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Socio-Economic, Digital and Psychological Factors Influencing the Online Dietary Supplement Purchasing Trends of Turkish Households

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Abstract

With the acceleration of digitalization, the procurement of dietary supplements through online platforms has become a global trend. While this process offers advantages such as easy access and price comparison for consumers, it also entails serious risks such as counterfeit products and data security. This study aims to identify the socio-economic, digital, and psychological dynamics influencing household heads' online dietary supplement purchasing behavior in Turkey. The study utilized the 2023 Household Information and Communication Technology Usage Survey microdata set published by the Turkish Statistical Institute (TurkStat). The study sample comprises 3,084 household heads representative of the general population of Turkey. The relationships between the dependent variable, online dietary supplement purchasing behavior in the past 12 months, and various independent variables were examined using multivariate binary logistic regression analysis and marginal effects. The study's findings indicate that the likelihood of purchasing dietary supplements online is statistically significantly influenced not only by demographic variables but also by digital behavior indicators reflecting digital literacy, past online shopping experiences, social media platform and device usage, and perceived risk and trust factors. Online dietary supplement purchasing behavior is a multidimensional phenomenon where trust, risk perception, and digital experiences are more decisive factors than demographic characteristics. Digital health regulations should focus on building trust on digital platforms, ensuring content transparency, and enhancing user literacy, rather than targeting only demographic groups. This approach will yield more effective results in managing consumers' risk perceptions regarding health products and establishing a secure e-commerce ecosystem.

JEL Codes: C25, D12, I11, L81

Introduction

The acceleration of digitalization today has led to health-related products being procured through online platforms and becoming a widespread consumption preference worldwide. Dietary supplements, over-the-counter medications, vitamins, and certain prescription products in some countries are reaching consumers through online sales platforms. This growing trend has gained significant momentum, especially after the COVID-19 pandemic, leading to a noticeable shift towards online health products and a significant transformation in households' access to these products in many countries [1]. Key motivations for online purchasing include easy access to products, the ability to compare prices, time savings, greater product variety, and privacy. Consumers may experience concerns regarding the risk of counterfeit products, incorrect dosage, information security, and website reliability when shopping for online health products, and therefore may be cautious in their purchasing behavior regarding these products [2, 3]. As of 2024, the total e-commerce transaction volume in Turkey has reached approximately 3 trillion TL. The share of the medical, personal care, and cosmetics sector in this transaction amounted to 90.32 billion TL. This amount corresponds to approximately 3% [4]. When it comes to global scale, the online pharmacy market reached a value of $98.8 billion in 2022, and this figure is projected to grow to $353.9 billion by 2032 [5].

The online purchasing process is a multi-layered structure that encompasses the consumer's intention, preference, and actions. The online procurement of dietary supplements, however, involves both economic and psychosocial factors, resulting in a more complex behavioral structure compared to other product categories. The Theory of Planned Behavior, the Technology Acceptance Model, and perceived risk-trust frameworks are theoretical approaches frequently used to examine consumer behavior. The concept of trust encompasses three dimensions: trust in the seller, trust in the product, and trust in the system. The authenticity of the product, the level of institutionalization of the platform where the purchase is made, the seller's licensing status, and data privacy policies are among the key factors that determine the consumer's trust.

This study aims to fill an important gap in the literature by examining online purchasing behavior of dietary supplement use at the household level. While most existing studies focus on individual consumer behavior, research that combines household decision dynamics with trust and risk perception, digital literacy, economic factors, social media influence, and demographic factors is limited. In this context, the aim of the study is to identify the factors influencing the online purchasing behavior of households in Turkey for dietary supplement use and to explain the digital, socio-economic, and psychological dynamics behind purchasing behavior. The behavior of purchasing dietary supplements online is not merely a technological transaction but also a complex psychosocial decision-making process. In this study, individuals' access to technological tools (desktop computers, smartphones, etc.) and digital skills are evaluated within the framework of the Technology Acceptance Model (TAM), while risk/trust perceptions stemming from social media interactions and past e-commerce experiences are examined through the lens of the Theory of Planned Behavior (TPB). In the literature, the integration of these two models within the context of health products fills a critical gap in explaining decision-making dynamics at the household level. To this end, the online purchasing behavior of households in Turkey regarding dietary supplements was analyzed on a national scale using the microdata set from the 2023 Turkish Statistical Institute (TurkStat) Household Information Technology Usage Survey [6]. In this respect, the study makes a unique contribution to the literature in terms of both content and scope.

In recent years, the use of online dietary supplement has seen a significant increase in many countries and has become an important area of research in terms of consumer behavior. Studies in the literature show that the decision to purchase dietary supplements, or natural products is shaped by many different variables, such as demographic characteristics, risk perception, digital literacy, trust, health status, social influences, and price sensitivity. However, studies on how consumers make decisions to purchase online dietary supplements is still limited in number [7].

According to a review study examining the reasons that lead people to purchase online dietary supplement is influenced by various factors. According to consumer beliefs, online dietary supplement has perceived benefits such as convenience, privacy, lower costs [2] and savings in time and effort, as well as risks such as health-related risks, financial risks, and concerns about product quality. When the perceived benefits outweigh the risks, consumers' tendency to purchase online dietary supplements increases. From a behavioral perspective, factors that increase consumers' tendency to purchase online dietary supplements include website usability, easy access to prescription medicines, and facilitators such as social media, while factors that decrease consumers' tendency to purchase medicines online include unsuitable payment options and financial constraints. The consumer's purchasing procedure,

computer/internet literacy, and knowledge of distinguishing legal sellers from illegal ones are also factors that influence online dietary supplement purchase behavior. However, social influence factors such as family, friends, peers, and healthcare providers, along with trust factors such as previous experience, customer reviews, and the availability of secure payment options, also influence consumers' decisions to purchase online dietary supplement [8].

According to another review study examining consumers' intentions and behaviors regarding online dietary supplement purchases, the effect of demographic variables on online medication purchases varies across studies [5]. Some studies claim the opposite [14–16]. Studies on educational status have similar results. While some studies have concluded that people with higher education levels engage in more online dietary supplement purchasing behavior [9, 14, 17, 18]. There are also studies showing that educational status is negatively associated with online dietary supplement purchasing [12]. A similar situation exists with regard to gender. While some studies show that men purchase online dietary supplement more frequently [12, 14, 17], others show that women purchase dietary supplement more frequently [13]. The situation differs in terms of income. Studies in the literature show that online dietary supplement increase as income rises [9, 11, 17, 18]. Moreover, ease of use and fast delivery, anonymity and elimination of the need for face-to-face interaction, online platforms offering a wider range of options and being open 24 hours a day, online platforms being able to offer lower prices, positive attitudes towards online pharmacies, and perceived trust are other factors that influence online dietary supplement purchasing. However, perceived risks such as financial, physical, and resource risks negatively affect intentions and behaviors related to purchasing dietary supplement online [5].

[19] concluded in their study that internet usage and general online shopping habits are key factors predicting attitudes toward purchasing online dietary supplement. According to the study's findings, individuals who use the internet more frequently and generally purchase products online are more likely to buy online dietary supplement. However, young individuals are more inclined to purchase online dietary supplement than older individuals. The tendency to purchase online dietary supplement also increases with higher levels of education. In their 2022 study, Fittler et al. concluded that consumers' tendency to purchase online dietary supplement increased after the COVID-19 pandemic. However, while the main benefits of purchasing online dietary supplements are convenience, 24/7 availability, and speed, the risks are identified as the product not being reliable or controlled and the potential for misuse.

In contrast, consumers do not trust e-commerce websites due to concerns about the authenticity of products. Other factors influencing consumers' online dietary supplements purchases include convenience, brand name, and consumers' previous experiences. However, online advertisements can increase individuals' health awareness. According to the results of a study conducted in Indonesia during the COVID-19 pandemic to determine the factors affecting consumer behavior regarding traditional medicine and health supplements, the consumption of online health supplements and traditional and complementary medicine (TCM) products does not show a significant difference based on age, gender, education level, income, and occupational status [20]. According to the results of a study examining consumers' decision-making process when purchasing online health supplements and complementary medicine, consumers' trust in online stores and concerns such as online security are among the important factors influencing consumers' purchasing decisions [7]. In a study examining the consumer profile of dietary supplements and complementary medicine in Turkey and worldwide, the use of health supplements and complementary medicine is generally more prevalent among women. Furthermore, there is a positive correlation between individuals' education and income levels and their use of health supplements and complementary medicine [21]. In a study evaluating consumers' frequency of purchasing online health products, their motivation, and their perception of safety, it was found that men purchase health supplements and traditional and complementary Medicine products more than women, and that purchases of traditional medicine and health supplements increase as income rises [22].

The second section describes the data and methodology used in the research, the third section presents the findings, and the fourth and final section provides a discussion and conclusions.

Data, Methodology and Findings

This section involves testing the online purchase of dietary supplements with empirical data by relating the theoretical model to observable criteria. The objective is to translate abstract constructs into concrete variables, define the outcome and covariate blocks, and state hypotheses that can be evaluated with the subsequent analysis. The main research questions of the study are listed below.

RQ_1. Which behavioral, social, and enabling factors are associated with purchasing dietary supplements online within the last 12 months?

RQ_2. Considering demographics and context, to what extent do digital access, skills and platform participation explain differences in purchasing behavior when buying dietary supplements online?

From these questions, we expect positive associations for digital enablement and social exposure, and context-dependent associations for convenience and transaction breadth once all controls are included. The dependent variable used in this study represents individuals' behavior of purchasing any dietary supplement online within the last 12 months. This variable is binary in nature, taking a value of 1 if the participant declares having purchased an online dietary supplement during the relevant period, and a value of 0 if they declare not having purchased such a product. In line with this structure, binary choice models were utilised in predicting the dependent variable. The independent variables used in this study are grouped under five main predictor blocks. Firstly, preliminary demographic characteristics include individuals' age groups, gender, educational levels, income groups, and employment status. Secondly, digital capabilities and device usage, access to desktop and laptop computers, smartphones, or the usage status of these devices, include self-reported online skill indicators that reflect individuals' functional digital literacy. Thirdly, social platform usage encompasses variables such as individuals' use of major social media platforms and their sharing of opinions on various topics via social media. Fourthly, convenience and variety of transactions encompass purchasing situations in different online shopping categories such as restaurants, cosmetics, cleaning, toys and electronics. Finally, privacy and security behaviors consist of variables reflecting the reading of privacy policies during online activities, checking site security indicators, and control behaviors over personal data.

The online purchasing process is a multi-layered structure that encompasses the consumer's intentions, preferences, and actions. In this study, the online procurement process for dietary supplements is examined within an integrated framework combining the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB), both of which are frequently used in the literature. While TAM focuses on an individual's perceived utility and perceived ease of use regarding technology, TPB explains intention and behavior through the components of attitude, subjective norms, and perceived behavioral control. This study aims to examine the socio-demographic, digital, and e-commerce-related factors influencing individuals' online dietary supplement purchasing behavior within the last 12 months. The hypotheses developed within the scope of the research aim to test whether demographic characteristics, internet and e-commerce usage habits, digital platform usage, and variables related to online experiences are significantly associated with this purchasing behavior. The hypotheses stated below will be examined using a multivariate binary logistic regression model.

H_1: Online purchasing behavior for dietary supplements shows significant differences based on sociodemographic characteristics such as age, gender, education level, and income status.

H_2: The technological tools individuals use (such as desktop computers) and their digital skills (such as the ability to download and install software) significantly influence online dietary supplement purchasing behavior.

H_3: The use of social media platforms (such as X) and social interactions including sharing opinions on these platforms significantly influence online purchasing behavior for dietary supplements.

H_4: Past negative e-commerce experiences (complaints and compensation issues) and online consumption habits in other product categories significantly influence purchasing behavior regarding dietary supplements.

Dataset

The data used in this research were drawn from the 2023 microdataset of the Household Information Technology Use Survey[1], conducted annually by the Turkish Statistical Institute (TurkStat) [6]. This research aims to measure households' access to comprehensive information and their use of information technologies, including the internet and digital services, as well as their attitudes toward topics such as e-commerce and e-skills, and their behaviors regarding digital security.

The study population comprises individuals aged 16–74 residing in Turkey. The sample, selected by TurkStat using a stratified sampling method, was designed to represent Turkey at both a regional and demographic level. Household and individual data in the survey were combined by household number, and analyses were conducted specifically for household heads, covering a total of 3,084 individuals.

The dependent variable in the study was a binary variable indicating whether individuals purchased dietary supplements online in the past 12 months. The independent variables included socio-demographic characteristics (gender, age, education level, employment status, etc.), frequency of internet use, electronic device access (desktop computer, laptop, smartphone, etc.), email and social media usage (WhatsApp, Instagram, X, Facebook, YouTube, etc.), and digital activities such as online banking, information seeking, and purchasing goods and services.

Table 1 insert here

Table 1
Descriptive Statistics and Chi-square Test Statistics Results According to Online Dietary Supplement Use

		Buying Dietary Supplement Online		Pearson χ^2 (p)
Variable	Category	No (0)	Yes (1)	
Gender	Woman	711 (26.95)	153 (34.30)	10.227, p = 0.001
	Man	1927 (73.05)	293 (65.70)	
Age of Household Head	18–25	188 (7.13)	21 (4.71)	10.288, p = 0.017
	26–35	839 (31.80)	164 (36.77)	
	36–50	1208 (45.79)	181 (40.58)	
	51+	403 (15.28)	80 (17.94)	
Education Level of the Head of Household	Illiterate/Primary School Graduate	268 (10.16)	29 (6.50)	41.948, p = 0.000
	Primary or Secondary School	279 (10.58)	25 (5.61)	
	Secondary education	763 (28.92)	99 (22.20)	
	Associate or Undergraduate	1146 (43.44)	241 (54.04)	
	Postgraduate	182 (6.90)	52 (11.66)	
Working Status of the Head of Household	Not working	590 (22.37)	110 (24.66)	1.1485, p = 0.284
	Working	2048 (77.63)	336 (75.34)	
Income of the Head of Household	Low	622 (23.58)	69 (15.47)	20.873, p = 0.000
	Middle	251 (19.75)	75 (16.82)	
	High	1495 (56.67)	302 (67.71)	
Internet Usage	Infrequent Users	18 (0.68)	3 (0.67)	0.0005, p = 0.982
	Daily User	2620 (99.32)	443 (99.33)	
E-Commerce Spending	1–2 Times	853 (32.34)	73 (16.37)	124.221, p = 0.000
	3–5 Times	905 (34.31)	122 (27.35)	
	6–10 Times	404 (15.31)	73 (16.37)	
	More than 10	476 (18.04)	178 (39.91)	
Internet Used Device: Desktop Computer	No	2092 (79.30)	317 (71.08)	15.100, p = 0.000
	Yes	546 (20.70)	129 (28.92)	
Internet Used Device: Laptop	No	1461 (55.38)	192 (43.05)	23.340, p = 0.000
	Yes	1177 (44.62)	254 (56.95)	
Internet Used Device: Smart Phone	No	29 (1.10)	4 (0.90)	0.1477, p = 0.701
	Yes	2609 (98.90)	442 (99.10)	

Sending/receiving emails	No	721 (27.33)	81 (18.16)	16.671, p = 0.000
	Yes	1917 (72.67)	365 (81.84)	
Make voice or video calls over the internet (using WhatsApp, Facetime, etc.)	No	105 (3.98)	17 (3.81)	0.0286, p = 0.866
	Yes	2533 (96.02)	429 (96.19)	
Creating a profile, sending messages or sharing content such as photos etc. on social media (Facebook, Twitter, Instagram, etc.)	No	186 (7.05)	25 (5.61)	1.2505, p = 0.263
	Yes	2452 (92.95)	421 (94.39)	
Searching for health-related information on the internet (such as injuries, diseases, nutrition, healthy living)	No	489 (18.54)	38 (8.52)	27.0161, p = 0.000
	Yes	2149 (81.46)	408 (91.48)	
Searching for information about goods or services on the Internet (Reference Category: No)	No	2 (0.08)	1 (0.22)	0.8645, p = 0.352
	Yes	2636 (99.92)	445 (99.78)	
Performing banking transactions over the internet (Reference Category: No)	No	151 (5.72)	12 (2.69)	7.0126, p = 0.008
	Yes	2487 (94.28)	434 (97.31)	
Selling goods or services over the internet (Facebook, Sahibinden, Letgo, Dolap, etc.)	No	2141 (81.16)	343 (76.91)	4.406, p = 0.036
	Yes	497 (18.84)	103 (23.09)	
Sharing opinions on social issues through websites or social media (Facebook, Twitter, Instagram, YouTube, etc.)	No	2062 (78.17)	302 (67.71)	23.289; p = 0.000
	Yes	576 (21.83)	144 (32.29)	
Instagram Usage	No	483 (18.31)	71 (15.92)	1.4788, p = 0.224
	Yes	2155 (81.69)	375 (84.08)	
YouTube Usage	No	294 (11.14)	33 (7.40)	5.6469, p = 0.017
	Yes	2344 (88.86)	413 (92.60)	
Facebook Usage	No	770 (29.19)	143 (32.06)	1.5121, p = 0.219
	Yes	1868 (70.81)	303 (67.94)	
X Usage	No	1518 (57.54)	230 (51.57)	5.5452, p = 0.019
	Yes	1120 (42.46)	216 (48.43)	
Using paid mobile applications related to health and wellness over the internet	No	2509 (95.11)	402 (90.13)	14.583, p = 0.000
	Yes	129 (4.89)	44 (9.87)	
Encountering the problem of goods and services not being sold to the country from foreign websites	No	2593 (98.29)	427 (95.74)	12.248, p = 0.000
	Yes	45 (1.71)	19 (4.26)	
Download mobile application software	No	2204 (83.55)	310 (69.51)	49.924, p = 0.000
	Yes	434 (16.45)	136 (30.49)	
Difficulty in using the website or its poor functioning	No	2502 (94.84)	410 (91.93)	6.161, p = 0.013
	Yes	136 (5.16)	36 (8.07)	

Shopping online from restaurants, fast food chains, and catering companies	No	1544 (58.53)	157 (35.20)	83.9325, p = 0.000
	Yes	1094 (41.47)	289 (64.80)	
Shopping for food products online	No	1782 (67.55)	160 (35.87)	164.168, P = 0.000
	Yes	856 (32.45)	286 (64.13)	
Shopping for cosmetics, beauty and health products online	No	2058 (78.01)	208 (46.64)	192.722, p = 0.000
	Yes	580 (21.99)	238 (53.36)	
Shopping for cleaning products, personal care items, and other supplies online	No	1995 (75.63)	179 (40.13)	231.025, p = 0.000
	Yes	643 (24.37)	267 (59.87)	
Purchasing goods or services from domestic sellers over the internet	No	68 (2.60)	7 (1.57)	1.702, p = 0.192
	Yes	2544 (97.40)	439 (98.43)	
Purchasing goods or services from sellers in EU countries over the internet	No	2521 (96.52)	417 (93.50)	9.2054, p = 0.002
	Yes	91 (3.48)	29 (6.50)	
Purchasing goods or services online from sellers in other countries	No	2554 (97.78)	422 (94.62)	14.583, p = 0.000
	Yes	58 (2.22)	24 (5.38)	
Buying sports equipment online	No	2242 (84.99)	295 (66.14)	92.857, p = 0.000
	Yes	396 (15.01)	151 (33.86)	
Purchasing children's toys or childcare products online	No	2145 (81.31)	265 (59.42)	107.083, p = 0.000
	Yes	493 (18.69)	181 (40.58)	
Purchasing electronic gadgets products over the internet	No	2195 (83.21)	301 (67.49)	61.081, p = 0.000
	Yes	443 (16.79)	145 (32.51)	
Copy or move files (documents, data, images, videos) between folders, devices (email, Messenger, WhatsApp, USB, cable) or on the cloud	No	1503 (56.97)	198 (44.39)	24.4109, p = 0.000
	Yes	1135 (43.03)	248 (55.61)	
Downloading or installing software or mobile applications	No	1239 (46.97)	150 (33.63)	27.406, p = 0.000
	Yes	1399 (53.03)	296 (66.37)	
Using word processing software	No	1651 (62.59)	229 (51.35)	20.252, p = 0.000
	Yes	987 (37.41)	217 (48.65)	
Create a presentation or document by adding text, documents, images, videos, animations, tables or graphs	No	1807 (68.50)	255 (57.17)	22.079, p = 0.000
	Yes	831 (31.50)	191 (42.83)	
Using spreadsheet software	No	1691 (64.10)	230 (51.57)	25.507, p = 0.000
	Yes	947 (35.90)	216 (48.43)	

Using advanced features of a spreadsheet program (functions, formulas, macros, Visual Basic, etc.) to organize, analyze, structure, or manipulate data	No	446 (47.10)	92 (42.59)	1.435, p = 0.231
	Yes	501 (52.90)	124 (57.41)	
Edit photos, videos or audio files	No	1113 (42.19)	252 (56.50)	31.671, p = 0.000
	Yes	1525 (57.81)	194 (43.50)	
Encountering information or content on online news sites or social media that is considered inaccurate or suspicious	No	1580 (59.89)	205 (45.96)	30.364, p = 0.000
	Yes	1058 (40.11)	241 (54.04)	
Checking the accuracy of information or content encountered on internet news sites or social media	No	489 (46.22)	74 (30.71)	19.238, p = 0.000
	Yes	569 (53.78)	167 (69.29)	
Read the privacy policy of the website or applications before providing personal data	No	1611 (61.07)	242 (54.26)	7.375, p = 0.007
	Yes	1027 (38.93)	204 (45.74)	
Checking the features that websites have to ensure the security of your personal data	No	1333 (50.53)	179 (40.13)	16.50, p = 0.000
	Yes	1305 (49.47)	267 (59.87)	

According to the descriptive statistics and chi-square analysis results presented in Table 1, statistically significant relationships were found between online dietary supplement purchasing behavior and certain socio-demographic characteristics. Gender, age, and educational level were found to be associated with online dietary supplement purchasing behavior ($p < 0.05$). When examined in terms of other variables, significant relationships emerged between desktop and laptop computer use, social media platform use, online skill indicators, online personal information checking, alternative e-commerce shopping behaviors, and online dietary supplement purchasing behavior ($p < 0.05$).

Methodology

Traditional regression analysis can be used effectively when the dependent variable is a continuous variable. However, when the dependent variable is binary, ordinal, or categorical (e.g., online dietary supplement purchase: no = 0, yes = 1), traditional regression analysis fails to yield appropriate results because the predicted values fall outside the probability limits [23, 24]. In such cases, logistic regression analysis models the probability that the dependent variable will have a specific outcome. The general form of the logistic regression model is shown in Eq. 1.

$$(Y_i = 1|X_i) = \frac{\exp\left(\beta_0 + \beta_1 X_{i1} + \ldots + \beta_k X_{ik}\right)}{1 + \exp\left(\beta_0 + \beta_1 X_{i1} + \ldots + \beta_k X_{ik}\right)}$$

1

In Eq. 1, $P\left(Y_i = 1|X_i\right)$ represents the probability of individual i purchasing dietary supplements online, β_0 is the constant term, and the β_j coefficients represent the effect of each independent variable X_{ij}. In binary logistic regression analysis, the probability of the dependent variable (Y) taking a specific value is expressed as p(x). This probability is modeled through the logit transformation of the linear combination.

$$logit\left(P_i\right) = \ln\left(\frac{p\left(i\right)}{1 - p\left(i\right)}\right) = \beta_0 + \sum_{j=1}^{k} \beta j X_{ij}$$

2

In Eq. 2, p(i) represents the probability of the observation purchasing dietary supplements online, X_i represents the independent variables used in the study, and β represents the coefficients to be estimated [23, 24]. This model estimation enables a probability-based examination of the factors influencing households' online dietary supplement purchasing behavior. Thanks to this transformation, the effect of a one-unit increases in the independent variables on the probability of the dependent variable occurring is expressed as the odds ratio.

In standard binary logistic regression models, including multiple variables simultaneously can lead to problems such as multicollinearity, model complexity, and overfitting. In such cases, regularization methods that facilitate variable selection and simplify the model are crucial.

Logistic regression models utilize the maximum likelihood (MLE) method for parameter estimation. The MLE method ensures that parameters are selected to maximize the likelihood of the observed data occurring. This approach can lead to bias in small samples, but provides consistent and efficient estimates in large samples [25].

One of the most frequently used methods for goodness-of-fit analysis in logistic regression models is the Hosmer-Lemeshow goodness-of-fit test. This test assesses the degree to which the estimated probabilities align with the observed values. The null hypothesis states that the model is a good fit for the observed data. Furthermore, the discriminatory power of the estimated model is generally assessed using the ROC (Receiver Operating Characteristic Curve) and the AUC (Area Under the Curve), which represents the area under this curve. AUC values close to 0.5 indicate that random guesses are made, the range of 0.7–0.8 is acceptable, the range of 0.8–0.9 is good, and values above 0.9 indicate excellent discrimination power [26, 27].

Pseudo-R^2 statistics (McFadden's R^2, Cox & Snell R^2, Nagelkerke R^2) can be used to measure the explanatory power of the estimated model in logistic regression analysis.

Findings

Table 2 presents the estimation results of the logistic regression model. According to the estimated model results, a Wald $\chi 2$ (33) = 371.13, $p < 0.001$, was obtained. These values indicate that the explanatory variables included in the model together significantly explain online dietary supplement purchasing behavior. According to the Hosmer-Lemeshow test results, the null hypothesis that there is no significant difference between the predicted and observed values could not be rejected ($\chi 2$ (8) = 8.37, $p = 0.398$), indicating that the model fits the data adequately. When the model was evaluated in terms of classification performance, 86.46% of the observations were correctly classified. However, given the imbalance in the outcome distribution, classification accuracy alone should be interpreted with caution. The ROC analysis yielded an AUC value of 0.7935, indicating that the model had an acceptable level of discrimination in predicting online dietary supplement purchasing behavior.

Table 2
Binary Logistic Regression Analysis Results

Variable Name	Parameter	Standart Error	z-Stat	P
Gender (Referance Category: Woman)				
Man	-0.192	0.138	-1.39	0.163
Age of Household Head (Referance Category: 36–50)				
18–25	-0.327	0.271	-1.21	0.226
26–35	0.030	0.133	0.23	0.819
51+	0.737	0.180	4.09	0.000
Education Level of the Head of Household (Referance Category: Associate or Undergraduate)				
Illiterate/Primary School Graduate	0.202	0.250	0.81	0.418
Primary or Secondary School	-0.148	0.245	-0.6	0.545
Secondary education	-0.119	0.153	-0.78	0.437
Postgraduate	0.020	0.206	0.1	0.923
Working Status of the Head of Household (Reference Category: Not Working)				
Working	-0.276	0.159	-1.74	0.082
Income of the Head of Household (Reference Category: High)				
Low	0.033	0.182	0.18	0.855
Middle	0.132	0.159	0.83	0.407
Internet Usage (Reference Category: Daily User)				
Infrequent Users	-0.725	0.691	-1.05	0.294
E-Commerce Spending (Reference Category: 3–5 Times)				
1–2 Times	-0.036	0.171	-0.21	0.835
6–10 Times	-0.037	0.172	-0.21	0.832
More than 10	0.257	0.157	1.64	0.102
Internet Used Device: Desktop Computer (Reference Category: No)				
Yes	-0.271	0.134	-2.02	0.043
Searching for health-related information on the internet (such as injuries, diseases, nutrition, healthy living) (Reference Category: No)				
Yes	-0.303	0.194	-1.56	0.119
Sharing opinions on social issues through websites or social media (blogs, Facebook, Twitter, Instagram, YouTube, etc.) (Reference Category: No)				
Yes	-0.478	0.126	-3.79	0.000
X Usage (Reference Category: No)				
Yes	0.260	0.124	2.1	0.036
Using paid mobile applications related to health and wellness over the internet (Reference Category: No)				
Yes	-0.014	0.212	-0.07	0.946
Downloading software over the Internet (including version upgrades) (Reference Category: No)				
Yes	-0.473	0.141	-3.35	0.001
Encountering the problem of goods and services not being sold to the country from foreign websites (Reference Category: No)				
Yes	-0.364	0.374	-0.97	0.331
Having problems with complaints and compensation or unsatisfactory feedback (Reference category: No)				
Yes	-0.691	0.227	-3.05	0.002
Shopping online from restaurants, fast food chains, and catering companies (Reference category: No)				
Yes	-0.635	0.128	-4.98	0.000
Shopping for cosmetics, beauty and health products online (Reference category: No)				

Variable Name	Parameter	Standart Error	z-Stat	P
Gender (Referance Category: Woman)				
Yes	-0.483	0.145	-3.34	0.001
Shopping for cleaning products, personal care items, and other supplies online (Reference category: No)				
Yes	-0.632	0.143	-4.4	0.000
Purchasing goods or services from domestic sellers over the internet (Reference Category: No)				
Yes	-0.843	0.391	-2.16	0.031
Purchasing sports equipment online (Reference Category: No)				
Yes	-0.427	0.135	-3.17	0.002
Purchasing children's toys or childcare products online (Reference Category: No)				
Yes	-0.701	0.129	-5.44	0.000
Purchasing music products such as CDs and records over the internet (Reference Category: No)				
Yes	-0.709	0.270	-2.63	0.009
Purchasing electronic gadgets products over the internet (Reference Category: No)				
Yes	-0.338	0.138	-2.45	0.014
Downloading or installing software or mobile applications (Reference Category: No)				
Yes	-0.198	0.130	-1.52	0.128
Taking online training or courses (Reference Category: No)				
Yes	-0.263	0.148	-1.78	0.076
Constant	11.596	1.488	7.79	0.000
Wald $chi^2(33) = 371.13$, Prob > chi2 = 0.000				
Pseudo $R^2 = 0.1843$				
Hosmer-Lemeshow chi2(8) = 8.37; Prob > chi2 = 0.3980				
Correctly classified = 86.46%				

According to Table 2, sociodemographic variables did not have a uniform effect on online dietary supplement purchasing behavior. Although gender, education level, income level, and employment status were not statistically significant in most categories, the likelihood of purchasing dietary supplements online was significantly higher among individuals aged 51 and over. Therefore, H_1 was partially supported. Desktop computer use was associated with a lower likelihood of purchasing dietary supplements online, and downloading software over the Internet was also associated with a statistically significant decrease in this likelihood. Since the findings showed that technology-use patterns and related digital skills significantly affected dietary supplement purchasing behavior, H_2 was supported. Individuals who used platform X were more likely to purchase dietary supplements online, whereas those who shared opinions on social media were less likely to do so. These results indicate that social media interactions shape purchasing behavior in different ways; therefore, H_3 was supported. Similarly, negative e-commerce experiences such as complaints or compensation problems, as well as online shopping across various product categories, were associated with a lower likelihood of purchasing dietary supplements online. Therefore, H_4 was supported.

Table 2 insert here

The AUC value obtained from the ROC curve was 0.7935, indicating that the model had acceptable discrimination in distinguishing online dietary supplement purchasing behavior.

Figure 1 insert here

Table 3 presents the average marginal effects of the estimated regression model. When examined in terms of demographic variables, the marginal effect of being male on the likelihood of purchasing dietary supplements online was negative but not statistically significant ($p > 0.05$). Taking the 36–50 age group as the reference, individuals aged 51 and over were 8.5% more likely to purchase dietary supplements online ($dy/dx = 0.085$; $p < 0.01$). No statistically significant difference was found in the younger age groups. No statistically significant difference was found in any category of the household head's education level compared with the reference group. This finding suggests that education level was not significantly associated with online dietary supplement purchasing behavior. Employed household heads were 2.8% less likely to purchase dietary supplements online than non-employed household heads ($dy/dx = -0.028$; $p < 0.10$). No significant difference was found across income groups.

Table 3
Average Marginal Effects Obtained from the Binary Logistic Regression Model

Variable Name	dy/dx	Std. Err.	z	P>|z|
Gender (Referance Category: Woman)				
Man	-0.020	0.014	-1.39	0.163
Age of Household Head (Referance Category: 36–50)				
18–25	-0.029	0.022	-1.29	0.196
26–35	0.003	0.013	0.23	0.819
51+	0.085	0.022	3.79	0.000
Education Level of the Head of Household (Referance Category: Associate or Undergraduate)				
Illiterate/Primary School Graduate	0.022	0.028	0.78	0.434
Primary or Secondary School	-0.015	0.024	-0.62	0.534
Secondary education	-0.012	0.015	-0.78	0.433
Postgraduate	0.002	0.021	0.10	0.924
Working Status of the Head of Household (Reference Category: Not Working)				
Working	-0.028	0.016	-1.74	0.082
Income of the Head of Household (Reference Category: High)				
Low	0.003	0.018	0.18	0.855
Middle	0.014	0.017	0.82	0.415
Internet Usage (Reference Category: Daily User)				
Infrequent Users	-0.074	0.070	-1.05	0.294
E-Commerce Spending (Reference Category: 3–5 Times)				
1–2 Times	-0.004	0.017	-0.21	0.834
6–10 Times	-0.004	0.017	-0.21	0.831
More than 10	0.027	0.017	1.61	0.108
Internet Used Device: Desktop Computer (Reference Category: No)				
Yes	-0.028	0.014	-2.02	0.043
Searching for health-related information on the internet (such as injuries, diseases, nutrition, healthy living) (Reference Category: No)				
Yes	-0.031	0.020	-1.56	0.118
Sharing opinions on social issues through websites or social media (blogs, Facebook, Twitter, Instagram, YouTube, etc.) (Reference Category: No)				
Yes	-0.049	0.013	-3.82	0.000
X Usage (Reference Category: No)				
Yes	0.027	0.013	2.11	0.035
Using paid mobile applications related to health and wellness over the internet (Reference Category: No)				
Yes	-0.001	0.022	-0.07	0.946
Downloading software over the Internet (including version upgrades) (Reference Category: No)				
Yes	-0.020	0.013	-1.52	0.127
Encountering the problem of goods and services not being sold to the country from foreign websites (Reference Category: No)				
Yes	-0.037	0.038	-0.97	0.331
Having problems with complaints and compensation or unsatisfactory feedback (Reference category: No)				
Yes	-0.070	0.023	-3.07	0.002
Shopping online from restaurants, fast food chains, and catering companies (Reference category: No)				
Yes	-0.065	0.013	-4.99	0.000
Shopping for cosmetics, beauty and health products online (Reference category: No)				

Variable Name	dy/dx	Std. Err.	z	P>|z|
Gender (Referance Category: Woman)				
Yes	-0.049	0.015	-3.37	0.001
Shopping for cleaning products, personal care items, and other supplies online (Reference category: No)				
Yes	-0.064	0.015	-4.42	0.000
Purchasing goods or services from domestic sellers over the internet (Reference Category: No)				
Yes	-0.086	0.040	-2.15	0.032
Purchasing sports equipment online (Reference Category: No)				
Yes	-0.043	0.014	-3.19	0.001
Purchasing children's toys or childcare products online (Reference Category: No)				
Yes	-0.071	0.013	-5.49	0.000
Purchasing music products such as CDs and records over the internet (Reference Category: No)				
Yes	-0.072	0.027	-2.64	0.008
Purchasing electronic gadgets products over the internet (Reference Category: No)				
Yes	-0.034	0.014	-2.46	0.014
Downloading or installing software or mobile applications (Reference Category: No)				
Yes	-0.048	0.014	-3.37	0.001
Taking online training or courses (Reference Category: No)				
Yes	-0.027	0.015	-1.78	0.075

When examining digital behavior, individuals who use desktop computers are 2.8% less likely to purchase dietary supplements online than those who do not use them (dy/dx = -0.028; $p < 0.05$). The variables of seeking health information online and using paid health-related apps did not reveal a statistically significant effect. However, individuals who share their views on social issues on social media were found to be 4.9 per cent less likely to purchase dietary supplements online than those who do not share their views (dy/dx = -0.049; $p < 0.01$).

Table 3 insert here

When examined in terms of social media platform usage, individuals who used the X platform were 2.7% more likely to purchase dietary supplements online than those who did not use the platform (dy/dx = 0.027; $p < 0.05$). This result indicates that social media habits have a significant impact on consumer behavior.

Individuals who had negative online shopping experiences, including complaints and compensation problems, were 7% less likely to purchase dietary supplements online than those who had not had such experiences (dy/dx = -0.070; $p < 0.01$).

Various online shopping situations have also been found to affect the likelihood of purchasing dietary supplement products online. Individuals who purchase cosmetic products online are 4.9% less likely to purchase online dietary supplement products compared to those who do not (dy/dx = -0.049; $p < 0.01$). Individuals who shop online or order food from restaurants online are 6.5% less likely to purchase online dietary supplement products compared to those who do not (dy/dx = -0.065; $p < 0.01$). Individuals who spend money online on cleaning and personal care products are 6.4% less likely to purchase online dietary supplement products compared to those who do not spend money on these items (dy/dx = -0.064; $p < 0.01$). Individuals who purchase sports equipment online are 4.3% less likely to purchase online dietary supplement products compared to those who do not (dy/dx = -0.043; $p < 0.01$). Individuals who purchase children's toys or childcare products online are 7.1% less likely to purchase dietary supplements online than those who do not (dy/dx = -0.071; $p < 0.01$). Individuals who purchase online music products are 7.2% less likely to purchase online dietary supplement products than those who do not (dy/dx=-0.072; $p < 0.01$). Individuals who purchase electronic devices online are 3.4% less likely to purchase online dietary supplement products than those who do not (dy/dx = -0.034; $p < 0.05$).

Individuals who shop online from domestic retailers are 8.6% less likely to purchase online dietary supplement products than those who do not (dy/dx=-0.086; $p < 0.05$). This estimate may indicate that foreign websites are preferred more for online dietary supplement product purchases. Individuals who know how to download mobile applications or software are 4.8% less likely to purchase dietary supplements online than those who do not (dy/dx = -0.048; $p < 0.01$).

Conclusion and Discussion

In this study, using microdata from the Household Information Technology Usage Survey published by the Turkish Statistical Institute in 2023, the factors influencing individuals' online purchasing behavior for dietary supplements were investigated. In line with this objective, a multivariate binary logistic

regression model estimation was performed by including numerous independent variables in the dataset under the headings of socio-economic, digital skills and e-commerce.

When assessed from a demographic perspective, it has been determined that an individual's age plays a distinguishing role in the purchase of online dietary supplements for certain groups. In particular, it has been determined that individuals aged 51 and over are more likely to purchase online dietary supplements compared to the 36–50 age group. This result supports some studies obtained from the literature [9–13] and differs from others [14–16, 19, 21]. This finding indicates that internet usage for health-related purposes is increasing among older age groups [28–29].

When considered in terms of employment status, actively employed individuals were less likely to purchase dietary supplements online than those who were not employed. This finding indicates that members of the non-working group, particularly older age groups and those who may have a high need for nutritional supplements, may be more inclined towards such products.

When considering digital access and usage habits, it has been determined that possessing technological equipment and digital literacy is associated with online purchasing behavior for dietary supplement products. However, the findings of the analysis indicate that desktop computer usage negatively affects the likelihood of online dietary supplement product purchasing. According to this result, it is thought that desktop computers may be a more restrictive and less preferred tool rather than a facilitating factor in online shopping for these products. This result can be linked to relevant studies in the literature [8, 19], although these studies indicate that the relationship in question occurred in the opposite direction specifically in relation to desktop computer use. At this point, it suggests that online purchasing behavior for dietary supplement products in Turkey is not limited to health-focused digital activities.

The findings regarding social media usage and online interactions are noteworthy. It has been determined that individuals who share social issues on social media are less likely to purchase online dietary supplements than other individuals. This suggests that individuals who use social media platforms more for public debate, expressing opinions, and social participation may be more distant from the behavior of purchasing online dietary supplement products. On the other hand, the high likelihood of purchasing online dietary supplements among individuals using the X social media platform demonstrates that social media platforms can have different and variable effects depending on user profiles and usage purposes [30].

Past online shopping experiences and consumption habits are seen to be among the key determinants of online purchasing behavior for dietary supplement products. It has been observed that individuals who have experienced problems such as complaints or compensation claims during the online shopping process in the past are less likely to purchase online dietary supplement products. This finding shows that negative online shopping experiences can weaken consumers' perception of trust, creating a deterrent effect against purchasing health-related products in particular in digital environments [31].

One of the study's notable findings is that individuals who shop online for categories such as cosmetics, food, and cleaning products are less likely to purchase dietary supplements, which suggests that this product group fundamentally diverges from traditional e-commerce dynamics. This situation can be explained by the fact that the procurement of dietary supplements requires a much more complex behavioral process both economically and psychosocially compared to other consumer products [5–32]. While consumers typically act based on motivations such as ease of use, speed, and price comparison when purchasing products like food or cosmetics, they adopt a much more cautious attitude when it comes to health due to safety concerns such as the risk of counterfeit products, incorrect dosages, and website reliability [1]. The literature emphasizes that for a purchase to occur regarding health-related products, the perceived benefit must clearly outweigh the risks; otherwise, the trust barrier cannot be overcome, even if the digital experience is high [8]. In this context, shopping experiences gained on general e-commerce sites may fall short in providing the content transparency and corporate trust that are critical for health products [7]. The fact that individuals with high digital literacy and active users of various platforms maintain a distance from this product category can be attributed to experienced users being more aware of information overload and risks in digital channels. Consequently, rather than acting as a facilitator in the dietary supplement sector, the intense digital consumption habits observed in other product categories function as an experiential barrier, causing individuals to filter their perceptions of trust and risk through a stricter lens.

The finding that individuals who shop online from domestic retailers and are able to download mobile applications or software are less likely to purchase online dietary supplement products indicates that digital literacy and the use of local platforms do not positively contribute to purchasing behavior in this product group. This situation suggests that, when it comes to health-related products, consumers may be inclined to evaluate trust, content transparency and risk perception from different angles rather than ease of use and digital experience. These findings are consistent with the literature. Previous studies have shown that online purchasing behavior for dietary supplement products is influenced by ease of use, time and labour savings, and previous experiences [8, 19, 20].

This study has revealed that online dietary supplement purchasing behavior at the household level exhibits a unique structure that diverges from traditional e-commerce patterns (RQ_1). The findings indicate that past negative e-commerce experiences (complaints and compensation issues) are the strongest deterrent factor (a 7% decrease in likelihood) and that the influence of social media varies depending on the nature of the platform (positive for X usage, negative for general opinion sharing). Regarding the impact of digital access and skills (RQ_2), contrary to common belief, it was found that advanced digital proficiency and desktop computer usage do not increase the likelihood of purchase; rather, they lead individuals to adopt a more cautious approach. In particular, the low likelihood of purchasing dietary supplements among shoppers in other categories such as cosmetics, food, and cleaning products, and the fact that purchasing from local sellers reduces the likelihood by 8.6%, demonstrates that this product group requires a distinct decision-making process regarding trust and ingredient transparency. The fact that the 51 and older age group exhibits the highest purchasing tendency (an 8.5% increase) indicates that digital health solutions are being adopted in parallel with the growing health needs of older individuals. Consequently, the online supply of dietary supplements is not merely a technological process but a multidimensional phenomenon shaped by perceptions of trust and risk, interwoven with digital experiences that transcend demographic boundaries.

In conclusion, the findings from this study indicate that the behavior of purchasing online dietary supplement products is a multidimensional phenomenon embedded within individuals' digital life experiences. It suggests that evaluating digital health policies and regulations concerning the online sale of dietary supplements using an approach that focuses on digital experience, trust, and user competence rather than demographic distinctions could yield more effective results.

Declarations

Ethics approval and consent to participate: This study is based on a secondary analysis of the 2023 Household Information and Communication Technology Usage Survey microdata set provided by the Turkish Statistical Institute (TurkStat). The data collection process by TurkStat is conducted under the legal framework of the Statistics Law of Turkey (No. 5429), which ensures the confidentiality of individual information. Since the researchers received the data in a strictly de-identified and anonymized format, further ethical approval from an institutional review board was not applicable.

Consent for publication: Not applicable.

Availability of data and materials: The data that support the findings of this study are available from the Turkish Statistical Institute (TurkStat), but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of TurkStat.

Competing interests: The authors declare that they have no competing interests.

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Authors' contributions: [SO, IYY] conceptualized the study, performed the econometric analysis, and interpreted the results. **[MEK, NÖ]** gathered the literature review and was a major contributor in writing the manuscript. All authors read and approved the final manuscript.

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Footnotes

1. This research is based on a secondary analysis of the Household Information Technology Usage Survey microdataset published by the Turkish Statistical Institute (TÜİK). The dataset used is anonymized and does not contain any directly identifiable elements that could reveal individual identities. The microdata shared by TÜİK was prepared in accordance with the Turkish Statistics Law No. 5429 and the Procedures and Principles Regarding Data Privacy and Security of Confidential Data in Official Statistics. Therefore, the study was evaluated within the scope of anonymized secondary data analysis. The usage, citation, and confidentiality rules determined by TurkStat were followed in the data usage.

Figures

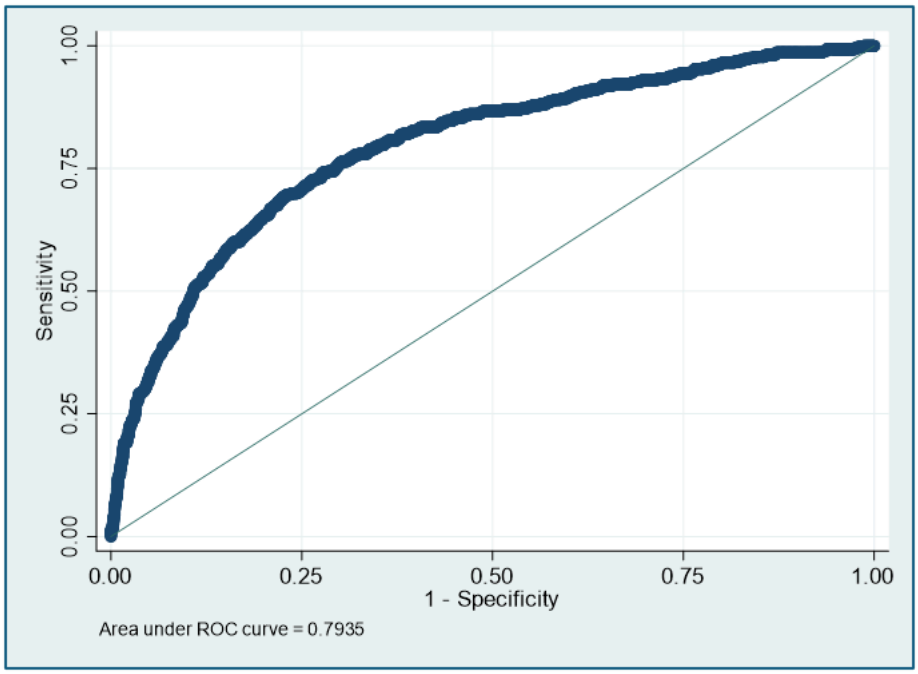


Figure 1

ROC Curve and AUC Value