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Knowledge, Attitudes, and Behaviours of Healthcare Professionals Regarding Starch-Based Sugar Consumption: A Cross-Sectional Survey Study – The Case of Erzurum City Hospital*

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Abstract: This study explores healthcare professionals' knowledge, attitudes, and behaviors concerning the consumption of high-fructose corn syrup (HFCS) and its health implications. Given their influence on public health, their awareness and food purchasing habits are critical for shaping nutritional education and health policies. A cross-sectional survey was conducted with 350 volunteers, including physicians, nurses, dietitians, psychologists, physiotherapists, and other staff at Erzurum City Hospital. Data were collected via face-to-face interviews using the validated "HFCS Consumption Scale" and a structured knowledge questionnaire. Statistical analyses were performed using SPSS 23, including t-tests, ANOVA, and non-parametric tests. While participants demonstrated high knowledge scores regarding HFCS-related risks (Mean: 76.54±8.160), this was not always reflected in their purchasing decisions. The highest awareness was noted in the "Health Risks of HFCS-Containing Foods" subscale (Mean: 40.57±4.312), particularly in relation to metabolic diseases. However, 75% of respondents reported not routinely reading food labels. Awareness and purchasing behavior varied significantly by gender, age, education, and profession. Female participants and physicians exhibited greater sensitivity, while younger professionals displayed lower consumer awareness. These findings underscore the gap between knowledge and behavior, suggesting a need for targeted interventions. Future research should examine how structured nutrition education affects long-term behavioral change. Improving healthcare professionals' nutritional literacy is essential not only for their own well-being but also for their role in promoting healthier dietary choices among the public.

Keywords: Processed food, healthcare professionals, health risk, high-fructose corn syrup.

Sağlık Çalışanlarının Nişasta Bazlı Şeker Tüketimine İlişkin Bilgi, Tutum ve Davranışları: Kesitsel Bir Anket Çalışması – Erzurum Şehir Hastanesi Örneği

Özet: Bu çalışma, sağlık çalışanlarının yüksek fruktozlu mısır şurubu (YFMŞ) tüketimi ve buna bağlı sağlık risklerine ilişkin bilgi, tutum ve davranışlarını incelemektedir. Toplum sağlığı üzerinde etkili konumda bulunan bu grubun farkındalık düzeyleri ile gıda satın alma alışkanlıkları, beslenme eğitimi ve sağlık politikalarının şekillendirilmesinde önemli bir rol oynamaktadır. Erzurum Şehir Hastanesi'nde görevli hekim, hemşire, diyetisyen, psikolog, fizyoterapist ve diğer sağlık personelinden oluşan 350 gönüllü katılımcıyla kesitsel bir anket çalışması gerçekleştirilmiştir. Veriler, geçerliği sağlanmış "YFMŞ Tüketim Ölçeği" ve yapılandırılmış bilgi formu aracılığıyla yüz yüze görüşmelerle toplanmıştır. Etik onaylar alınmış, veriler SPSS 23 programı ile t-testi, ANOVA ve parametrik olmayan testler kullanılarak analiz edilmiştir. Katılımcıların YFMŞ' nin sağlık riskleri konusundaki bilgi düzeylerinin yüksek olduğu (Ort: 76,54±8,160) belirlenmiş olsa da bu farkındalık her zaman satın alma davranışlarına yansımamaktadır. En yüksek puan, "YFMŞ İçeren Gıdaların Sağlık Riskleri" alt boyutunda (Ort: 40,57±4,312) gözlenmiş ve metabolik hastalıklarla ilişki konusunda güçlü bir bilinç düzeyine işaret etmiştir. Ancak katılımcıların %75'i gıda satın alırken etiketleri düzenli olarak incelemediklerini bildirmiştir. Bilgi düzeyi ve davranışlar; cinsiyet, yaş, eğitim durumu ve meslek gruplarına göre anlamlı farklılık göstermiştir. Kadınlar ve hekimler daha yüksek farkındalık ve duyarlılık sergilerken, genç sağlık çalışanlarının tüketici farkındalığı daha düşüktür. Bulgular, bilgi ve davranış arasında belirgin bir uçuruma işaret etmekte; yapılandırılmış beslenme eğitimlerinin bu alandaki etkisinin uzun vadede değerlendirilmesi gerektiğini göstermektedir. Sağlık çalışanlarının beslenme okuryazarlığının artırılması hem kendi sağlıkları hem de toplumun sağlıklı beslenme alışkanlıkları kazanmasında önemli katkılar sağlayacaktır.

Anahtar Kelimeler : İşlenmiş gıdalar, sağlık çalışanları, sağlık riski, yüksek fruktozlu mısır şurubu.

1. Introduction

Nutrition is the process of acquiring and utilizing essential nutrients required for the body's growth and development, the attainment and maintenance of health, the continuity of life, and the facilitation of both physical and mental productivity. The increasing consumption of high-fructose corn syrup (HFCS) has raised significant health concerns due to its association with chronic conditions such as obesity, hypertension, and cardiovascular disease. Adequate and balanced nutrition plays a crucial role in preventing diseases, fostering a healthy population, and promoting physical and

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social well-being. A wide range of social, environmental, economic, and cultural factors influences nutritional challenges. Psychosocial background, economic status, nutrition education, and dietary habits all shape nutritional behaviors. Additionally, technological advancements have also impacted nutrition, both positively and negatively (1).

The increasing consumer demand for convenience, the intensifying workload, and time constraints have led to a rise in the consumption of processed and ready-to-eat foods (2). In this context, sugars, glucose, and fructose syrups—especially high-fructose corn syrup (HFCS)—have become essential raw materials for the food industry (3). HFCS accounts for a significant 40% share among sweeteners used in the food sector. It is produced by the enzymatic and chemical hydrolysis of corn starch, converting it into glucose and subsequently fructose. Both sucrose and HFCS contain approximately 50% glucose and 50% fructose, making HFCS a key alternative to sucrose. Its industrial advantages—higher sweetness, lower cost, longer shelf life, and moisture retention—have contributed to a dramatic increase in HFCS use and a simultaneous decline in sucrose consumption (4, 5).

The United States, as the leading HFCS producer, experienced a significant increase in HFCS use due to corn subsidies introduced in the 1960s, which reduced production costs. This rise in HFCS consumption paralleled the increase in obesity rates. HFCS is widely used in soft drinks and differs from glucose in metabolism—it does not trigger insulin or leptin release, which may lead to increased calorie intake and weight gain. Therefore, excessive HFCS consumption may contribute significantly to the obesity epidemic (6). Since genetic changes do not occur over such short periods, dietary and lifestyle changes were identified as key contributors. Historical USDA data revealed that the increase in HFCS intake was the most significant dietary shift during this period. Several studies have shown a correlation between HFCS consumption and obesity, as well as other chronic diseases (6-8).

Building on these earlier associations, recent meta-analyses and systematic reviews have reinforced the link between high consumption of added sugars—particularly HFCS—and the development of obesity, type 2 diabetes, hypertension, and cardiovascular diseases. For instance, Agarwal, Das (9) reported that fructose intake is significantly associated with metabolic syndrome and insulin resistance. Meng, Li (10) demonstrated that sugar-sweetened beverages increase cardiovascular risk, even at moderate intake levels. Similarly, Te Morenga, Mallard (11) found that sugar consumption elevates blood pressure in both children and adults, independent of total caloric intake. These findings support the hypothesis that excessive fructose intake, especially from industrial sweeteners such as HFCS, plays a direct role in the pathophysiology of non-communicable diseases.

In Türkiye, dietary patterns have shifted over the past decades toward increased consumption of ultra-processed foods rich in refined sugars. Despite the known health risks, consumer knowledge about HFCS content in foods remains limited, and food label reading behavior is generally low. Healthcare professionals, as role models and trusted sources of health information, play a crucial role in shaping public awareness and dietary choices. Their awareness of nutrition, healthy food selection, and dietary behaviors is not only essential for public health but also for improving workplace efficiency and contributing to the national economy (12, 13).

This study aims to examine healthcare professionals' knowledge, attitudes, and behaviors regarding the health risks associated with HFCS consumption and food purchasing decisions. The study employs a survey methodology to assess the demographic characteristics of healthcare professionals, their level of knowledge regarding HFCS-containing foods, their attitudes and behaviors related to health risks when purchasing food products, and the factors influencing their purchasing decisions concerning processed foods.

2. Materials and methods

2. 1. Research Type and Design

This descriptive cross-sectional study used a quantitative survey model to assess healthcare professionals' knowledge, attitudes, and behaviors related to HFCS consumption and health risks during food purchasing.

2. 2. Research Setting and Duration

The study was conducted at Erzurum City Hospital between June 2022 and June 2023.

2. 3. Population and Sample

The study population consisted of physicians, nurses, midwives, dietitians, psychologists, physiotherapists, food engineers, and healthcare technicians working at Erzurum City Hospital (N=2,156). As of June 2022–June 2023, there were 2,156 healthcare professionals employed at Erzurum City Hospital. Assuming that 50% of healthcare professionals may know about HFCS, the sample size was determined as 350 participants with a 95% confidence interval and a 5% margin of error. All selected participants were interviewed and included in the study.

2.4. Data Collection Instruments

A four-page survey form was utilized in this study. The survey consisted of two sections. The first section included demographic information, such as gender, age, profession, educational background, and weight gain status over the past six months. The second section comprised 21 questions designed to assess participants' knowledge, attitudes, and behaviors regarding HFCS consumption. The "HFCS Consumption Scale," which consists of 21 items, was used as

a data collection tool. This scale was developed and validated by Taş (14) and its reliability tests have been conducted. The scale is structured into four subdimensions: "Health Risks of HFCS-Containing Foods," which includes 10 items (Items 10, 11, 12, 13, 14, 15, 16, 17, 18, 21); "Consumer Awareness," which consists of 6 items (Items 1, 4, 5, 6, 8, 9); "Sensitivity When Purchasing Food Products," comprising 3 items (Items 2, 3, 7); and "Use of HFCS Without Labeling," which includes 2 items (Items 19, 20). The Cronbach's Alpha reliability coefficient for the entire scale was calculated as 0.860, while the reliability coefficients for the subdimensions were found to be 0.859 for "Health Risks of HFCS-Containing Foods," 0.764 for "Consumer Awareness," 0.652 for "Sensitivity When Purchasing Food Products," and 0.616 for "Use of HFCS Without Labeling."

2. 5. Data Collection

The research data were collected through a survey method, following the approval of the necessary permissions. The survey form was administered through face-to-face interviews with each voluntary participant. Before commencing the survey, participants were informed about the purpose, scope, and confidentiality of the study, and it was emphasized that participation was entirely voluntary. Written informed consent was obtained from the healthcare professionals who agreed to participate, and the four-page survey form was completed accordingly. On average, the completion of the survey form took approximately 15 minutes per participant.

2.6. Inclusion and Exclusion Criteria

Participants included in the study were healthcare professionals working at Erzurum City Hospital between June 2022 and June 2023. Inclusion criteria were:

- being aged 18 years or older,
- currently employed in a healthcare-related position (e.g., physician, nurse, dietitian, psychologist, physiotherapist, etc.),
- voluntary participation and informed consent,
- ability to understand and answer the questionnaire items in Turkish.

Exclusion criteria were:

- temporary staff or interns not employed on a permanent basis,
- individuals not actively working in clinical or support services,
- failure to complete more than 20% of the questionnaire,
- refusal to provide informed consent.

2. 7. Data Analysis

Skewness and kurtosis values were examined to assess whether the data distribution approximates normality. Skewness values closer to zero indicate a symmetrical distribution, whereas kurtosis values near zero suggest a normal peak in the data distribution. The Health Risks of HFCS-Containing Foods and Sensitivity When Purchasing Food Products subscales exhibited higher skewness and kurtosis, suggesting deviations from normality. The Consumer Awareness and Use of HFCS Without Labeling subscales had skewness and kurtosis values closer to zero, indicating a more normal distribution. The overall scale (HFCS Consumption Scale) displayed moderate skewness and kurtosis values, suggesting an approximately normal distribution.

2. 8. Statistical Analysis

The data obtained in this study were analyzed using SPSS 23 statistical software. Prior to conducting statistical analyses, the normality of the data distribution was assessed. To determine whether the data followed a normal distribution, Skewness and Kurtosis values were examined. Skewness and Kurtosis values ranging between -1.5 and +1.5 indicate that the data can be considered normally distributed. As shown in Table 3.3, all subdimensions, except for "Sensitivity When Purchasing Food Products," were within the acceptable range of-1.5 to +1.5, indicating that the data followed a normal distribution. Based on this finding, an independent samples t-test was conducted for comparisons between two independent groups, while a one-way analysis of variance (ANOVA) was applied for comparisons involving three or more groups. However, the "Sensitivity When Purchasing Food Products" subdimension did not meet the normal distribution criteria. As a result, the Mann-Whitney U test was used for comparisons between two independent groups, and the Kruskal-Wallis H test was applied for comparisons involving three or more groups.

2. 8. Generalizability and Limitations of the Study

This study was conducted between June 2022 and June 2023 at Erzurum City Hospital and was limited to specific occupational groups, including physicians, nurses, midwives, dietitians, psychologists, physiotherapists, healthcare technicians, and food engineers. The findings obtained cannot be generalized to all healthcare professionals. However, the results may be applicable to groups that meet the study's inclusion criteria and share similar characteristics with the study sample. Additionally, the study findings are restricted to the data collected using the HFCS Consumption Scale. Although the sample included a higher proportion of female participants (72.6%), this distribution reflects the actual gender ratio in the hospital workforce, particularly among nurses. Therefore, while the gender imbalance may introduce a sampling bias, it also provides a realistic representation of the institutional demographic structure. Nevertheless, the overrepresentation of female respondents should be acknowledged as a limitation when generalizing the findings to the broader population of healthcare professionals.

2. 9. Ethical Considerations

Ethical approval was obtained from the Ethics Subcommittee of Erzurum Atatürk University Faculty of Veterinary Medicine on July 25, 2022 (Decision No: 2022/24). Institutional permission was also granted by the hospital administration. Prior to participation, all individuals were informed about the study's purpose and confidentiality, and written informed consent was obtained. A copy of the consent form was provided to each participant. All data were used solely for research purposes, remained confidential, and were handled in accordance with data protection and privacy principles.

3. Results

The demographic characteristics of the participants included in the sample are presented in Table 1.

Table 1. Demographic characteristics of participants.

Demographic Characteristics		*n*	%
Gender	Female	254	2.6
	Male	96	7.4
Age	21-30	129	36.9
	31-40	129	36.9
	41-50	73	20.9
	51 and above	19	5.4
Profession	Physician	53	15.1
	Nurse	230	65.7
	Midwife	35	10.0
	Dietitian	4	1.1
	Psychologist	5	1.4
	Physiotherapist	6	1.7
	Health Officer	15	4.3
	Food Engineer	2	.6
Educational Level	High School	13	3.7
	Associate Degree	44	12.6
	Bachelor's Degree	215	61.4
	Master's Degree	26	7.4
	Doctorate	52	14.9
Weight Gain in the Last 6 Months	Yes	137	39.1
	No	213	60.9
Total		**350**	**100**

Among the 350 participants, 72.6% were female and 27.4% were male, reflecting the gender distribution commonly observed in healthcare settings, particularly due to the dominance of women in nursing roles. The majority of participants were aged between 21–30 (36.9%) and 31–40 (36.9%), indicating a predominantly young to mid-career workforce. In terms of profession, the largest group consisted of nurses (65.7%), followed by physicians (15.1%), and midwives (10%), showing that the sample mainly represents frontline clinical staff. Regarding education, 61.4% had a bachelor's degree, while 14.9% held a doctoral degree, suggesting a relatively high academic profile. Additionally, 39.1% of participants reported weight gain in the last six months, potentially reflecting lifestyle and workload-related challenges during the study period.

The reliability analysis results obtained from the study are presented in Table 2.

Table 2. Measurement scales and reliability analysis.

Scales	Number of Items	Item Number	Cronbach's Alpha
Health Risks of HFCS-Containing Foods	10	10,11,12, 13,14,15, 16,17,18, 21	0.715
Consumer Awareness	6	1,4,5 6,8,9	0.845
Sensitivity When Purchasing Food Products	3	2, 3, 7	0.663
Use of HFCS Without Labeling	2	19, 20	0.671
HFCS Consumption Scale	21	-	0.750

According to Table 2, the Cronbach's Alpha reliability analysis values for the scale used in the study are presented. The overall reliability coefficient for the "HFCS Consumption Scale" was determined as 0.750. The reliability coefficients for the subdimensions were found to be 0.715 for the "Health Risks of HFCS-Containing Foods" subscale, 0.845 for the "Consumer Awareness" subscale, 0.663 for the "Sensitivity When Purchasing Food Products" subscale, and 0.671 for the "Use of HFCS Without Labeling" subscale. These values indicate that the scale demonstrates an acceptable level of reliability.

Table 3 presents the normality analysis results for the scale used in the study.

Table 3. Normality analysis results of the scale used in the study.

Scales	n	Skewness	Kurtosis
Health Risks of Foods Containing Corn Syrup	350	-1.018	1.361
Consumer Awareness	350	-0.388	-0.433
Sensitivity When Purchasing Food Products	350	-1.608	2.744
Use of Corn Syrup Without Masking	350	-0.956	-0.051
HFCS Consumption Scale	350	-0.851	0.293

Skewness and kurtosis values were examined to assess whether the data distribution approximates normality. Skewness values closer to zero indicate a symmetrical distribution, whereas kurtosis values near zero suggest a normal peak in the data distribution. The Health Risks of HFCS-Containing Foods and Sensitivity When Purchasing Food Products subscales exhibited higher skewness and kurtosis, suggesting deviations from normality. The Consumer Awareness and Use of HFCS Without Labeling subscales had skewness and kurtosis values closer to zero, indicating a more normal distribution. The overall scale (HFCS Consumption Scale) displayed moderate skewness and kurtosis values, suggesting an approximately normal distribution.

Table 4 presents the descriptive analysis results of the mean scores obtained by participants from the scale used in the study.

Table 4. Minimum, maximum, mean, and standard deviation values of the scale used in the study.

Scale	Min.	Max.	Mean ($\bar{X}$)	Standard Deviation (SD)
Health Risks of HFCS-Containing Foods	22.00	50.00	40.57	4.312
Consumer Awareness	6.00	24.00	16.48	3.704
Sensitivity When Purchasing Food Products	4.00	12.00	10.70	1.569
Use of HFCS Without Labeling	4.00	10.00	8.79	1.512
HFCS Consumption Scale	48.00	92.00	76.54	8.160

The mean total score of the "HFCS Consumption Scale" was calculated as 76.54±8.160, while the scores for its subdimensions varied. The mean score for "Health Risks of HFCS-Containing Foods" was 40.57±4.312, indicating a considerable level of awareness among participants regarding the potential health risks associated with HFCS consumption. The "Consumer Awareness" subdimension yielded a mean score of 16.48±3.704, suggesting that participants demonstrated moderate to high levels of awareness about HFCS in food products. For the "Sensitivity When Purchasing Food Products" subdimension, the mean score was 10.70±1.569, reflecting participants' attentiveness and selectivity in food purchasing decisions. The "Use of HFCS Without Labeling" subdimension had a mean score of 8.79±1.512, indicating participants' concerns about the presence of HFCS in food products without explicit labeling. Additionally, in the "Health Risks of HFCS-Containing Foods" subdimension, which consists of 10 items with a maximum possible score of 50, the observed mean score of 40.57 suggests that participants had a high level of knowledge and awareness regarding the health risks of HFCS consumption. In light of the total scale score and subdimension scores, it can be concluded that participants exhibited a high level of awareness and knowledge regarding HFCS consumption and its potential health implications

Table 5 presents the distribution of responses given by the participants regarding their knowledge and sensitivity toward purchasing processed food products.

Table 5. Participants' knowledge and sensitivity regarding the purchase of processed food products.

Questions on purchasing sensitivities: How often		***n***	***%***
I pay attention to the ingredients list of the food products I purchase.	Never	13	3.7
	Occasionally	104	29.7
	Usually	162	46.3
	Always	71	20.3
I pay attention to whether the packaging of the food product is intact.	Never	2	.6
	Occasionally	11	3.1
	Usually	71	20.3
	Always	266	76.0
I pay attention to the cleanliness of the places where the food product is produced.	Never	17	4.9
	Occasionally	37	10.6
	Usually	123	35.1
	Always	173	49.4
I avoid purchasing products that contain corn syrup.	Never	31	8.9
	Occasionally	127	36.3
	Usually	154	44.0
	Always	38	10.9
I always consider the nutritional value when purchasing a food product.	Never	22	6.3
	Occasionally	101	28.9
	Usually	174	49.7
	Always	53	15.1
I pay attention to ensuring that the packaging of the food products I purchase is made of materials that do not harm the product.	Never	36	10.3
	Occasionally	93	26.6
	Usually	121	34.6
	Always	100	28.6
I pay attention to the expiration date when purchasing a food product.	Never	5	1.4
	Occasionally	11	3.1
	Usually	70	20.0
	Always	264	75.4
I pay attention to the ingredients of the food products when purchasing them."	Never	15	4.3
	Occasionally	122	34.9
	Usually	143	40.9
	Always	70	20.0
I prioritize the nutritional value of food products over their taste.	Never	25	7.1
	Occasionally	76	21.7
	Usually	206	58.9
	Always	43	12.3
Total		350	100.0

As presented in Table 5, healthcare professionals showed high levels of sensitivity regarding product safety and content during food purchasing. Specifically, 75.4% of participants stated that they always and 20% usually check the expiration date of food products, while 76% always examine whether the packaging is intact—indicating a strong emphasis on hygiene and product integrity. In terms of nutritional awareness, 66.6% (usually or always) read the ingredient list, and 71.2% prioritize nutritional value over taste. Importantly, in response to the item "I avoid purchasing products that contain corn syrup," 10.9% stated 'always', 44% 'usually', 36.3% 'occasionally', and 8.9% 'never'—revealing that while over half (54.9%) demonstrate consistent avoidance behavior, a significant proportion still consume such products irregularly or without conscious exclusion. These findings underscore a partial gap between health-related knowledge and consistent purchasing behaviors, suggesting an area for targeted nutritional intervention.

Table 6 presents the distribution of responses provided by the participants regarding their level of knowledge on purchasing processed food products.

Table 6. Participants' knowledge levels regarding the purchase of processed food products.

Questions on health risks: Responses		*n*	%
Foods containing starch-based sugar (corn syrup, fructose syrup) cause diabetes.	Disagree	3	.9
	Neutral	40	11.4
	Agree	307	87.7
Foods containing starch-based sugar (corn syrup, fructose syrup) cause hypertension.	Disagree	12	3.4
	Neutral	49	14.0
	Agree	289	82.6
Foods containing starch-based sugar (corn syrup, fructose syrup) are absorbed faster than suga derived from sugar beets.	Disagree	22	6.3
	Neutral	117	33.4
	Agree	211	60.3
Foods containing starch-based sugar (corn syrup, fructose syrup) do not provide a feeling of satiety.	Disagree	75	21.4
	Neutral	100	28.6
	Agree	175	50.0
Foods containing starch-based sugar (corn syrup, fructose syrup) cause obesity.	Disagree	6	1.7
	Neutral	13	3.7
	Agree	331	94.6
Foods containing starch-based sugar (corn syrup, fructose syrup) disrupt hormonal balance in the body.	Disagree	7	2.0
	Neutral	70	20.0
	Agree	273	78.0
Foods containing starch-based sugar (corn syrup, fructose syrup) are amon the foods I enjoy, find tasty, and recommend to my friends and family.	Disagree	295	84.3
	Neutral	41	11.7
	Agree	14	4.0
The consumption of food containing starch-based sugar (corn syrup, fructos syrup) causes addiction during childhood.	Disagree	12	3.4
	Neutral	67	19.1
	Agree	271	77.4
Starch-based sugar (corn syrup, fructose syrup) enhances the taste and quality of food products.	Disagree	88	25.1
	Neutral	135	38.6
	Agree	127	36.3
Starch-based sugar (corn syrup, fructose syrup) enhances the taste and quality of food products.	Disagree	21	6.0
	Neutral	125	35.7
	Agree	204	58.3
Starch-based sugar (corn syrup, fructose syrup) is widely used in flavored food products.	Disagree	2	0.6
	Neutral	41	11.7
	Agree	307	87.7
Starch-based sugar (corn syrup, fructose syrup) increases food consumption due to its taste enhancement, leading to associated health risks.	Disagree	5	1.4
	Neutral	23	6.6
	Agree	322	92.0
Total		350	100.0

This table presents the participants' knowledge levels regarding the health risks and economic aspects of foods containing starch-based sugar (corn syrup, fructose syrup). The responses indicate a high level of awareness among participants, particularly regarding the association between starch-based sugar consumption and obesity, diabetes, and excessive food intake.

Table 7 presents the results of the analysis comparing the mean scores obtained from the scale and its sub-factors based on the demographic characteristics of the participants.

Table 7. Comparison of scale score averages by demographic characteristics of the participants (n=350).

Variables	n	Health Risks of Foods Containing Corn Syrup	Consumer Awareness	Sensitivity When Purchasing Food Products	Use of Corn Syrup Without Masking	Total Scale Score
		Mean.±Sd	Mean.±Sd	Mean.±Sd	Mean.±Sd	Mean.±Sd
Gender						
Female	254	40.96±4.064	16.55±3.335	10.89±1.279	8.78±1.501	77.20±7.371
Male	96	39.54±4.776	16.27±4.550	10.19±2.080	8.79±1.548	74.80±9.781
TEST		**t=2.773 p=0.006**	t=0.566 p=0.572	**MW=10.514 p=0.037**	t=-0.024 p=0.981	**t=2.180 p=0.031**
Age						
(1) 21-30	129	40.17±4.404	15.01±3.695	10.41±1.753	8.54±1.595	74.15±8.126
(2) 31-40	129	41.13±3.868	17.00±3.644	10.73±1.481	9.06±1.437	77.94±7.973
(3) 41-50	73	40.58±4.396	17.56±3.295	10.94±1.422	8.65±1.492	77.75±8.108
(4) 51 and Above	19	39.31±5.802	18.73±1.880	11.47±0.841	9.05±1.223	78.57±6.397
TEST		F=1.651 p=0.177	**F=13.262 p=0.000 1<2,3,4 2<4**	**KW=11.110 p=0.011 1<3,4 2<4**	**F=3.052 p=0.029 1<2**	**F=6.143 p=0.000 1<2,3**
Profession						
(1) Physician	53	41.94±2.748	18.52±2.317	11.52±1.030	9.62±0.790	81.62±3.814
(2) Nurse	230	40.09±4.528	15.95±3.818	10.42±1.672	8.56±1.600	75.03±8.760
(3) Midwife	35	41.60±3.210	15.82±3.276	10.80±0.994	8.62±1.436	76.85±6.184
(4) Dietician	4	44.25±2.629	18.50±4.358	12.00±0.000	9.50±1.000	84.25±3.593
(5) Psychologist	5	41.00±4.636	13.60±5.128	10.40±3.049	9.20±1.788	74.20±10.894
(6) Physiotherapist	6	43.00±2.097	17.83±4.400	11.33±0.816	9.66±0.816	81.83±3.250
(7) Health Mem.	15	38.33±6.298	18.33±2.716	11.13±1.187	8.80±1.473	76.60±6.609
(8) Food Eng.	2	42.50±0.707	19.00±2.828	12.00±0.000	10.00±0.000	83.50±2.121
TEST		**F=2.894 p=0.006 2<1**	**F=4.861 p=0.000 2,3<1**	**KW=41.882 p=0.000 2,3<1**	**F=3.947 p=0.000 2,3<1**	**F=5.682 p=0.000 2,3<1**
Education Status						
(1) High School	13	39.61±4.752	15.84±2.911	11.00±1.080	7.84±1.519	74.30±8.107
(2) Associate Degree	44	39.88±5.031	15.45±4.201	10.11±1.794	8.18±1.768	73.63±9.435
(3) Bachelor's Degree	215	40.44±4.303	16.07±3.805	10.58±1.612	8.76±1.477	75.87±8.188
(4) Master's Degree	26	41.30±4.823	17.80±3.452	10.84±1.084	9.15±1.286	79.11±6.883
(5) Doctorate	52	41.53±3.083	18.50±1.904	11.53±1.128	9.46±1.195	81.03±5.110
TEST		F=1.331 p=0.258	**F=6.679 p=0.000 2,3<5**	**KW=32.249 p=0.000 1,2,3,4<5**	**F=6.370 p=0.000 1,2,3<5**	**F=7.049 p=0.000 2,3<5**
Weight Gain in the Last 6Months						
Yes	137	40.37±4.277	16.24±3.928	10.67±1.585	8.77±1.499	76.06±8.485
No	213	40.69±4.338	16.63±3.552	10.71±1.561	8.79±1.523	76.84±7.948
TEST		t=-0.693 p=0.489	t=-0.969 p=0.333	MW=14363.5 p=0.797	t=-0.147 p=0.883	t=-0.877 p=0.381

According to Table 7, significant differences were observed in HFCS-related knowledge and behaviors across gender, age, education level, and profession. Female participants scored higher than males in both "Purchasing Sensitivity" ($p=0.037$) and total scale score ($p=0.031$), indicating stronger consumer awareness. In terms of age, participants aged 31–40 and over 50 had significantly higher scores in "Consumer Awareness" and "Purchasing Sensitivity" compared to the 21–30 age group ($p<0.01$), suggesting that awareness increases with age. Professional differences were also notable: physicians and dietitians scored significantly higher than nurses and midwives across all subscales and the overall scale ($p<0.001$), highlighting the influence of professional training on nutritional literacy. Educational background had a clear impact—participants with doctoral degrees had the highest scores in "Consumer Awareness," "Purchasing Sensitivity," and total scale ($p<0.001$). Conversely, no statistically significant difference was found based on self-reported weight change status ($p>0.05$), indicating that HFCS awareness alone may not directly translate into weight-related outcomes.

4. Discussion

This study was conducted to examine the factors health professionals consider when purchasing food products, as well as to assess their knowledge, attitudes, and behaviors regarding the consumption of HFCS.

According to the first finding, participants demonstrated a high level of knowledge and awareness in the subdimension "Perceived Health Risk of HFCS-Containing Foods" (Table 4). Similarly, in a study involving 300 participants, 68% reported having prior knowledge about HFCS (15). This awareness may be attributed to the widespread use of HFCS and the public's generally negative perception of artificial sweeteners.

In other subdimensions, the participants' level of "Consumer Awareness" was found to be average, while their "Sensitivity When Purchasing Food Products" was above average, and their awareness in the "Unmasked Use of HFCS" subdimension was high. Overall, the findings suggest that health professionals possess a satisfactory level of knowledge. Supporting this, Kızgın and Tuncer (16) reported that 60% of participants aged 15–29 paid particular attention to additives and sweeteners in packaged foods, indicating a relatively high level of awareness. However, some gaps in knowledge related to healthy food choices were identified in this study. For instance, in a study involving university students, nearly all fourth-year students were found to have sufficient nutritional knowledge, whereas only 79.7% of first-year students met this threshold (17). The same study revealed that first-year students consumed more packaged products and soft drinks. Similarly, Özüpek and Arslan (18) found that nutrition literacy was lowest among first-year students, and this gap appeared to narrow as students progressed in their curriculum, particularly through the inclusion of health and nutrition-related courses (19).

Numerous studies have also shown that individuals studying in health-related fields or receiving nutrition education tend to exhibit higher levels of nutritional knowledge and greater sensitivity in food selection (20-25). Collectively, these findings underscore the critical role of nutrition education in shaping informed knowledge and attitudes.

According to the findings, 46.3% of healthcare professionals reported that they "usually" pay attention to the ingredients list on food products, while 20.3% stated that they "always" do so. These results indicate that more than half of the participants consider ingredient information when purchasing food (Table 5). In contrast, a study conducted by Sakar and Açkurt (26) with 150 teachers revealed that 84.7% of participants did not read food labels and only 2.6% had a regular label-reading habit. This discrepancy may stem from differences in nutritional habits, professional knowledge, or social environment across occupational groups.

These findings highlight the growing importance of fostering label-reading habits and improving food literacy. Indeed, Silva, Lima (27) emphasized that while some individuals report reading labels, many still struggle to fully comprehend the information, underscoring the need for more comprehensive food literacy education.

The study also found that 76% of participants "always" check the integrity of food packaging, and more than half pay attention to whether the packaging is made from materials suitable for direct food contact. Similarly, Tapkı, Demirtaş (28) reported that consumers preferred tin containers—considered a healthier alternative—over plastic when purchasing olive oil. Taş (14) also observed that a majority of consumers were concerned about whether the packaging materials were safe for health. In another study, Ayduğ (29) found that consumers believed food packaging should be made from recyclable, non-toxic materials that do not compromise the integrity of the product.

Additionally, more than half of the participants stated that they consider the cleanliness of the production site when purchasing food, and many reported avoiding products containing corn syrup. These results are in line with, Taş (14) who found that most consumers prioritize hygiene in production facilities and that 20% check whether a product contains high-fructose corn syrup. The relatively higher level of HFCS awareness in our sample suggests a more informed participant group. Similarly, (29) emphasized that consumers view the cleanliness of product content as a critical factor in purchasing decisions.

In our study, approximately half of the participants stated that they consider the nutritional value of products during

purchase. Supporting this, Aygen (30) reported that the majority of individuals find the nutritional information on labels useful. However, Demir, Gökoğlu (15) found that only 17.7% of participants from various regions paid attention to energy and nutrient content. Likewise, Çalık, Kaner (31) observed that 72.2% of respondents ignored this information. These findings suggest that healthcare professionals place greater importance on nutritional value compared to the general population and highlight a general lack of consumer awareness in this area. Therefore, efforts to raise awareness of nutrient content remain essential.

Three-quarters of the participants in this study stated that they "always" check the expiration date when purchasing food products. This finding is consistent with the results of a study conducted by Demir, Coşkun (32) involving 505 female participants, in which over 90% reported checking expiration dates on product packaging. Similarly, Arslan, Özlü (24) found that 67.4% of women and 55.6% of men paid consistent attention to expiration dates. Aygen (30) also reported that 72% of consumers always or often consider expiration dates when shopping. Collectively, these findings suggest a high level of consumer awareness on this issue.

In the present study, 60% of participants indicated that they pay attention to the product's ingredients, while 40% stated that they do not. Sezek, Kaya (33) found that half of university students read label information, and 87.5% believed that such information should be taken into account. Similarly, Yasan, Kendilci (34) reported that 82% of participants regularly check product content, while 15.6% do so occasionally. These findings indicate that consumers generally value ingredient information when making food choices.

Additionally, 58.9% of participants reported prioritizing the nutritional value of food products over taste. This aligns with the findings of Demir and Coşkun (32), who noted that nutritional quality was among the most important factors for female consumers when purchasing food. Although factors such as taste, health, convenience, and price often influence consumer preferences, the data suggest that nutritional content is not overlooked in the decision-making process.

In this section, responses to questions assessing participants' knowledge regarding the purchase of processed foods containing high-fructose corn syrup (HFCS) were analyzed and discussed in light of the existing literature (Table 6).

According to the statistical analyses, nearly 90% of healthcare professionals believed that HFCS-containing foods contribute to the development of diabetes. This knowledge is consistent with findings in the literature. In a prospective cross-sectional study, Wu, Giovannucci (35) reported a positive association between excessive fructose intake and elevated C-peptide levels. Based on this relationship, the authors suggested that high fructose consumption may play a role in the onset of insulin resistance and the development of Type 2 diabetes. Similarly, a study conducted among adolescents aged 13 to 19—including lean, obese, and type 2 diabetic groups—showed that HFCS intake resulted in a rapid rise in blood fructose, glucose, and insulin levels within 15 minutes (36). However, there are also studies presenting opposing findings. In a 10-week trial with adults, participants were given low-fat milk sweetened with either fructose, glucose, or no added sugar. The results showed no significant differences in insulin sensitivity or glucose tolerance among the groups, and no one type of sugar was found to be more harmful than the others (5).

In line with the belief that HFCS contributes to diabetes, more than 80% of participants in the present study also reported that they believed such foods lead to hypertension. Supporting this, Chen and Caballero (37) found that diets high in added sugars—particularly those rich in fructose—were associated with elevated blood pressure, and that reducing sugar intake resulted in a corresponding decrease in blood pressure. Similarly, in a two-week study involving mildly overweight men, daily intake of 200 g of fructose significantly increased blood pressure levels (38).

A notable finding of the study was that approximately one-third of healthcare professionals were undecided about whether HFCS-containing foods are absorbed more rapidly than sugar derived from sugar beets. It is important to note that the fructose in HFCS exists in free form, whereas fructose in natural sources is bound in complex structures with other nutrients (39). As a monosaccharide, fructose is absorbed directly without digestion, while sucrose must first be broken down by the sucrase enzyme into its monosaccharide components, fructose and glucose, before it can be absorbed (40). This breakdown process is dependent on the activity of brush-border enzymes in the small intestine (41). Based on this biochemical pathway, it can be inferred that HFCS is absorbed more rapidly than table sugar.

When participants were asked whether HFCS-containing foods induce satiety, about half of them stated that HFCS does not promote a feeling of fullness. Scientific evidence supports the participants' view that HFCS does not induce satiety effectively. Unlike glucose, fructose does not trigger insulin or leptin secretion, both of which are essential for signaling fullness in the brain. As a result, HFCS consumption may lead to reduced satiety, increased caloric intake, and potential weight gain (42-44). These findings suggest that the participants demonstrated a relatively strong level of awareness on this issue.

The study also revealed that nearly all participants agreed that HFCS-containing foods contribute to obesity. A large body of evidence has shown that high intake of HFCS and other fructose-containing sweeteners is significantly associated with increased body mass index, visceral fat accumulation,

and central adiposity in both adults and children (45-50). These findings collectively suggest that excessive fructose consumption plays a major role in the development of obesity across different age groups. Animal studies also found that fructose and HFCS intake increase adiposity even without significant body weight changes (51, 52).

When asked about the potential hormonal effects of HFCS, 78% of healthcare professionals reported believing that HFCS negatively impacts hormonal balance, while 11.7% expressed uncertainty. Several studies have demonstrated that high fructose intake may disrupt hormone regulation, particularly affecting leptin and insulin levels (53-55). In a study involving 254 participants, 46.1% stated that HFCS impairs hormonal balance (14). The difference in findings between these two studies may be attributed to the participants' level of health education, with healthcare professionals demonstrating greater awareness on the topic.

Despite enjoying the taste of HFCS-containing products, the vast majority of participants reported that they would not recommend them to others, reflecting a disconnect between personal preference and perceived health risk. This behavioral inconsistency—where individuals aspire to make healthy choices yet continue consuming unhealthy options—is well documented in the literature (56). Participants were divided on whether HFCS improves the taste and quality of food products, likely reflecting conflicting perceptions between sensory appeal and health-related concerns. While some may recognize its flavor-enhancing effects, others remain skeptical due to its association with poor nutritional quality. The majority of healthcare professionals in this study viewed HFCS as a contributor to adverse health outcomes—a perception echoed in broader consumer research. Processed foods and added sugars, particularly HFCS, have been widely associated with increased risks of obesity, cardiovascular disease, and metabolic disorders (14, 57-60). This aligns with the prevailing public view that HFCS-containing products undermine nutritional quality and long-term health.

In this study, the relationships between participants' gender, age, profession, educational background, and weight change status over the past six months and their levels of awareness regarding the health risks of corn syrup-containing foods, consumer consciousness, purchasing sensitivity, and awareness of unmasked use of corn syrup were examined (Table 7). Nutritional knowledge and food preferences often vary according to demographic factors such as education level, gender, age, and occupation (61). Awareness and purchasing behaviors varied significantly across demographic characteristics. Female, older, and more highly educated participants—particularly those with doctoral degrees—demonstrated greater nutritional awareness and purchasing sensitivity. Physicians also exhibited higher knowledge and consumer consciousness than other healthcare professions. These findings are in line with previous studies indicating that nutrition-related knowledge and behavior are influenced by gender roles, age-related experience, professional training, and educational attainment (25, 62, 63). The greater nutritional awareness observed among women may be attributed to their roles in family nutrition, food preparation, and body image sensitivity. However, some studies found no significant gender-based differences, while others reported higher knowledge among men (64-66).

Additionally, older participants—especially those aged 42 and above—demonstrated higher consumer awareness than younger individuals, aligning with studies suggesting that nutritional knowledge increases with age (67). Several studies have shown that adults, particularly those aged 40–49, possess higher nutritional knowledge and are more attentive to food labels compared to younger individuals (58, 68). In contrast, younger age groups—especially those aged 19–30—tend to consume more processed and snack foods, often prioritizing convenience and speed over nutrition (32, 60, 69, 70). These generational differences in food preferences are influenced by lifestyle, work routines, and cooking habits (71). Physicians exhibited higher awareness of HFCS-related health risks, consumer behavior, and labeling sensitivity compared to nurses and dietitians. No significant differences were found among other professional groups. These findings align with prior studies reporting that physicians generally possess greater nutritional knowledge due to their extensive health education (72-74). The comparable scores among other healthcare professionals may reflect similar levels of formal training. Participants with doctoral degrees scored significantly higher in consumer awareness, purchasing sensitivity, unmasked use awareness, and overall HFCS scale scores compared to those with lower educational attainment; however, no significant difference was observed in health risk awareness. This aligns with previous studies showing that individuals with postgraduate education tend to have greater nutrition knowledge, are more likely to read labels, and demonstrate healthier food preferences (62, 73, 75-77). Education level has been consistently linked to improved nutrition literacy and consumer behavior across various populations (78-81).

When participants were compared based on whether they had gained weight in the past six months, no significant differences were observed in their awareness of the health risks of corn syrup-containing foods, consumer consciousness, purchasing sensitivity, or unmasked corn syrup usage. It is important to note that weight gain is influenced by a range of factors beyond the consumption of processed foods or corn syrup alone. Daily caloric intake, physical activity, medication use, hormonal imbalances, chronic diseases, and stress all play significant roles in weight fluctuations.

5. Conclusion and Recommendations

This study revealed that although healthcare professionals possess a high level of knowledge regarding foods containing HFCS, this knowledge is not consistently reflected in their attitudes and behaviors. Notably, inconsistencies were observed in label-reading habits and healthy food preferences. Demographic factors such as gender, age, profession, and educational level were found to significantly influence knowledge and behavior. The findings of the study necessitate the consideration of certain recommendations aimed at improving the knowledge and attitudes of healthcare professionals. Primarily, it is important to integrate structured nutrition education into the professional development of all healthcare workers. These educational programs should focus on enhancing the ability to interpret food labels accurately, increasing ingredient awareness, and evaluating evidence-based dietary risks. In addition, workplace-based health promotion initiatives should aim to reduce HFCS consumption and encourage behavior change by supporting informed food choices. At the national level, legal regulations should be developed to govern the use of HFCS in processed foods and to mandate clear labeling of such ingredients. Furthermore, interdisciplinary collaboration among physicians, dietitians, and educators should be strengthened to design intervention programs that address misconceptions and promote evidence-based practices. Lastly, it is recommended that longitudinal studies be supported to investigate the long-term impact of nutrition education on the behavioral patterns of healthcare professionals and its broader implications for public dietary habits.

Author Contributions

T.A. was responsible for data collection, analysis, and interpretation, as well as drafting and writing the manuscript. M.A.A. designed and supervised the study, oversaw data analysis, and contributed to the writing and editing of the manuscript. All authors approved the final version of the article, which has not been published elsewhere.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

1. Kıskaç N, Rashidi M, Karaman F. Beslenme bozuklukları ve beslenme yöntemleri. Sağlık Bilimleri Araştırması: Hemşirelik ve Ebelik II, Cengiz Açıl H (ed). Özgür Yayınları. 2023;103-104.

2. Baştürk F, Yıldız S, İnan P. Hazır gıda ürünleri satın alma davranışını etkileyen pazarlama faktörlerinin incelenmesi: Iğdır ilinde bir araştırma. Çankırı Karatekin Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi. 2014;4(1):223-36.

3. Seguin RA, Aggarwal A, Vermeylen F, Drewnowski A. Consumption frequency of foods away from home linked with higher body mass index and lower fruit and vegetable intake among adults: a cross-sectional study. Journal of Environmental Public Health. 2016;2016(1):3074241.

4. Bocarsly ME, Powell ES, Avena NM, Hoebel BG. High-fructose corn syrup causes characteristics of obesity in rats: increased body weight, body fat and triglyceride levels. Pharmacology Biochemistry Behavior. 2010;97(1):101-6.

5. Lowndes J, Sinnett SS, Rippe JM. No effect of added sugar consumed at median American intake level on glucose tolerance or insulin resistance. Nutrients. 2015;7(10):8830-45.

6. Bray GA, Nielsen SJ, Popkin BM. Consumption of high-fructose corn syrup in beverages may play a role in the epidemic of obesity. The American Journal of Clinical Nutrition. 2004;79(4):537-43.

7. Dornas WC, de Lima WG, Pedrosa ML, Silva ME. Health implications of high-fructose intake and current research. Advances in Nutrition. 2015;6(6):729-37.

8. Kocatepe D, Tırıl A. Sağlıklı beslenme ve geleneksel gıdalar. Journal of Tourism Gastronomy Studies. 2015;3(1):55-63.

9. Agarwal V, Das S, Kapoor N, Prusty B, Das B. Dietary fructose: a literature review of current evidence and implications on metabolic health. Cureus. 2024;16(11):e74143.

10. Meng Y, Li S, Khan J, Dai Z, Li C, Hu X, et al. Sugar- and artificially sweetened beverages consumption linked to type 2 diabetes, cardiovascular diseases, and all-cause mortality: a systematic review and dose-response meta-analysis of prospective cohort studies. Nutrients. 2021;13(8).

11. Te Morenga L, Mallard SR, Ormerod FB. No effect of added sugars in soft drink compared with sugars in fruit on cardiometabolic risk factors: results from a 4-week, randomized controlled trial. Frontiers in Nutrition. 2021;8:636275.

12. Kelly M, Wills J, Jester R, Speller V. Should nurses be role models for healthy lifestyles? Results from a modified Delphi study. Journal of Advanced Nursing. 2016;73.

13. Di Prinzio RR, Dosi A, Arnesano G, Vacca ME, Melcore G, Maimone M, et al. Effectiveness of a food education program for healthcare workers: a pilot study in a Total Worker Health© approach. Frontiers in Public Health. 2025;Volume 13 - 2025.

14. Taş F. Knowledge attitudes and behaviors of adult individuals about high fructose corn syrup consumption; cross sectional survey study. Clinical Nutrition ESPEN. 2020;40:179-86.

15. Demir G, Gökoğlu F, Kılıçkalkan B, Baş BB, Altunel H. Kadın ve erkek tüketicilerin gıda katkı maddeleri ile ilgili bilgi, tutum ve davranışları. Food Health. 2020;6(4):225-37.

16. Kızgın Y, Tuncer B. Türk gıda kodeksine göre gıda etiketi okuryazarlığının belirlenmesi: genç tüketiciler üzerinde bir araştırma. Business & Management Studies: An International Journal. 2020.

17. Akyüz EY, Konan MN, Alatlı R. Beslenme ve Diyetetik bölümü 1. ve 4. sınıf öğrencilerinin besin tercihlerinin karşılaştırılması. Sağlık Akademisyenleri Dergisi. 2021;8(1):43-8.

18. Özüpek G, Arslan M. Popüler diyet uygulama, beslenme okuryazarlığı ve beden kütle indeksi ilişkisinin değerlendirilmesi: beslenme ve diyetetik öğrencileri üzerine bir çalışma. Türkiye Diyabet ve Obezite Dergisi. 2021;5(3):340-50.

19. Ertürk Yaşar H. Spor Bilimleri Fakültesi öğrencilerinin sağlıklı beslenmeye ilişkin tutumları ve beslenme okuryazarlığı. MANAS Sosyal Araştırmalar Dergisi. 2023;12(3):1150-8.

20. Shafer L, Gillespie A, Wilkins JL, Borra ST. Position of the American Dietetic Association: nutrition education for the public. Journal of the Academy of Nutrition and Dietetics. 1996;96(11):1183.

21. Mazicioğlu MM, Öztürk A. Üniversite 3. ve 4. sınıf öğrencilerinde beslenme alışkanlıkları ve bunu etkileyen faktörler. Erciyes Tıp Dergisi. 2003;25(4):172-8.

22. Ermiş E, Doğan E, Erilli N, Satıcı AJSvPAD. Üniversite öğrencilerinin beslenme alışkanlıklarının incelenmesi: Ondokuz Mayıs Üniversitesi örneği. 2015;6(1):30-40.

23. Özbahar Acar Z. Üniversite öğrencilerinde obezite ve yaşam davranışları. 2015.

24. Arslan E, Özlü T, Garipoğlu G. Üniversite öğrencilerinin besin etiketi okuma davranışının incelenmesi. Sağlık Bilimleri Dergisi. 2022;31(1):71-8.

25. Baş D, Kayak S. Üniversite öğrencilerinin besin etiket bilgisi okuma tutumu ve gıda okuryazarlığı düzeylerinin değerlendirilmesi. Üçüncü Sektör Sosyal Ekonomi Dergisi. 2023.

26. Sakar E, Açkurt F. İlköğretim okullarında görevli öğretmenlerin beslenme alışkanlıkları ve beslenme bilgi düzeyleri. Sağlık ve Yaşam Bilimleri Dergisi. 2019;1(1):30-6.

27. Silva B, Lima JP, Baltazar AL, Pinto E, Fialho S. Perception of Portuguese consumers regarding food labeling. Nutrients. 2022;14(14):2944.

28. Tapkı N, Demirtaş B, Dağıstan EJTTvDBD. Hatay kent merkezindeki tüketicilerin zeytinyağı satın alma tercihlerini etkileyen faktörlerin belirlenmesi. Türk Tarım ve Doğa Bilimleri Dergisi. 2020;7(2):331-41.

29. Ayduğ İ. Paketli gıda ambalajlarının satın alma davranışına etkisi. Journal of Global Tourism Technology Research. 2020;1(1):50-76.

30. Aygen FG. Tüketicilerin besin etiketi incelenmesi konusundaki tutum ve davranışları. İşletme Araştırmaları Dergisi. 2012;4(3):28-54.

31. Çalık G, Kaner G, Yalçın T. Tip 2 diyabetli bireylerin satın alma davranışları ve besin etiketi okuma alışkanlıklarının incelenmesi. İzmir Katip Çelebi Üniversitesi Sağlık Bilimleri Fakültesi Dergisi. 2020;5(3):255-62.

32. Demir İ, Coşkun BN, Duman N. Fakirleşiyor muyuz? Kadın tüketicilerin gıda tüketim alışkanlıkları. Dünya İnsan Bilimleri Dergisi. 2022;2022(1):112-31.

33. Sezek F, Kaya E, Doğan S. Üniversite öğrencilerinin genel beslenme alışkanlıkları, katkılı besinler hakkındaki bilgi, görüş ve tutumları. Cankaya University Journal of Arts and Sciences. 2008;1(10):117-34.

34. Yasan N, Kendilci EA, Kendilci K, Altay S. Bitlis Eren Üniversitesi personelinin beslenme alışkanlıkları ve beslenme bilgi düzeyleri. Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi. 2023;12(3):1288-300.

35. Wu T, Giovannucci E, Pischon T, Hankinson SE, Ma J, Rifai N, et al. Fructose, glycemic load, and quantity and quality of carbohydrate in relation to plasma C-peptide concentrations in US women. The American Journal of Clinical Nutrition. 2004;80(4):1043-9.

36. Patterson ME, Yee JK, Wahjudi P, Mao CS, Lee W-NP. Acute metabolic responses to high fructose corn syrup ingestion in adolescents with overweight/obesity and diabetes. Journal of Nutrition and Intermediary Metabolism. 2018;14:1-7.

37. Chen L, Caballero B, Mitchell DC, Loria C, Lin P-H, Champagne CM, et al. Reducing consumption of sugar-sweetened beverages is associated with reduced blood pressure: a prospective study among United States adults. Circulation. 2010;121(22):2398-406.

38. Perez-Pozo SE, Schold J, Nakagawa T, Sánchez-Lozada LG, Johnson RJ, Lillo JL. Excessive fructose intake induces the features of metabolic syndrome in healthy adult men: role of uric acid in the hypertensive response. International Journal of Obesity. 2010;34(3):454-61.

39. Choo VL, Viguiliouk E, Blanco Mejia S, Cozma AI, Khan TA, Ha V, et al. Food sources of fructose-containing sugars and glycaemic control: systematic review and meta-analysis of controlled intervention studies. BMJ (Clinical Research Ed). 2018;363:k4644.

40. Seylam A, Karataş B, Çelebi A. Yüksek fruktozlu mısır şurubunun karaciğer yağlanması ve obezite gelişimi ile ilişkisi. Adnan Menderes Üniversitesi Sağlık Bilimleri Fakültesi Dergisi. 2021;5(2):422-30.

41. Örek YŞ, Mertoğlu C. Yüksek fruktozlu mısır şurubunun insan sağlığına etkileri. Van Tıp Dergisi. 2020;27(3):371-82.

42. Tappy L, Lê K-A. Metabolic effects of fructose and the worldwide increase in obesity. Physiological Reviews. 2010.

43. Boyunağa H, Badem ND, Mortaş T. Mısır şurubunun metabolizmada oluşturduğu anarşi ve hastalıklarla ilişkisi. Kırıkkale Üniversitesi Tıp Fakültesi Dergisi. 2018;20(2):198-204.

44. Forshee RA, Storey ML, Allison DB, Glinsmann WH, Hein GL, Lineback DR, et al. A critical examination of the evidence relating high fructose corn syrup and weight gain. Critical Reviews in Food Science and Nutrition. 2007;47(6):561-82.

45. Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. The Lancet. 2001;357(9255):505-8.

46. Stanhope KL, Schwarz JM, Keim NL, Griffen SC, Bremer AA, Graham JL, et al. Consuming fructose-sweetened, not glucose-sweetened, beverages increases visceral adiposity and lipids and decreases insulin sensitivity in overweight/obese humans. The Journal of Clinical Investigation. 2009;119(5):1322-34.

47. Brunkwall L, Chen Y, Hindy G, Rukh G, Ericson U, Barroso I, et al. Sugar-sweetened beverage consumption and genetic predisposition to obesity in 2 Swedish cohorts. The American Journal of Clinical Nutrition. 2016;104(3):809-15.

48. Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. American Journal of Public Health. 2007;97(4):667-75.

49. Aeberli I, Gerber PA, Hochuli M, Kohler S, Haile SR, Gouni-Berthold I, et al. Low to moderate sugar-sweetened beverage consumption impairs glucose and lipid metabolism and promotes inflammation in healthy young men: a randomized controlled trial. The American Journal of Clinical Nutrition. 2011;94(2):479-85.

50. Cantoral A, Téllez-Rojo MM, Ettinger A, Hu H, Hernández-Ávila M, Peterson K. Early introduction and cumulative consumption of sugar-sweetened beverages during the pre-school period and risk of obesity at 8–14 years of age. Pediatric Obesity. 2016;11(1):68-74.

51. Sadowska J, Bruszkowska M. Assessing the effect of sugar type and form of its intake on selected parameters of carbohydrate-lipid metabolism and plasma atherogenic indices in rats. Roczniki Państwowego Zakładu Higieny. 2019;70(1).

52. Dupas J, Feray A, Goanvec C, Guernec A, Samson N, Bougaran P, et al. Metabolic syndrome and hypertension resulting from fructose enriched diet in Wistar rats. BioMed Research International. 2017;2017(1):2494067.

53. Nakagawa T, Hu H, Zharikov S, Tuttle KR, Short RA, Glushakova O, et al. A causal role for uric acid in fructose-induced metabolic syndrome. American Journal of Physiology-Renal Physiology. 2006;290(3):F625-F31.

54. Zubiría MG, Alzamendi A, Moreno G, Rey MA, Spinedi E, Giovambattista A. Long-term fructose intake increases adipogenic potential: evidence of direct effects of fructose on adipocyte precursor cells. Nutrients. 2016;8(4):198.

55. Crescenzo R, Cigliano L, Mazzoli A, Cancelliere R, Carotenuto R, Tussellino M, et al. Early effects of a low fat, fructose-rich diet on liver metabolism, insulin signaling, and oxidative stress in young and adult rats. Frontiers in Physiology. 2018;9:411.

56. Trivedi M, Sridhar K, Kumar A. Impact of healthy alternatives on consumer choice: a balancing act. Journal of Retailing. 2016;92(1):65-82.

57. Öztürk E, Tekeli S. Tüketicilerin besin seçim güdüleri: Y ve Z kuşaklarının karşılaştırılması. Pazarlama ve Pazarlama Araştırmaları Dergisi. 2021;14(1):147-82.

58. Freire WB, Waters WF, Rivas-Mariño G, Nguyen T, Rivas PJPHN. A qualitative study of consumer perceptions and use of traffic light food labelling in Ecuador. 2017;20(5):805-13.

59. Bray GA. Energy and fructose from beverages sweetened with sugar or high-fructose corn syrup pose a health risk for some people. Advances in Nutrition. 2013;4(2):220-5.

60. Johnson RJ, Sanchez-Lozada LG, Nakagawa T. The effect of fructose on renal biology and disease. Journal of the American Society of Nephrology. 2010;21(12):2036-9.

61. Bartkiene E, Steibliene V, Adomaitiene V, Juodeikiene G, Cernauskas D, Lele V, et al. Factors affecting consumer food preferences: food taste and depression-based evoked emotional expressions with the use of face reading technology. BioMed Research International. 2019;2019(1):2097415.

62. Özenoğlu A, Gün B, Karadeniz B, Koç F, Bilgin V, Bembeyaz Z, et al. Yetişkinlerde beslenme okuryazarlığın sağlıklı beslenmeye ilişkin tutumlar ve beden kütle indeksi ile ilişkisi. Life Sciences. 2021;16(1):1-18.

63. Nayga Jr RM. Toward an understanding of consumers' perceptions of food labels. The International Food and Agribusiness Management Review. 1999;2(1):29-45.

64. Acemioğlu R, Doğan Y. Fen bilgisi öğretmen adaylarının sağlıklı beslenme konusuna ilişkin tutumlarının farklı değişkenler açısından incelenmesi. Aydın Karapınar. 2021.

65. Aktaş C. Sağlık çalışanlarında beslenme ve sağlık okuryazarlık düzeyi ile diyet kalite indeksi arasındaki ilişkinin belirlenmesi. Başkent Üniversitesi Sağlık Bilimleri Enstitüsü. 2022.

66. Sargın K, Güleşce M. Öğretmenlerin sağlıklı beslenmeye ilişkin tutumlarının değerlendirilmesi (Van ili örneği). Gaziantep Üniversitesi Spor Bilimleri Dergisi. 2022;7(1):1-11.

67. Gündoğdu S. Adana ilinde görev yapan okulöncesi öğretmenlerinin beslenme bilgi düzeyleri ve alışkanlıklarının araştırılması. 2009.

68. Hakli G, As E, Ucar A, ÖZdogan Y, Yilmaz MV, ÖZçelik AÖ, et al. Nutritional knowledge and behavior of adults: their relations with sociodemographic factors. Pakistan Journal of Nutrition. 2016;15(6):532.

69. Özyazıcıoğlu N, Çınar HG, Buran G, Ayverdi D. Uludağ Üniversitesi Sağlık Yüksekokulu öğrencilerinin beslenme alışkanlıkları. Anadolu Hemşirelik ve Sağlık Bilimleri Dergisi. 2009;12(2):34-40.

70. Zemzemoğlu TEA, Erem S, Uludağ E, Uzun S. Sağlık bilimleri fakültesi öğrencilerinin beslenme alışkanlıklarının belirlenmesi. Food Health. 2019;5(3):185-96.

71. Cappelli A, Cini E. Will the COVID-19 pandemic make us reconsider the relevance of short food supply chains and local productions? Trends in Food Science and Technology. 2020;99:566.

72. Yücel B. Sağlık çalışanlarının beslenme alışkanları ve beslenme bilgi düzeylerinin incelenmesi. Başkent Üniversitesi Sağlık Bilimleri Enstitüsü. 2015.

73. Keskin Y, Akar Y, Erdem Ö, Erol S. Yetişkinlerin beslenme bilgisi ve besin tercihleri ile beden kütle indeksi arasındaki ilişki: kesitsel bir çalışma. Dokuz Eylül Üniversitesi Hemşirelik Fakültesi Elektronik Dergisi. 2022;15(2):149-62.

74. Ayhan DE, Günaydın E, Gönlüaçık E, Arslan U, Çetinkaya F, Asımı H, et al. Uludağ Üniversitesi Tıp Fakültesi öğrencilerinin beslenme alışkanlıkları ve bunları etkileyen faktörler. Uludağ Üniversitesi Tıp Fakültesi Dergisi. 2012;38(2):97-104.

75. Hawley KL, Roberto CA, Bragg MA, Liu PJ, Schwartz MB, Brownell KD. The science on front-of-package food labels. Public Health Nutrition. 2013;16(3):430-9.

76. Méjean C, Macouillard P, Péneau S, Hercberg S, Castetbon K. Perception of front-of-pack labels according to social characteristics, nutritional knowledge and food purchasing habits. Public Health Nutrition. 2013;16(3):392-402.

77. Carbone ET, Zoellner JM. Nutrition and health literacy: a systematic review to inform nutrition research and practice. Journal of the Academy of Nutrition and Dietetics. 2012;112(2):254-65.

78. Rothman RL, Housam R, Weiss H, Davis D, Gregory R, Gebretsadik T, et al. Patient understanding of food labels: the role of literacy and numeracy. American Journal of Preventive Medicine. 2006;31(5):391-8.

79. Grunert KG, Wills JM, Fernández-Celemín L. Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the UK. Appetite. 2010;55(2):177-89.

80. Sponselee HC, Kroeze W, Poelman MP, Renders CM, Ball K, Steenhuis IH. Food and health promotion literacy among employees with a low and medium level of education in the Netherlands. BMC Public Health. 2021;21:1-11.

81. Stran KA, Knol LL. Determinants of food label use differ by sex. Journal of the Academy of Nutrition and Dietetics. 2013;113(5):673-9.