauerkraut, sour pickles, apple cider vinegar, kombucha, şalgam (fermented turnip juice), and boza.

A substantial body of research indicated that maintaining a healthy balance of bacteria in the digestive system is closely linked to overall well-being. Probiotics support this microbial balance in the gut and have been associated with numerous scientifically documented health benefits (GILLETTE, 2025).

In the last two decades, consumers have shown increased interest in health and well-being, reflecting a shift in consumption behavior and greater attention toward “healthier” foods. The global probiotic market value exceeded 48 billion USD in 2021, with 14% of this market attributed to probiotic supplements (PARASKEVAKOS, 2020). Between 2016 and 2021, the highest growth in probiotic supplement market value was observed in developing countries, namely China (14.9%), India (14.7%), and Brazil (13.5%) (ANONYMOUS, 2023). Although, probiotic products are prominent as part of the healthy living trend, their consumption varies across countries. In some countries probiotics are considered part of food and dietary supplements, while in others, they are classified as pharmaceuticals. Accordingly, consumer preferences for probiotic products differ by region. In the United States consumers predominantly prefer probiotics as supplements, whereas in Asia-Pacific and European Union countries probiotic yogurt and fermented milk products are more popular (ÇELİK, 2023). As of 2022 the European Union probiotic market was valued at €9.5 billion; of which 53% (€5.04 billion) was accounted for by probiotic yogurt, 30% (€2.86 billion) by traditional sour milk products, and 17% (€1.6 billion) by probiotic supplements. While the European Union ranks second globally in the probiotic yogurt market, it constitutes 47% of the global total market value for sour milk products, and 25% for probiotic supplements (IPA, 2024).

The commercial probiotic market is categorized into three main segments: probiotic

yogurt (FF-functional/fortified), sour milk products, and probiotic supplements. Probiotic yogurts, available in plain, flavored, and drinkable formats, are dairy-based products enriched with added probiotic strains. North America, the Asia Pacific, and European Union, are the dominant markets for these yogurts. Sour milk products represent a subgroup of dairy items created by fermenting pasteurized milk with lactic acid bacteria. Examples of such products included traditional yogurt, ayran (a yogurt-based beverage), buttermilk, and kefir. The primary markets for sour milk products are the European Union, the Middle East and Africa, and the Asia Pacific. Probiotic supplements, are offered in pharmaceutical forms containing strains like “*Saccharomyces boulardii*”. The United States leads the global market for probiotic supplements, with the Asia Pacific and European Union following closely behind (ÇELİK, 2023).

It is crucial for consumers to understand the health benefits of probiotic products to develop or strengthen positive attitudes toward them. However, consumer knowledge about the benefits of probiotic foods remains limited (CARVALHO et al., 2014). Therefore, observing how much of their constrained budgets consumers allocate to and spend on products they have limited knowledge about is highly important.

The existing literature on consumer behavior toward probiotic products remains limited and is generally addressed within the broader framework of functional foods. In these studies, perceptions and attitudes toward probiotic products are examined predominantly through descriptive analyses, while the ways in which socioeconomic, demographic, and cultural differences shape consumption decision-making processes have not been sufficiently explored. In Turkey, the dominance of traditional food products and the relatively low level of probiotic awareness further constrain research on probiotic product consumption. Notably, regions such as the Eastern Mediterranean characterized by high cultural diversity and an intensive tradition of producing and consuming conventional foods are almost entirely absent from the literature. Moreover, the question of which socioeconomic variables determine probiotic product consumption, and to what extent; remains largely unanswered in the context of Turkey.

The aim of this study, conducted in the Eastern Mediterranean region, was to determine the impact of socio-economic differences on probiotic consumption. In this context, probiotic products

are examined in three main groups: “probiotic yogurt, traditional fermented dairy products (sour milk products), and probiotic supplements” (IPA, 2024). The study sought to answer the question of how socio-economic characteristics such as; age, education, occupation, food expenditure, and income, influence probiotic consumption and consumption frequency.

The hypotheses developed within the framework of the research are as follows:

H₁: Socio-economic characteristics have no effect on the consumption of probiotic products.

H₂: Socio-economic characteristics have no effect on the consumption of traditional fermented products.

H₃: Socio-economic characteristics have no effect on the use of probiotic supplements.

H₄: Socio-economic characteristics have no effect on the frequency of probiotic product consumption.

H₅: Socio-economic characteristics have no effect on the frequency of consuming traditional fermented products.

H₆: Socio-economic characteristics have no effect on the frequency of probiotic supplement use (Figure 1).

MATERIALS AND METHODS

Materials

The primary data for this study were obtained through a survey conducted with randomly selected consumers living in the TR63 Region of Turkey. During the data collection process, the

three provinces within the region (Kahramanmaraş, Hatay, and Osmaniye) were stratified according to their population sizes, and the number of surveys to be conducted in each province was proportionally allocated based on these strata. Accordingly, the study employed a stratified random sampling approach. The distribution of survey numbers was proportional to the population of these central districts based on 2020 data from the Turkish Statistical Institute (TSI) (TSI, 2020). Specifically, 300 surveys were conducted in Kahramanmaraş’s central districts (population: 664,958), 176 surveys in Antakya, Hatay’s central district (population: 389,377), and 124 surveys in Osmaniye’s city center (population: 274,420), amounting to a total of 600 surveys. Data collection took place in April and May of 2021.

The questionnaire used in the study was developed based on a review of the relevant literature to measure probiotic and traditional product consumption and purchasing behaviors. The survey was constructed by drawing on scales related to functional food consumption, probiotic awareness, health motivations, and consumer behavior. The survey form consists of four sections: (i) participants’ awareness and consumption levels of probiotic products, (ii) their consumption levels and preferences regarding traditional products, (iii) their awareness and consumption levels of probiotic supplement products, and (iv) the socioeconomic and demographic variables.

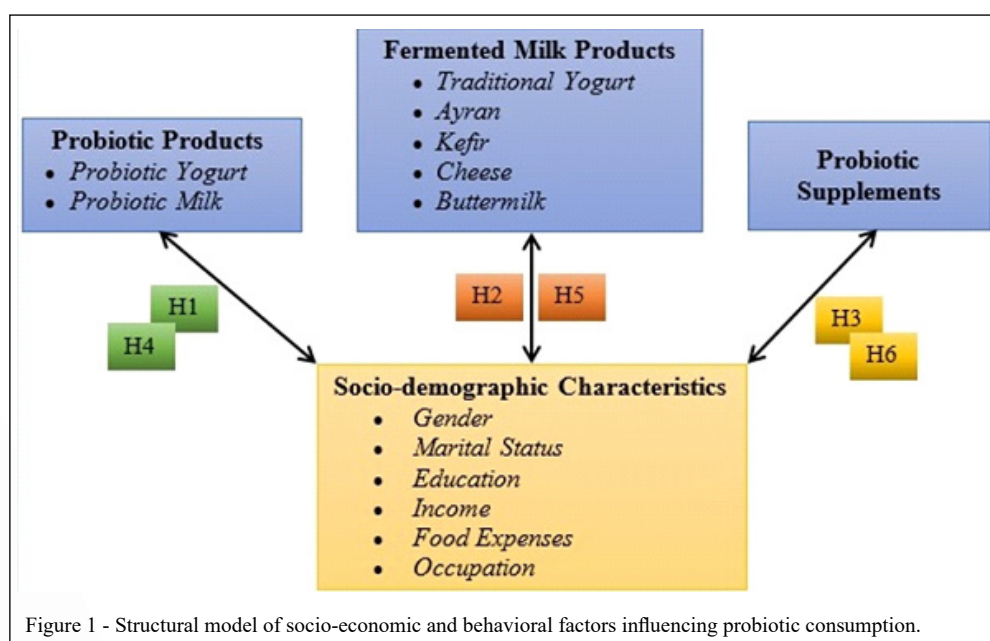


Figure 1 - Structural model of socio-economic and behavioral factors influencing probiotic consumption.

Determining Sample Size

In order to determine the sample size for this research, the simple random sampling method was employed. The formula used for calculating the sample size is provided below (CHURCHILL, 1995). For this study, the maximum possible sample size was targeted, assuming P and Q values of 0.50. Consequently, the sample size was determined to be 600 with a 95% confidence level and a 4% margin of error. The formula is as follows:

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

P: Probability of a positive outcome (%50)

Q: 1-P Probability of a negative outcome (%50)

$Z_{\alpha/2}$: Confidence interval (95%, table value = 1.96)

d: Margin of error (4%)

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

The survey questions addressed participants' socio-economic characteristics including: age, gender, education, occupation, income, marital status, and food expenditures. Products were categorized into three groups: (a) probiotic products (functional/fortified-FF), (b) traditional fermented dairy products, and (c) supplements. Probiotic consumption (non-consumption = 0, consumption = 1) and consumption frequency were measured using a Likert scale (1 = Never, 2 = Once a month, 3 = Once a week, 4 = 2–3 times a week, 5 = Daily), and hypotheses were developed accordingly.

The products analyzed within these categories included: probiotic milk and yogurt under the probiotic product group; traditional fermented yogurt, milk, ayran, kefir, cheese, and butter under the traditional fermented dairy product group; and probiotic supplements under the supplement group.

Data analysis

The data collected were analyzed using SPSS 21 software. Descriptive statistics were employed to summarize participants' socio-economic characteristics. The logistic regression analysis was utilized to examine binary and categorical outcome variables calculated using continuous or categorical predictors (BACKHAUS et al., 2016). This method was used to identify the relationship between socio-economic characteristics and the likelihood of consuming each product category.

Socio-economic characteristics were used as independent variables for each product group. For instance, HANOUF et al. (2021) employed an ordinal logistic regression model to analyze the

relationship between probiotic consumption levels and socio-economic factors such as: gender, age, marital status, household size, presence of children, household income, place of residence, and education level. Similarly, in this study the dependent variable, consumption status, was measured nominally as “yes” or “no”. This approach aligns with the method used by YEUNG & YEE (2012).

Goodness-of-fit statistics for the logistic regression model including: -2 log-likelihood, the Hosmer-Lemeshow test (HOSMER & LEMESHOW, 2000), Cox and Snell R-Square, and Nagelkerke R-Square, were evaluated. Additionally, variance analysis (ANOVA) and T-tests were applied to assess whether socio-economic factors played a significant role in consumption frequency. Tukey's test was performed for factors with a normal distribution, while the Games-Howell test was applied to factors without a normal distribution.

RESULTS AND DISCUSSION

The socio-economic characteristics of the study participants are presented in table 1. Among the respondents, 51.5% were women. In terms of age distribution, most participants fell within the 28–37 age group (31.8%), followed closely by those aged 38–47 (30.3%). Approximately 65% of the participants were married. Regarding educational background, the highest representation came from high school graduates (36%) and bachelor's degree holders (34.7%).

When examining occupational distribution, 28.1% of the participants were teachers or academics, 25.9% were employed in the public sector, 25.1% were unemployed, students, or retirees, and 20.9% were self-employed. As for income levels, the most frequently observed category was the 5001–7000 TL range, encompassing 38% of the participants.

A logistic regression analysis was conducted to determine the impact of socio-economic characteristics on the consumption of probiotic products. Table 2 presents the results of the regression model for probiotic products. The consumption rates of probiotic-containing products among the surveyed consumers were as follows: cheese 98.7%, ayran 97.8%, traditional fermented yogurt 94.7%, kefir 63.5%, probiotic milk 45.2%, buttermilk 43.8%, probiotic yogurt 41.8%, and probiotic supplements 18.5%. The estimated logistic regression coefficients (β), significance levels, and the odds ratios ($\text{Exp}(\beta)$) for product consumption are reported together. In the applied models, the

Table 1 - The socio-economic and demographic characteristics of the study participants.

Variables	Frequency	Ratio (%)
-----Gender-----		
Women	309	51.5
Men	291	48.5
Total	600	100
-----Age-----		
18-27	110	18.3
28-37	191	31.8
38-47	182	30.3
48 +	117	19.5
Total	600	100
-----Marital status-----		
Married	390	65
Single	210	35
Total	600	100
-----Education-----		
High school and below	216	36
Associate degree	59	9.8
Bachelor's degree	208	34.7
Graduate	117	19.5
Total	600	100
-----Occupation*-----		
Unemployed (student, retired, etc.)	132	25.1
Teacher/Academic	148	28.1
Independent Business (Self-employed)	110	20.9
Public Employee	136	25.9
Total	526	100
-----Monthly Income**-----		
<5000	219	36.5
5001-7000	228	38
7001<	153	25.5
Total	600	100
-----Monthly Food Expenditure-----		
500-1000	252	42
1001-1500	169	28.2
1501<	179	29.8
Total	600	100

(*) Data that violated normal distribution were excluded; (**) 1 USD = 8.87 TL (2021).

Hosmer and Lemeshow test results ($P > 0.05$) indicate an adequate model fit. The reference group in the analysis was defined as “non-consumers”.

According to the analysis results, socio-economic characteristics explain 21.7% of the variance in the probiotic yogurt consumption model. An increase in the level of education raises the likelihood of an individual consuming probiotic yogurt by 1.93 times. Moreover, the probability of probiotic yogurt consumption is 53.7% higher among

women compared to men. No significant relationships were observed between probiotic yogurt consumption and the other variables included in the model.

Regarding probiotic milk consumption, socio-economic characteristics account for 15.8% of the model. Higher education levels increase the likelihood consuming probiotic milk by 1.73 times. Furthermore, individuals employed in the public sector exhibit a 20% higher tendency to consume probiotic milk. The positive relationship between

Table 2 - Logistic regression analysis results for probiotic consumption status.

Variables	Probiotic yogurt -----consumption-----			Probiotic milk -----consumption-----			Traditional yogurt -----consumption-----			----Cheese consumption----		
	β	Exp (β)	sig.	β	Exp (β)	sig.	β	Exp (β)	sig.	β	Exp (β)	sig.
Income	-0.154	0.857	0.376	-0.133	0.875	0.428	-0.327	0.721	0.334	0.037	1.037	0.952
Occupation	-0.156	0.855	0.091	-0.202*	0.817	0.025	0.231	1.260	0.276	-0.283	0.754	0.407
Age	-0.015	0.985	0.907	0.045	1.046	0.715	0.407	1.502	0.171	0.425	1.530	0.409
Food expenditure	0.269	1.309	0.075	0.172	1.187	0.243	-0.487	0.615	0.100	-0.813	0.443	0.155
Education level	0.657*	1.930	0.000	0.552*	1.737	0.000	-0.451*	0.637	0.045	-0.175	0.840	0.655
Gender	-0.622*	0.537	0.003	-0.331	0.718	0.102	0.262	1.300	0.536	0.031	1.032	0.967
Marital Status	0.41	1.507	0.090	0.398	1.489	0.089	-1.186*	0.306	0.019	-0.615	0.541	0.480
Constant	-2.924	0.054	0.000	-2.351	0.095	0.000	5.651	284.496	0.000	6.615	746.349	0.002
-2 Log likelihood	619.814 ^a			654.269 ^a			192.778 ^a			77.001 ^a		
Chi-square	9.011			6.097			3.661			9.619		
Hosmer and Lemeshow Test	0.341			0.636			0.886			0.293		
Nagelkerke R ²	0.217			0.158			0.168			0.076		
Corrents predictions	67.30%			64.60%			94.50%			98.50%		
Variables	-----Ayran consumption----			---Kefir consumption---			----Buttermilk consumption---			-----Supplement use-----		
	β	Exp (β)	sig.	β	Exp (β)	sig.	β	Exp (β)	sig.	β	Exp (β)	sig.
Income	0.075	1.078	0.881	0.016	1.016	0.926	-0.548*	0.578	0.001	-0.096	0.909	0.637
Occupation	0.224	1.251	0.466	-0.006	0.994	0.945	-0.183*	0.833	0.038	-0.157	0.855	0.169
Age	0.605	1.832	0.192	0.097	1.102	0.429	-0.019	0.982	0.873	-0.181	0.835	0.245
Food expenditure	-0.423	0.655	0.333	-0.202	0.817	0.173	0.293*	1.340	0.043	0.338	1.403	0.057
Education level	-0.358	0.699	0.261	0.179	1.196	0.062	0.135	1.144	0.151	0.384*	1.468	0.002
Gender	-0.379	0.685	0.539	-0.786*	0.456	0.000	0.691*	1.995	0.001	-0.392	0.675	0.119
Marital Status	-0.421	0.656	0.578	-0.448	0.639	0.054	-0.136	0.873	0.547	0.046	1.047	0.872
Constant	4.634	102.939	0.006	0.481	1.618	0.316	-0.14	0.869	0.76	-2.746	0.064	0.000
-2 Log likelihood	105.199 ^a			662.929 ^a			695.140 ^a			469.428 ^a		
Chi-square	5.148			8.213			8.047			13.847		
Hosmer and Lemeshow Test	0.742			0.413			0.429			0.086		
Nagelkerke R ²	0.089			0.064			0.064			0.092		
Corrents predictions	97.70%			65.80%			62.70%			81.70%		

*The mean difference is significant at the 0.05 level.

education and probiotic milk consumption may be attributed to higher health consciousness, greater purchasing power, and a stronger tendency to adopt healthy eating habits among more educated individuals. In a study conducted by NIVA (2006), it was found that individuals in regular employment consumed more functional food products compared to those who were unemployed.

The traditional fermented yogurt consumption model is explained to the extent of

16.8% by socio-economic characteristics. According to this model, higher education levels decrease the likelihood of consuming traditional yogurt by 63.7%, while being married raises the likelihood by 30.6%. With respect to kefir consumption, the results indicated that women are 45.6% more likely to consume kefir than men. However, YELCE & GÜL (2020) reported that increased education and income are associated with a decrease in kefir consumption, a finding that contrasts with the present study.

According to the buttermilk consumption model, a one-unit increase in income enhances the likelihood of consuming buttermilk by 57.8%. Additionally, employed individuals are 83.3% more likely to consume buttermilk. An increase in food expenditures raises the likelihood of not consuming buttermilk by 1.34 times, and women are 1.99 times more likely than men to refrain from consuming buttermilk. In the supplement consumption model, a rise in the level of education increases the likelihood of supplement consumption by 1.46 times. A study conducted in the United States found that functional food consumers tend to have a higher level of education (VERBEKE, 2005). Similarly, the intake of multivitamins and minerals is higher among educated individuals (JONG et al., 2003). Moreover, research in Finland has shown that educated consumers have a more positive attitude toward functional foods (URALA & LAHTEENMAKI, 2007). These findings are consistent with the results of the present study.

In summary, the findings indicated that higher education levels are associated with increased consumption of probiotic yogurt and milk, while the consumption of traditional products decreases. This pattern is consistent with the findings reported by URALA & LAHTEENMAKI (2007) and VERBEKE (2005), who found that individuals with higher educational attainment tend to have a more positive attitude toward functional foods. No significant effects were observed regarding the factors influencing cheese consumption.

According to the results of the logistic regression analysis, the consumption of probiotic products is influenced by factors such as occupation, education, and gender. In the case of traditional products, only the consumption of fermented yogurt, kefir, and buttermilk is affected by socio-economic characteristics. Additionally, probiotic supplement consumption is significantly influenced by education level. These findings indicated that at least one socio-economic factor affects the consumption of probiotic-enhanced, traditional, and supplement products. Therefore, the following hypotheses were rejected:

H₁: "Socio-economic characteristics have no effect on the consumption of probiotic-enhanced products."
H₂: "Socio-economic characteristics have no effect on the consumption of traditional products."
H₃: "Socio-economic characteristics have no effect on the consumption of supplement products."

These results align with the findings of KARAKAYA & ÖZKAN (2020), who reported that as consumers' education levels increase, the likelihood of purchasing branded milk and dairy

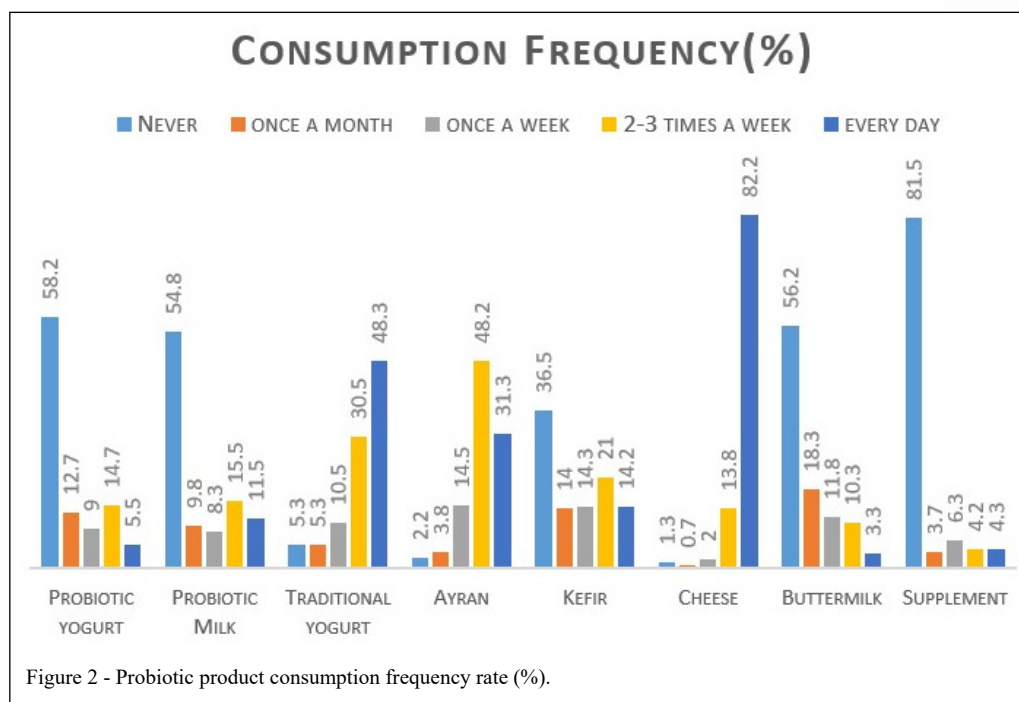
products sold in retail markets decreases. Moreover, their study found that female consumers are more likely than male consumers to purchase retail milk and dairy products. Similarly, ONURLUBAŞ & TAŞDAN (2017) found that women consume more traditional foods. However, while their study identified a positive relationship between income level and traditional food consumption, it also found that higher education levels lead to a decline in traditional food consumption, consistent with the findings of this study.

ANOVA test results

The frequency of probiotic product consumption is presented in figure 2. Accordingly, the products with the highest rates of non-consumption are; probiotic yogurt, probiotic milk, kefir, buttermilk, and probiotic supplements. In contrast, the most frequently consumed products daily are cheese and fermented yogurt. A study conducted in Brazil found that probiotic yogurt was the most frequently consumed product among participants, with 3.7% consuming it daily and 27.8% consuming it at least once a week. The second most frequently consumed product was probiotic-enriched fermented milk, with 3.1% consuming it daily and 18.8% at least once a week. Additionally, the research found that 94.9% of participants did not consume probiotic capsules (CARVALHO et al., 2014). Another analysis conducted in Turkey determined that 87.9% of consumers consume traditional foods, and the probability of traditional food consumption in the country was estimated at approximately 98.0% (ONURLUBAŞ & TAŞDAN, 2017).

The frequency of probiotic product consumption was analyzed by considering consumers' demographic characteristics. In this context, individual differences were examined. To evaluate these differences, the results of the t-test are presented in table 3, while the results of the variance (ANOVA) analysis are shown in table 3.

The findings in table 3 indicate that the consumption frequency of probiotic yogurt ($P = 0.000$) and probiotic milk ($P = 0.000$) significantly differs between men and women, with women consuming these products more frequently. However, no statistically significant difference was found in the consumption frequency of traditional yogurt. Regarding other traditional products, men consume ayran ($P = 0.017$) and buttermilk ($P = 0.001$) more frequently than women, whereas women have a higher consumption frequency of kefir ($P = 0.000$) and cheese ($P = 0.027$). Additionally, the consumption



frequency of probiotic supplements ($P = 0.017$) is significantly higher among women. In summary, females have been found to consume probiotic products more frequently than males.

These results align with the findings of SCHULTZ et al. (2011), which demonstrated that women exhibit greater interest in probiotic products than men. Relevant studies have indicated that female consumers tend to exhibit greater nutritional awareness than male consumers, largely due to their predominant role in household food-related decision-making and purchasing activities (MCKENZIE et al., 2022). Similarly, PAYAHOO et al. (2012) observed a significant gender-related difference in product awareness.

The consumption frequency of probiotic yogurt ($P = 0.014$) and probiotic milk ($P = 0.032$) significantly varies based on marital status, with single individuals consuming these products more frequently than married individuals. In contrast, within the traditional product group, the consumption frequency of yogurt ($P = 0.000$) and ayran ($P = 0.000$) is significantly higher among married individuals. These results are consistent with the findings of ONURLUBAŞ & TAŞDAN (2017), who reported that traditional products are more commonly consumed by married individuals. The association between household size, economic factors, and the

preference for traditional products further supports these findings.

The differences in the frequency of probiotic product consumption based on socio-demographic characteristics are presented in table 4. The frequency of probiotic yogurt and milk consumption was found to be statistically significant ($P < 0.05$) in relation to socio-economic characteristics (gender, marital status, age, education, occupation, income, and food expenditure). Based on this result, the null hypothesis (H_0) stating that “socio-economic characteristics have no effect on the frequency of probiotic product consumption,” is rejected, and the alternative hypothesis, “at least one socio-economic characteristic affects the frequency of probiotic product consumption”, is accepted.

The frequency of traditional yogurt consumption shows significant differences based on marital status, age, education, and occupation. The frequency of cheese consumption is significantly affected by differences in gender, age, education, food expenditure, and income. The factors influencing the frequency of buttermilk consumption are gender, marital status, education, occupation, and income. Meanwhile, the frequency of kefir consumption is influenced by gender and changes in food expenditure. The only statistically significant factor affecting the consumption of churned buttermilk is

Table 3 - Influence of gender and marital status on consumption frequency (Independent t-test results).

Variables	Mean	P value	Variables	Mean	P value
Probiotic yogurt			Probiotic yogurt		
Female	2.16	0.000*	Married	1.87	0.014*
Male	1.76		Single	2.15	
Probiotic milk			Probiotic milk		
Female	2.46	0.000*	Married	2.09	0.032*
Male	1.90		Single	2.37	
Fermented yogurt			Fermented yogurt		
Female	4.05	0.138	Married	4.31	0.000*
Male	4.18		Single	3.74	
Ayran			Ayran		
Female	3.94	0.017*	Married	4.14	0.000*
Male	4.12		Single	3.82	
Kefir			Kefir		
Female	2.95	0.000*	Married	2.71	0.058
Male	2.28		Single	2.47	
Cheese			Cheese		
Female	4.81	0.027*	Married	4.75	0.784
Male	4.69		Single	4.74	
Buttermilk			Buttermilk		
Female	1.71	0.001*	Married	1.86	0.844
Male	2.02		Single	1.88	
Probiotic supplement			Probiotic supplement		
Female	1.56	0.017*	Married	1.46	0.869
Male	1.35		Single	1.47	

*The mean difference is significant at the 0.05 level.

gender. Based on these findings, at a significant level of $P < 0.05$, at least one socio-economic characteristic has a statistically significant effect on the consumption of traditional products. Consequently, the null hypothesis (H_0) stating that “socio-economic characteristics have no effect on the frequency of traditional product consumption”, is rejected, and the alternative hypothesis is accepted.

The factors affecting the frequency of probiotic supplement consumption are identified as gender, education level, occupation, and food expenditure. Therefore, the null hypothesis (H_0) stating that “socio-economic characteristics have no effect on the frequency of probiotic supplement consumption”, is rejected, and the alternative hypothesis is accepted.

AGUIRRE (2014) found that income level, education level, and family size are significant determinants of the frequency of probiotic product consumption. These results align with the present study. The analysis results indicated that individuals with higher income levels consume probiotic milk

and yogurt more frequently. This finding is consistent with an examination by JONG et al. (2003), which reported that the consumption of functional foods is more prevalent among high-income individuals. Conversely, the greater consumption of traditional products such as buttermilk and cheese among lower-income individuals can be explained by the perception of traditional products as staple foods. This observation aligns with previous literature findings that highlight the impact of income level on traditional product consumption (AGUIRRE, 2014).

An additional study concluded that probiotic consumption is more prevalent among individuals over the age of 35 and those with higher education levels (AVILA et al., 2020). The findings of the present research indicated that probiotic consumption is more common among women, individuals with higher education, and those with higher income levels. Another analysis revealed that the use of probiotic supplements is more prevalent among women, older age groups, highly educated individuals, and high-income participants; supporting

Table 4 - Relationship between socio-economic status and consumption frequencies (ANOVA test results).

Products	Age (sig.)	Education level (sig.)	Occupation (sig.)	Food expenditure (sig)	Income (sig)
Probiotic yogurt	0.017*	0.000**	0.000**	0.000**	0.035*
Probiotic milk	0.001*	0.000**	0.000**	0.001*	0.010*
Fermented yogurt	0.012*	0.005*	0.011*	0.114	0.115
Cheese	0.004*	0.005*	0.436	0.003*	0.006*
Ayran	0.356	0.030*	0.010*	0.206	0.008*
Kefir	0.506	0.229	0.448	0.015*	0.700
Buttermilk	0.397	0.155	0.093	0.335	0.179
Supplement	0.898	0.000**	0.001*	0.002*	0.059

*P < 0.05, **P < 0.01.

the findings of the present study (MAHDAVI-ROSHAN et al., 2021). A similar investigation demonstrated that education level, income level, and gender (female) increase awareness and the likelihood of purchasing probiotic dairy products (YILMAZ ERSAN et al., 2020).

An examination among Jordanian students identified a relationship between probiotic knowledge and gender, indicating that women are more knowledgeable about probiotics than men (AL-NABULSI et al., 2014). A possible explanation for the higher probiotic product consumption among women is that women tend to be more knowledgeable and conscious about nutrition and food compared to men. Additionally, women are generally more concerned with their health and physical appearance than men (TURREL, 1997).

According to the results of the variance analysis test, it was concluded that socio-economic characteristics influenced the frequency of product consumption. To determine between which subgroups this effect occurs, Post Hoc test results were required. The relationships between age and the frequency of consumption of probiotic yogurt, probiotic milk, traditional yogurt, and cheese, are presented in table 5.

There is a significant difference in the consumption of probiotic yogurt ($P < 0.05$; $P = 0.008$) and probiotic milk ($P < 0.05$; $P = 0.017$) between individuals aged 18-27 and those over 48 years old. Individuals aged 18-27 consume probiotic yogurt and milk more frequently. In probiotic milk consumption ($P < 0.05$; $P = 0.045$), individuals aged 38-47 consume probiotic products more frequently than those aged 28-37.

Among traditional products, there is a significant difference in the consumption of fermented

yogurt between individuals aged 18-27 and those over 48 years old ($P < 0.05$; $P = 0.011$). Accordingly, traditional yogurt consumption is higher among individuals over 48 years old.

Regarding cheese consumption, there is a statistically significant difference between individuals aged 18-27 and those aged 28-37 ($P < 0.05$; $P = 0.022$). Accordingly, individuals aged 28-37 consume more cheese compared to those aged 18-27.

The relationships between the frequency of consumption of probiotic yogurt, milk, traditional fermented yogurt, buttermilk, cheese, and supplements; and the level of education are presented in table 6.

Regarding probiotic yogurt consumption, there is a significant difference among individuals with high school, undergraduate, and postgraduate education levels. As the level of education increases, the frequency of probiotic yogurt and milk consumption also increases.

In contrast, individuals with a high school education tend to consume traditional products more frequently than those with undergraduate and postgraduate degrees. In other words, the frequency of traditional yogurt, cheese, and buttermilk consumption is inversely proportional to the level of education. Individuals with lower education levels are more likely to consume traditional products.

Regarding probiotic supplement use, there is a significant difference between individuals with undergraduate/associate degrees and those with only a high school education. Individuals with higher education levels tend to consume more probiotic supplements.

Table 7 presents the relationships between product consumption frequency and occupational groups. Regarding probiotic yogurt consumption,

Table 5 - Post Hoc test results for age.

Products	Reference Age	Age	Mean difference	Std Error	Sig
Probiotic yogurt (Games-Howell)	18-27	28 - 37	0.213	0.165	0.571
		38 - 47	0.251	0.166	0.429
		48 +	0.552	0.171	0.008*
	28-37	18 - 27	-0.213	0.165	0.571
		38 - 47	0.038	0.139	0.993
		48 +	0.339	0.145	0.093
Probiotic milk (Games-Howell)	18-27	28-37	0.410	0.178	0.098
		38 - 47	0.008	0.179	1.000
		48 +	0.582	0.197	0.017*
	28-37	18-27	-0.410	0.178	0.098
		38 - 47	-0.402	0.154	0.045*
		48 +	0.171	0.174	0.759
Fermented yogurt (Games-Howell)	18-27	28 - 37	-0.250	0.155	0.375
		38 - 47	-0.266	0.158	0.337
		48 +	-0.496	0.159	0.011*
	28-37	18 - 27	0.250	0.155	0.375
		38 - 47	-0.016	0.112	0.999
		48 +	-0.246	0.113	0.133
Cheese (Games-Howell)	18-27	28 - 37	-0.259	0.089	0.022*
		38 - 47	-0.092	0.099	0.788
		48 +	-0.195	0.105	0.248
	28-37	18 - 27	0.259	0.089	0.022*
		38 - 47	0.166	0.058	0.023
		48 +	0.064	0.067	0.778

*The mean difference is significant at the 0.05 level.

there is a statistically significant difference between unemployed individuals and self-employed individuals ($P < 0.05$; $P = 0.007$), teachers/academics and self-employed individuals ($P < 0.05$; $P = 0.000$), and teachers/academics and public sector employees ($P < 0.05$; $P = 0.004$).

For probiotic milk consumption, statistically significant differences were found between unemployed individuals and self-employed individuals ($P < 0.05$; $P = 0.023$), teachers/academics and self-employed individuals ($P < 0.05$; $P = 0.000$), and teachers/academics and public sector employees ($P < 0.05$; $P = 0.001$). The results indicated that probiotic yogurt and milk consumption are higher among teachers/academics.

Among traditional products, significant differences were found in the consumption of traditional fermented yogurt ($P < 0.05$; $P = 0.013$) and buttermilk ($P < 0.05$; $P = 0.018$) between unemployed individuals and teachers/academics. Based on these results, unemployed individuals consume

more fermented yogurt and buttermilk compared to teachers/academics.

Regarding probiotic supplement use; there is a statistically significant difference between unemployed individuals and self-employed individuals ($P < 0.05$; $P = 0.037$), and between teachers/academics and self-employed individuals ($P < 0.05$; $P = 0.000$). These findings suggested that probiotic supplements are less preferred by self-employed individuals.

Table 8 presents the relationship between product consumption frequency and monthly food expenditures. A statistically significant difference was found between food expenditures and the consumption of probiotic yogurt and milk. Individuals with food expenditures of 500-1000 TL consume these products less frequently compared to those with higher expenditures.

Among traditional products, a statistically significant difference was observed between kefir consumption and food expenditures. Individuals

Table 6 - Post Hoc test results for education level.

Products	Reference Education level	Education level	Mean difference	Std Error	Sig
Probiotic yogurt (Games-Howell)	High School	Associate degree	-0.269	0.167	0.378
		Undergraduate	-0.920	0.117	0.000**
		Postgraduate	-1.001*	0.150	0.000**
	Associate degree	High school	0.269	0.167	0.378
		Undergraduate	-0.651*	0.181	0.003**
		Postgraduate	-0.732*	0.204	0.003**
Probiotic milk (Games-Howell)	High School	Associate degree	-0.255	0.210	0.618
		Undergraduate	-1.078*	0.139	0.000**
		Postgraduate	-0.758*	0.164	0.000**
	Associate degree	High school	0.255	0.210	0.618
		Undergraduate	-0.823*	0.211	0.001**
		Postgraduate	-0.503	0.228	0.123
Fermented yogurt (Games-Howell)	High School	Associate degree	0.141	0.138	0.738
		Undergraduate	0.377*	0.108	0.003**
		Post graduate degree	0.276	0.130	0.152
	Associate degree	High school	-0.141	0.138	0.738
		Undergraduate	0.237	0.152	0.408
		Postgraduate	0.135	0.169	0.854
Ayran (Games-Howell)	High School	Associate degree	0.025	0.103	0.995
		Undergraduate	0.172	0.086	0.185
		Postgraduate	0.280*	0.108	0.049*
	Associate degree	High school	-0.025	0.103	0.995
		Undergraduate	0.147	0.114	0.572
		Postgraduate	0.255	0.132	0.216
Cheese (Games-Howell)	High School	Associate degree	0.108	0.073	0.454
		Undergraduate	0.212*	0.064	0.006**
		Postgraduate	0.195*	0.071	0.035*
	Associate degree	High school	-0.108	0.073	0.454
		Undergraduate	0.104	0.086	0.623
		Postgraduate	0.087	0.092	0.775
Supplement (Games-Howell)	High School	Associate degree	-0.075	0.127	0.935
		Undergraduate	-0.542*	0.105	0.000**
		Postgraduate	-0.274	0.110	0.065
	Associate degree	High school	0.075	0.127	0.935
		Undergraduate	-0.467*	0.147	0.010*
		Postgraduate	-0.199	0.151	0.554

*P < 0.05, **P < 0.01.

spending 1001-1500 TL on food consume more kefir compared to those spending more than 1501 TL ($P < 0.05$; $P = 0.013$).

Regarding cheese consumption, individuals with food expenditures of 500-1000 TL consume more cheese than those spending 1501 TL or more ($P < 0.05$; $P = 0.008$). Since traditional products are considered essential goods, their importance increases as income and purchasing power decrease. Therefore, individuals with lower food expenditures prioritize essential consumption products.

For probiotic supplement use, individuals with food expenditures of 1001-1500 TL consume more supplements compared to those with lower expenditures ($P < 0.05$; $P = 0.011$).

Table 9 presents the relationship between product consumption frequency and income levels. A statistically significant difference was found in the consumption of probiotic yogurt ($P < 0.05$; $P = 0.033$) and probiotic milk ($P < 0.05$; $P = 0.011$), between individuals with an income below 5000 TL and those with an income above 7001 TL. This indicated that

Table 7 - Post Hoc test results for occupational groups.

Products	Reference Occupation	Occupation	Mean difference	Std Error	Sig
Probiotic yogurt (Games-Howell)	Unemployed	Teachers/academics	-0.366	0.166	0.124
		Self-employed	0.502	0.153	0.007*
		Public sector	0.169	0.157	0.704
	Teachers/academics	Unemployed	0.366	0.166	0.124
		Self-employed	0.867	0.154	0.000*
		Public sector	0.535	0.158	0.004*
Probiotic milk (Games-Howell)	Unemployed	Teachers/academics	-0.339	0.187	0.273
		Self-employed	0.524	0.182	0.023*
		Public sector	0.338	0.175	0.218
	Teachers/academics	Unemployed	0.339	0.187	0.273
		Self-employed	0.863	0.182	0.000*
		Public sector	0.677	0.175	0.001*
Fermented yogurt (Games-Howell)	Unemployed	Teachers/academics	0.441	0.145	0.013*
		Self-employed	0.161	0.132	0.619
		Public sector	0.172	0.130	0.553
	Teachers/academics	Unemployed	-0.441	0.145	0.013*
		Self-employed	-0.281	0.141	0.196
		Public sector	-0.27	0.139	0.216
Ayran (Games-Howell)	Unemployed	Teachers/academics	0.344	0.117	0.018*
		Self-employed	0.064	0.102	0.924
		Public sector	0.138	0.105	0.559
	Teachers/academics	Unemployed	-0.344	0.117	0.018*
		Self-employed	-0.28	0.112	0.062
		Public sector	-0.206	0.115	0.279
Supplement (Games-Howell)	Unemployed	Teachers/academics	-0.227	0.138	0.352
		Self-employed	0.289	0.107	0.037*
		Public sector	0.065	0.117	0.945
	Teachers/academics	Unemployed	0.227	0.138	0.352
		Self-employed	0.516	0.128	0.000*
		Public sector	0.292	0.137	0.145

*The mean difference is significant at the 0.05 level.

individuals with higher incomes tend to consume more probiotic products.

Among traditional products, a statistically significant difference was observed in buttermilk consumption ($P < 0.05$; $P = 0.007$) between individuals with an income below 5000 TL and those earning between 5001-7000 TL. The results suggested that individuals with lower incomes consume more buttermilk.

Regarding cheese consumption ($P < 0.05$; $P = 0.016$), a statistically significant difference was found between individuals earning 5001-7000 TL and those earning above 7001 TL. The findings indicated that individuals with lower incomes tend to consume more cheese.

CONCLUSION

This study fills an important gap in the literature by analyzing the preference differences between probiotic and traditional dairy products, as well as their socioeconomic determinants, using multivariate statistical methods among consumers in the Eastern Mediterranean Region of Turkey. As such, it represents one of the few empirical investigations addressing regional patterns of probiotic consumption in the country. The findings indicated that probiotic product use is strongly influenced by demographic and behavioral factors, including education, income, gender, health consciousness, and product knowledge. Higher education and income levels are

Table 8 - Post Hoc test results for monthly food expenditures.

Products	Reference Food expenditures (TL)	Food expenditures (TL)	Mean difference	Std Error	Sig
Probiotic Yogurt (Games-Howel)	500 - 1000	1001 - 1500	-0.634	0.125	0.000*
		1501 and above	-0.700	0.128	0.000*
	1001-1500	500 - 1000	0.634	0.125	0.000*
		1501 and above	-0.066	0.151	0.900
Probiotic Milk (Games-Howel)	500 - 1000	1001 - 1500	-0.505	0.148	0.002*
		1501 and above	-0.426	0.145	0.010*
	1001-1500	500 - 1000	0.505	0.148	0.002*
		1501 and above	0.080	0.168	0.883
Kefir (Tukey HSD)	500 - 1000	1001-1500	-0.166	0.148	0.502
		1501 and above	0.288	0.145	0.117
	1001-1500	500 - 1000	0.166	0.148	0.502
		1501 and above	0.454	0.160	0.013*
Cheese (Games-Howel)	500 - 1000	1001 - 1500	0.034	0.057	0.816
		1501 and above	0.212	0.070	0.008*
	1001-1500	500 - 1000	-0.034	0.057	0.816
		1501 and above	0.178	0.076	0.053
Supplement (Games-Howel)	500 - 1000	1001 - 1500	-0.310	0.107	0.011*
		1501 and above	-0.310	0.104	0.008
	1001-1500	500 - 1000	0.310	0.107	0.011*
		1501 and above	0.000	0.128	1.000

The mean difference is significant at the 0.05 level.

associated with greater awareness and purchasing propensity, and women appear more inclined to consume probiotic products. The results also showed that traditional fermented foods continue to hold a dominant place in local consumption habits, and that information provision plays a critical role in shaping the competitive position of probiotic alternatives. Overall, the study provided a foundational framework for understanding consumer tendencies and consumption behaviors related to probiotic products in Turkey's Eastern Mediterranean Region.

This study indicated that consumers residing in the region do not exhibit widespread consumption habits regarding probiotic-enriched foods and supplements. Accordingly, producers and retailers should prioritize promotional and advertising strategies to enhance the purchase of probiotic products. Increasing public awareness of probiotic products, particularly among individuals with lower education and income levels, appears essential for improving consumption. Informative campaigns, supported by product tastings and temporary price incentives, may enhance consumer acceptance. In regions where traditional food

consumption is dominant, highlighting the health benefits and probiotic content of products, as well as emphasizing similarities with familiar foods, could facilitate adoption. Strengthening labeling standards and supporting producers in developing culturally compatible probiotic alternatives may further promote informed choices and contribute to healthier dietary practices.

This research was subject to several limitations. First, as the study covers only the Eastern Mediterranean Region of Turkey, the findings cannot be generalized to the entire country; although, they do provide indicative insights into national consumption patterns. Second, the data were collected in 2021, in the post-pandemic period, and consumer behaviors may reflect context-specific influences of that time. Finally, as the data are based on self-reported responses, respondent bias may be present. Future studies conducted in different regions could reveal regional variations, benefit from the inclusion of qualitative data, and enable temporal comparisons if the same survey is reapplied; thereby contributing more robustly to the literature.

Table 9 - Post Hoc test results for income levels.

Products	Reference Income level (TL)	Income level (TL)	Mean difference	Std Error	Sig
Probiotic Yogurt (Tukey HSD)	5000 and below	5001 - 7000	-0.219	0.125	0.187
		7001 and above	-0.349	0.139	0.033*
	5001-7000	5000 and below	0.219	0.125	0.187
		7001 and above	-0.131	0.138	0.611
Probiotic Milk (Games-Howel)	5000 and below	5001 - 7000	-0.282	0.137	0.1
		7001 and above	-0.468	0.161	0.011*
	5001-7000	5000 and below	0.282	0.137	0.1
		7001 and above	-0.186	0.163	0.491
Ayran (Tukey HSD)	5000 and below	5001 - 7000	0.257	0.084	0.007*
		7001 and above	0.193	0.094	0.101
	5001-7000	5000 and below	-0.257	0.084	0.007
		7001 and above	0.064	0.093	0.773
Cheese (Games-Howel)	5000 and below	5001 - 7000	-0.048	0.054	0.643
		7001 and above	0.164	0.08	0.104
	5001-7000	5000 and below	0.048	0.054	0.643
		7001 and above	0.212	0.076	0.016*

*The mean difference is significant at the 0.05 level.

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DECLARATION OF CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTIONS

All authors contributed equally for the conception and writing of the manuscript.

DATA AVAILABILITY STATEMENT

Raw data of the study can be requested from the corresponding author.

DECLARATION OF USE OF ARTIFICIAL INTELLIGENCE

The authors did not use artificial intelligence to develop this work.

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