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Knowledge, perceptions and consumption of ultra-processed foods in the Greek population
A cross-sectional epidemiological study

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Γνώσεις, αντιλήψεις και κατανάλωση υπερ-επεξεργασμένων τροφίμων στον ελληνικό πληθυσμό: Συγχρονική επιδημιολογική μελέτη

Περίληψη στο τέλος του άρθρου

OBJECTIVE **Assessment of knowledge, perceptions, as well as frequency of consumption, of ultra-processed foods in the general Greek population.** METHOD **A cross-sectional survey was conducted among 374 adult men (mean age [standard deviation, SD]: 34 (15) years old) and 652 adult women (35 (14) years old) from all regions of Greece, in May 2023. Data were collected through an online, standard, self-administered and anonymous questionnaire. The classification of ultra-processed foods was based on the NOVA classification system. For the assessment of knowledge and perceptions, 16 questions were used, and a score (0–100) was created. In terms of consumption, the relevant information was collected through a short Food Frequency Questionnaire.** RESULTS **A total of 29% of the participants reported daily consumption of ultra-processed foods. The ultra-processed foods with the greatest weekly consumption were packaged bread and pastries (62% of the participants), breakfast cereals, and cereal bars with sugar (49%) and packaged sweet snacks (48%). Regarding knowledge and perceptions, 40% of the participants reported that they have limited to no awareness of the term ultra-processed foods, while the mean (SD) knowledge and perceptions score was 63/100 (19). An inverse association was observed between the knowledge and perceptions score and the overall consumption of ultra-processed foods score (p=0.05).** CONCLUSIONS **A moderate level of knowledge, along with a high consumption of ultra-processed foods were revealed in the Greek population, emerging the cooperation of physicians and other health professionals (especially dietitians) to raise awareness and guide the population towards healthier food choices.**

Key words

Consumption
Knowledge
Nutrition
Perception
Ultra-processed foods

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Over the past few years, the consumption of ultra-processed foods has increased rapidly worldwide, resulting in the displacement of unprocessed or minimally processed foods and freshly prepared meals.[1] Since the Second World War, human nutrition shifted from home-cooked meals to more industrialized, processed foods.[2] The concept of ultra-processed foods was first coined by a team at the University of São Paulo and proposed in a commentary article, in 2009.[3] A year later, the NOVA (which is not an acronym) classification system was proposed to categorize these foods and food products into groups based on the extent of the industrial processing they undergo.[4]

Ultra-processed foods (e.g., carbonated soft drinks, ice cream, mass-produced packaged breads and buns) are formulations of ingredients, mostly of exclusive industrial use (e.g., colours, flavours, emulsifiers), that result from a sequence of industrial processes (e.g., hydrogenation, hydrolysis, molding).[5] They are highly profitable (i.e., low-cost ingredients, long shelf-life, branded products), convenient (ready-to-eat, ready-to-drink, ready-to-heat), hyper-palatable and usually branded products that are marketed and promoted in attractive ways (e.g., health claims, special deals, vivid packaging).[5,6] Ultra-processed foods are energy-dense products, high in sugar, saturated and trans fatty acids and salt, and low in dietary fiber, protein, vitamins and minerals.[5] The poor nutritional quality of ultra-processed foods might be one of the reasons why higher consumption of these products is associated with non-communicable diseases, like some types of cancer

and atherosclerotic cardiovascular disease.[7] A recent systematic review and meta-analysis reported an association between high consumption of ultra-processed foods and an increased risk of overweight/obesity, elevated waist circumference, reduced HDL-cholesterol levels, an increased risk of the metabolic syndrome and a greater risk of all-cause mortality, cardiovascular disease, cerebrovascular disease and depression.[8] Ultra-processed food consumption has also been associated with renal function decline,[9] as well as with a higher risk of type 2 diabetes[10] and an increased risk of incident Crohn's disease.[11] However, further studies are needed to confirm the impact of ultra-processed food intake on human health. Moreover, it is crucial to underline that –based on the few existed studies– individuals are not well-informed about ultra-processed foods and their relationship with health status is not well understood and appreciated in most countries around the world.[12,13]

Thus, this study aims to investigate the perceptions and knowledge of the adult Greek population about ultra-processed foods, as well as the frequency of consumption of these products, and to examine their relationship with socio-demographic, clinical and lifestyle parameters (i.e., eating habits, exercise, smoking).

MATERIAL AND METHOD

Study design

This is a cross-sectional study in a sample of Greek adult men and women from all regions of Greece, which was conducted through an online, standard, self-administered and anonymous questionnaire, during May 2023.

Sample and sampling procedures

The sample included 1,026 participants, 374 men 34 (15) years old and 652 women 35 (14) years old. Of them, 63.7% were from Attica region, 9.6% from Thessaly, 5.1% from Peloponnese, 4.9% from central Macedonia, 3.2% from Crete, 4.0% from Aegean islands, 2.5% from central Greece, 2.0% from Epirus, 2.4% from western Greece and Ionian islands, and 2.5% from Macedonia and Thrace. A convenient sampling procedure was applied; thus, the selected sample was not representative of the total Greek population (census 2021).

Measurable characteristics

Socio-demographic characteristics

The sociodemographic characteristics that were evaluated in this work were sex (men, women), age (in years), level of education, marital status, household composition and place of residence. Specifically, educational level was assessed in five categories: (a) attended primary school (up to 6 years), (b) secondary school graduate (9–12 years of school), (c) post-secondary vocational studies, (d) higher education graduate (i.e., university/college), and (e) postgraduate studies. Also, participants were asked whether they currently study or have studied disciplines regarding dietetics, nutrition, or food science. Marital status was categorized into: (a) single, (b) married/cohabiting, (c) divorced, (d) widower/widow. Household composition referred to the number of children per household and to whether children lived in the same house as their parents.

Clinical characteristics and medical history

The evaluated clinical characteristics included reported body weight, and height; body mass index (BMI) was calculated as weight in kg per height in m^2. Participants were classified as overweight ($25 \leq BMI < 30$ kg/m^2) or obese (BMI ≥ 30 kg/m^2). A detailed medical history of the participants was also retrieved regarding cardiometabolic diseases (cardiovascular, hypertension, diabetes, dyslipidemia), cancer, depression, anxiety, other mental disorders, digestive diseases, and frailty syndrome.

Lifestyle characteristics

Dietary assessment was based on a semi-quantitative food frequency questionnaire. Moreover, a special score was also created to evaluate the consumption of ultra-processed foods (range 0–100), with lower values suggesting less frequent intake. The consumption of ultra-processed foods was recorded based on the NOVA classification system. Overall, dietary quality was evaluated according to the level of adherence to a Mediterranean type of diet via MedDietScore (which ranges from 0 to 55). Participants were classified into three groups according to whether they had low (<27), medium (27–35) or high adherence (>35). To assess participants' physical activity level, frequency, duration and intensity of exercise was recorded. Smoking habit, current or in the past, was also recorded.

Assessment of knowledge and perceptions regarding ultra-processed foods

For the evaluation of participants' knowledge regarding ultra-processed foods, the following questions were asked (and coded in a Likert scale): "Do you know the term ultra-processed foods?", "How much do you agree with the following suggestions regarding ultra-processed foods? Ultra-processed foods are mainly made in industrial level with increased processing processes, Ultra-processed foods are prepared in both industrial as well as domestic level with increased processing and cooking processes", "How would you categorize the following foods in terms of ultra-processed characterization? Packaged bread and mass-produced toast bread, salted nuts, pasteurized milk, pre-prepared meals "ready for heating", mayonnaise, ketchup, mustard etc., cheeses,

sausages, burgers, hot dogs and other processed meat products, carbonated soft drinks and beverages (with sugar or sweeteners), packaged cookies, pastries, cakes etc., butter, yogurt desserts, canned tuna, sugar, energy drinks (available answers: unprocessed and minimally processed foods, processed cooking ingredients, processed foods, ultra-processed foods)", "Do you believe ultra-processed foods are rich in: proteins, dietary fiber, salt, saturated and trans fatty acids, added sugars?", "Do you believe eating ultra-processed foods could harm your health?", "Do you believe that children's consumption of ultra-processed foods could harm their health as early as childhood/adolescence?". For the assessment of perceptions, the following questions were asked: "Do you consult food labels when you are buying a product?", "What is the main reason of choosing a fast food (e.g., crisps, cookies, packaged pastries, soft drinks, "ready-to-bake" pre-prepared meals)?: (a) Low price, (b) better taste, (c) simple in preparation, (d) mood enhancement, (e) social influence, (f) longer shelf life".

Based on these questions, a summary score was created by assigning 1 to the correct answer and 0 to the wrong and then summing up all individual items and rescaling to 0–100 scale; lower score values indicate lower level of knowledge according to the most recent literature and guidelines about ultra-processed foods.[4]

Bioethics

The study was carried out in accordance with the Declaration of Helsinki (1989) of the World Medical Association and was approved by the Research Ethics Committee of Harokopio University. All participants were informed about the aims and procedures of the study.

Statistical analysis

Continuous variables are presented as mean value and standard deviation (SD), while categorical variables are presented as absolute and relative (%) frequencies. Associations between categorical variables were evaluated using Pearson's' Chi-square test. Multiple logistic regression was performed to determine the association between the score of knowledge (binary outcome, <50/100: low versus >50: moderate/high) and consumption, considering sex and age, and other socio-demographic characteristics of the participants. A simple path analysis was also applied to evaluate how participants' characteristics affects the relationship between knowledge and consumption. All statistical analyses were performed using STATA 14.0 (Stata Corp LP, College Station, Texas, Ltd, and M. Psarros et Associates, Sparta, Greece). All tests were two-sided and a $p<0.05$ was considered statistically significant.

RESULTS

Knowledge and perceptions regarding ultra-processed foods

The overall mean value (SD) of the knowledge and perceptions score was 63/100 (19); and for it was higher for women, 65/100 (18), as compared to men, 59/100 (21) ($p<0.001$). Tables 1 and 2 illustrate participants' responses regarding ultra-processed foods knowledge. Overall, 40% of the participants declared that their knowledge level regarding ultra-processed foods was very limited. Participants' perceptions are illustrated in table 3. As it can be seen, 83% of the men participants reported that their level of health awareness regarding ultra-processed foods is very low, as compared to the 78% of women participants ($p<0.001$). In addition, 85% of men and 93% of women participants recognize that the consumption of ultra-processed foods is potentially harmful for human health ($p<0.001$). Data

Table 1. Participants' responses regarding knowledge of ultra-processed foods.

	Total	Men	Women	p-value
Have you ever heard the term "Ultra-processed foods"? n (%)				
No, not at all	164 (16%)	80 (21%)	84 (13%)	<0.001
I have heard something about it	246 (24%)	103 (28%)	143 (22%)	<0.001
I know about it, but not much	413 (40%)	129 (35%)	284 (44%)	<0.001
I think I know it	162 (16%)	42 (11%)	120 (18%)	<0.001
I know it well	41 (4%)	20 (5%)	21 (3%)	<0.001
Ultra-processed foods are rich in, yes (%)				
Protein	119 (12%)	56 (15%)	63 (10%)	0.001
Fiber	71 (7%)	25 (7%)	46 (71%)	0.044
Salt	858 (84%)	287 (77%)	571 (88%)	<0.001
Saturated and or trans fats	896 (87%)	302 (81%)	594 (91%)	<0.001
Added sugars	923 (90%)	316 (85%)	607 (93%)	<0.001

Table 2. Participants' responses assessing knowledge concerning the classification of food items according to the NOVA classification system.

How would you categorize the following food items?		Unprocessed – minimally processed	Processed culinary ingredients	Processed	Ultra-processed	p-value
Packaged bread	Total	116 (11%)	214 (21%)	429 (42%)	175 (17%)	
	Men	56 (15%)	87 (23%)	87 (23%)	52 (14%)	0.005
	Women	60 (9%)	127 (19%)	342 (52%)	123 (19%)	
Salted nuts	Total	321 (31%)	260 (25%)	396 (39%)	49 (5%)	
	Men	120 (32%)	97 (26%)	144 (39%)	13 (4%)	0.515
	Women	201 (31%)	163 (25%)	252 (39%)	36 (6%)	
Pasteurized milk	Total	175 (17%)	232 (23%)	484 (47%)	135 (13%)	
	Men	52 (14%)	95 (25%)	184 (49%)	43 (12%)	0.066
	Women	123 (19%)	137 (21%)	300 (46%)	92 (14%)	
Ready-to-eat meals	Total	47 (5%)	183 (18%)	318 (31%)	478 (47%)	
	Men	21 (6%)	69 (18%)	131 (35%)	153 (41%)	0.034
	Women	26 (4%)	114 (17%)	187 (27%)	325 (50%)	
Condiments (ketchup, mayonnaise, etc.)	Total	27 (3%)	183 (18%)	327 (32%)	489 (48%)	
	Men	14 (4%)	66 (18%)	130 (35%)	164 (44%)	0.106
	Women	13 (2%)	117 (18%)	127 (30%)	325 (50%)	
Cheese	Total	353 (34%)	314 (31%)	332 (32%)	27 (3%)	
	Men	127 (34%)	117 (31%)	116 (31%)	14 (4%)	0.36
	Women	226 (35%)	197 (30%)	216 (33%)	13 (2%)	
Carbonated drinks (with sugar)	Total	29 (3%)	110 (11%)	211 (21%)	676 (66%)	
	Men	15 (4%)	44 (12%)	81 (22%)	234 (63%)	0.184
	Women	14 (2%)	66 (10%)	130 (20%)	442 (28%)	
Sweet snacks	Total	36 (4%)	147 (14%)	344 (34%)	502 (49%)	
	Men	21 (6%)	58 (16%)	136 (36%)	159 (43%)	0.002
	Women	15 (2%)	89 (13%)	208 (32%)	343 (53%)	
Butter	Total	210 (20%)	426 (42%)	317 (31%)	73 (7%)	
	Men	69 (18%)	164 (44%)	112 (30%)	29 (8%)	0.484
	Women	141 (22%)	262 (40%)	205 (31%)	44 (7%)	
Canned tuna	Total	112 (11%)	263 (26%)	439 (43%)	212 (21%)	
	Men	46 (12%)	101 (27%)	155 (41%)	72 (19%)	0.516
	Women	66 (10%)	162 (25%)	284 (44%)	140 (21%)	
Sugar	Total	220 (21%)	315 (31%)	308 (30%)	183 (18%)	
	Men	97 (26%)	121 (32%)	104 (28%)	52 (14%)	0.007
	Women	123 (19%)	194 (30%)	204 (31%)	131 (20%)	
Yogurt parfaits	Total	105 (10%)	278 (27%)	448 (44%)	195 (19%)	
	Men	48 (13%)	116 (31%)	148 (40%)	62 (17%)	0.01
	Women	57 (9%)	162 (25%)	300 (46%)	133 (20%)	
Energy drinks	Total	20 (2%)	88 (9%)	147 (14%)	771 (75%)	
	Men	12 (3%)	35 (9%)	57 (15%)	270 (72%)	0.101
	Women	8 (1%)	53 (8%)	90 (14%)	501 (77%)	

Table 3. Perceptions of participants regarding the production of ultra-processed foods and their relationship with human health.

	Completely disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Completely agree
	Total sample (n=1,026)				
How much do you agree with the following statements?					
Ultra-processed foods are mainly produced at an industrial level using higher industrial processes	29 (3%)	55 (5%)	165 (16%)	307 (30%)	470 (46%)
Ultra-processed foods are produced at an industrial level as well as at home environment using higher industrial processes	152 (15%)	242 (24%)	322 (31%)	215 (21%)	95 (2%)
Do you believe that the consumption of ultra-processed foods can be harmful to health? Yes (%)	1 (0%)	10 (1%)	85 (8%)	340 (33%)	590 (58%)
Do you believe that the consumption of ultra-processed foods by children can harm their health? Yes (%)	2 (0%)	9 (1%)	84 (8%)	289 (28%)	642 (63%)
	Men (n=374)				
How much do you agree with the following statements?					
Ultra-processed foods are mainly produced at an industrial level using higher industrial processes	14 (4%)	22 (6%)	70 (19%)	111 (29%)	157 (42%)
Ultra-processed foods are produced at an industrial as well as at home environment using higher industrial processes	49 (13%)	90 (24%)	128 (34%)	75 (20%)	32 (9%)
Do you believe that the consumption of ultra-processed foods can be harmful to health? Yes (%)	1 (0%)	5 (1%)	49 (13%)	123 (33%)	196 (52%)
Do you believe that the consumption of ultra-processed foods by children can harm their health? Yes (%)	1 (0%)	4 (1%)	45 (12%)	120 (32%)	204 (55%)
	Women (n=652)				
How much do you agree with the following statements?					
Ultra-processed foods are mainly produced at an industrial level using higher industrial processes	15 (2%)	33 (5%)	95 (15%)	196 (30%)	15 (2%)
Ultra-processed foods are produced at an industrial as well as at home environment using higher industrial processes	103 (16%)	152 (23%)	194 (30%)	140 (21%)	103 (16%)
Do you believe that the consumption of ultra-processed foods can be harmful to health? Yes (%)	0 (0%)	5 (1%)	36 (6%)	217 (33%)	
Do you believe that the consumption of ultra-processed foods by children can harm their health? Yes (%)	1 (0%)	5 (1%)	39 (6%)	169 (26%)	438 (67%)

analysis revealed significant differences between men and women regarding their perceptions about the health effects of ultra-processed foods; specifically, women seem more aware about the unfavorable health consequences of ultra-processed foods consumption on health, as compared to men ($p<0.001$).

Moreover, 8% of the women and 17% of the men participants did not consult food labels when shopping ($p<0.001$). For men the predominant reason that leads them to choose an ultra-processed food was that they taste better (40%), whereas for women the main reason was the minimal effort and preparation required for their consumption (33%). In addition, mood enhancement was a reason for consuming ultra-processed foods (25% of women and 15% of men, $p<0.001$). Aspects like lower price (7%), social influence/peer pressure (5%) and longer shelf life (2%) seemed to have a smaller influence in the decision of consuming ultra-processed foods, both for men and women.

Consumption of ultra-processed foods

In total 29% of the participants consumed ultra-processed foods daily, with the most consumed foods being packaged bread and assorted products (62%), breakfast cereals with sugar (49%) and packaged sweet snacks (48%). No significant differences between men and women regarding overall consumption were observed ($p=0.147$). Good-specific analysis showed that 45% of men compared to 51% of women consumed breakfast cereals ($p=0.017$), 46% of men compared to 26% of women consumed sugar-

carbonated drinks (p<0.001) and 29% of men compared to 19% of women consumed cold cuts of meat (p<0.001). Figure 1 illustrated the distribution of participants' consumption of ultra-processed foods, overall, as well as in men and women separately.

Relationship of ultra-processed food consumption with knowledge and perceptions

An inverse relationship was observed between consumption and knowledge and perceptions' score (b= -0.0074 (standard error: 0.038), p=0.052). When path analysis was applied to further elucidate the relationship (fig. 2), it was revealed that a 10-year difference in age was associated with a 0.9/100 decrease in the knowledge and perception score (95% confidence interval [CI] -1.8/100, -0.1/100) after taking into account age and sex, as well as education and marital status of the participants. Moreover, older participants were less likely to consume various ultra-processed foods, as compared to younger ones (all p-values <0.01).

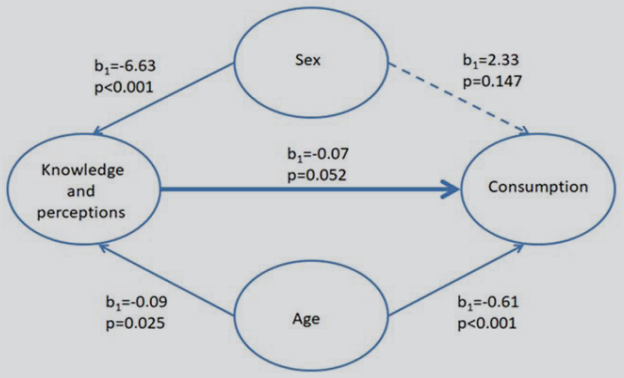

Figure 2. The role of sex and age on the relationship between knowledge and perceptions score and consumption of ultra-processed foods score.

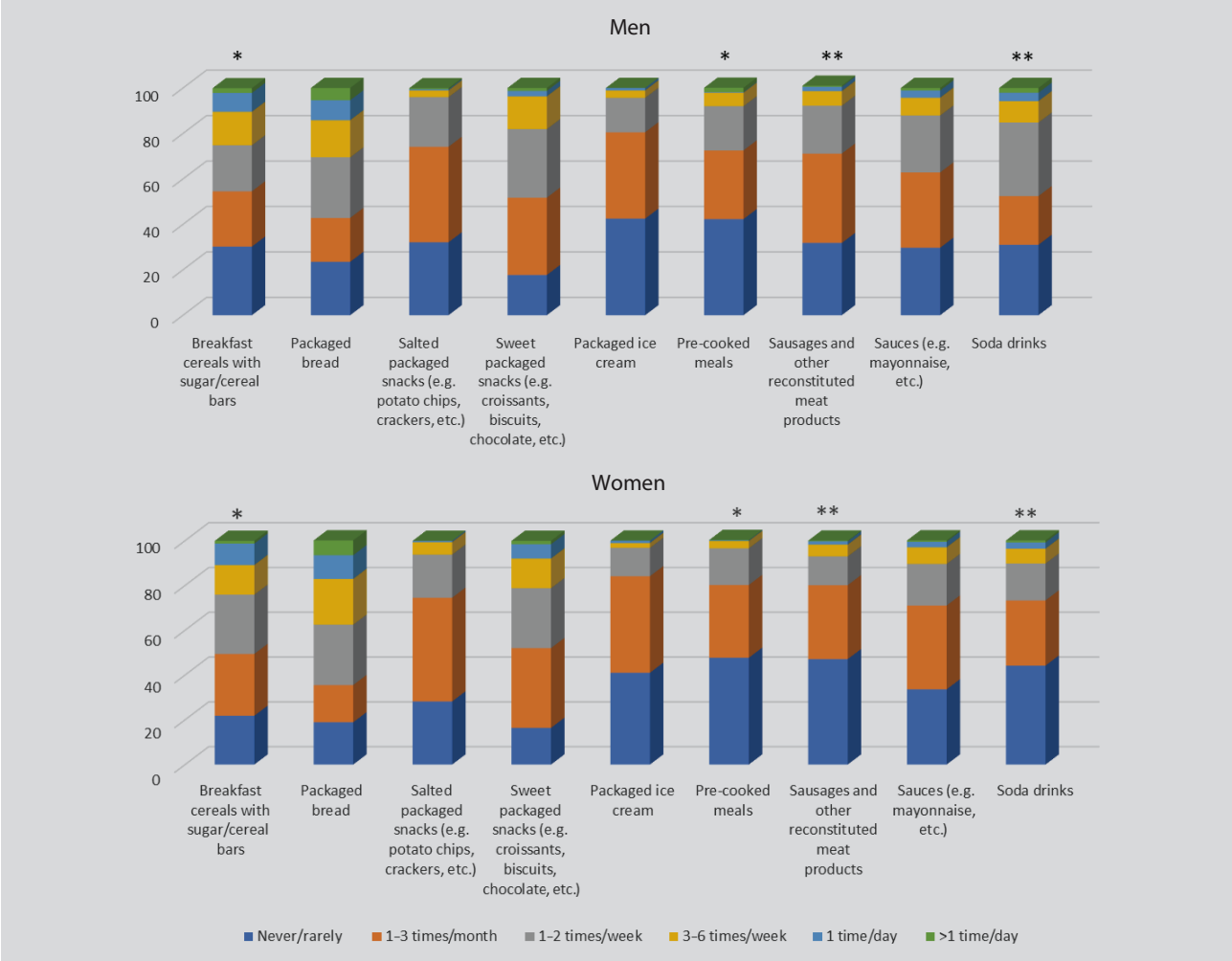

Figure 1. Distribution of the consumption of ultra-processed foods in men and women participants. *p≤0.05, **p<0.001.

DISCUSSION

The aim of the study was to assess the knowledge, perceptions, and consumption regarding ultra-processed foods of the adult Greek population. Specifically, it was found that 40% of the participants have limited to no awareness of the term ultra-processed foods, with men being less aware of the term and its health implications compared to women. Regarding the dietary behaviors, it was observed that approximately one-third of the men and women participants consume ultra-processed foods daily, and with the greatest preference appearing in packaged pastries, sugary breakfast cereals and ready-to-consume sweets snacks. In addition, it emerged that the primary reason men choose ultra-processed foods was their better taste, while for women, was the ease of meal preparation. Lastly, it was noted that people with an elevated level of knowledge regarding ultra-processed foods consumed fewer foods that have undergone extensive industrial processing. Despite the limitations of this observational study, the reported findings set a framework about the knowledge and beliefs about ultra-processed foods of the Greek population that might be taken into consideration for shaping future public health actions.

Recognizing the overreliance on processed foods, the Food and Agriculture Organization of the United Nations (FAO) published a technical report to provide guidance to countries and researchers on how to incorporate information on processed foods into their food consumption studies.[14] In this report, two examples of food classification based on their processing were described: one developed as part of the European Prospective Investigation into Cancer and Nutrition (EPIC) study,[15] and the NOVA classification system, devised by researchers at the University of São Paulo, Brazil.[4] NOVA categorizes foods and food products into four groups according to the nature, extent, and purpose of their industrial processing. Specifically, it classifies all foods and food products into four groups: unprocessed or minimally processed foods, processed culinary ingredients, processed foods, and ultra-processed foods.[6] The term "ultra-processed food" refers to formulations of ingredients, ready-to-consume or ready-to-heat, resulting from a series of industrial processes. Specifically, the initial process enabling the production of ultra-processed foods involves fractionating whole foods into substances that include sugars, oils and fats, proteins, starches, and fiber. Subsequently, some of these substances are then subjected to hydrolysis or hydrogenation or other chemical modifications, culminating in the assembly of both unmodified and modified food substances using industrial techniques, such as extrusion, casting and pre-frying. Often, additives such as colors, flavor enhancers, emulsifiers, thickeners, and aerators are used in the final processing stage to confer sensory properties that are particularly appealing to consumers. Ultra-processed foods encompass savory and sweet packaged snacks, mass-produced packaged bread, packaged cookies, cake mixes, margarine and the like, sugary breakfast cereals, fruit yogurts, and ready-to-consume sauces. Energy drinks, carbonated beverages, and packaged beverages such as "fruit" drinks, "cocoa" drinks and milk drinks also fall into the same category. The aforementioned products share common features, including low cost, extended shelf life, convenience, hyper-palatability and aggressive marketing, all contributing to their competitive advantage in the food market and consequently leading to an increasing consumption trend. Ultra-processed foods represent a percentage of 57% of the daily energy intake in adults in the United States,[16] while recent studies indicate that in Europe, the proportion of energy intake derived from these foods ranges from 14% to 44%, with the highest consumption in the Netherlands and Germany, and the lowest in Italy.[17] The nature of the processes used in the production of ultra-processed foods, as well as the nutritional profile of the included ingredients, inherently render them unhealthy.[5] In particular, the World Health Organization (WHO) confirms that adopting a dietary pattern high in ultra-processed foods deviates to a significant extent from the guidelines for following a healthy diet,[18] leading to an increased risk of developing various non-communicable diseases, including obesity, cardiovascular diseases, metabolic syndrome, cancer, depression, gastrointestinal disorders, frailty and premature mortality.[19]

Despite the number of initiatives that have been implemented aiming at nutrition education, it remains noteworthy that there is a limited number of studies that evaluate the nutrition knowledge of the general population and its correlation with dietary intake. However, it appears that the contribution of nutrition knowledge to the overall quality of dietary intake is complex as it is influenced by the interaction of various demographic and environmental factors.[20] The individual cognitive process of managing and interpreting nutrition information is influenced by objective knowledge (i.e., information solely derived from scientific sources) and subjective knowledge which arises when people inaccurately perceive the level of their cognitive abilities, resulting in the frequent adoption of erroneous perceptions concerning nutrition. Studies investigating the impact of knowledge on food choices and consumption habits have demonstrated that subjective knowledge exerts a stronger influence compared to objective knowledge.

Nutrition knowledge has been confirmed to have a positive effect on the adherence to healthy dietary behaviors by contributing to better compliance with recommendations, especially regarding selected food groups such as fruits, vegetables and fats. Factors that significantly influence nutrition knowledge include age, sex, education level and socioeconomic profile of the individual. Notably, women tend to have higher levels of nutrition knowledge than men, a fact attributed to their dominant role in meal preparation and planning, or the comparatively lower engagement of men with nutrition. In addition, an increased level of nutrition knowledge has been observed in people with higher education and elevated socioeconomic standing, while at the same time middle-aged individuals have shown better knowledge levels concerning nutrition in comparison to younger individuals and the elderly.[13] Over time, the scientific community has come to a consensus in replacing the term nutrition knowledge with "nutrition literacy" which is defined as "the extent to which individuals have the ability to acquire, process and understand the nutrition information and skills needed to make appropriate nutrition decisions".[21] Finally, regarding the investigation of perceptions related to the role of a balanced diet, significant gender differences have also been observed, with women exhibiting a better understanding of the adverse health effects that low-nutrient foods can have.[22]

Dietary habits constitute a cornerstone of human health, providing fundamental structural elements for the development and maintenance of a healthy state throughout an individual's lifespan. However, the fast-paced rhythms of daily life and the easy accessibility of energy-rich foods with low nutrient content act as reinforcing factors in adopting an unhealthy dietary pattern.[23] Long-term adherence to a low-quality diet contributes to the occurrence of non-communicable diseases such as cardiovascular diseases, cancer, chronic respiratory diseases, diabetes mellitus, obesity, and cognitive impairment.[24] Over the past decade, there has been intense scientific interest regarding the industrial processing of food and its adverse consequences on health. In contrast, limited literature exists concerning consumers' knowledge and perceptions regarding ultra-processed foods and their ability to discern the degree of industrial processing of a product. In particular, within a study conducted across three countries (Italy, Netherlands, Brazil), it was found that the majority of consumers were unfamiliar with the NOVA classification system but were better acquainted with the term ultra-processed food. Simultaneously, most of the participants assessed ultra-processed foods as "unhealthy" and a significant part of them agreed that their consumption contributes to the gradual increase in body weight. Moreover, the same study indicated that Brazilian consumers exhibited a greater understanding of the NOVA classification and were more aware of the health implications of ultra-processed foods, compared to Dutch and Italian consumers. This particular finding is attributed to the incorporation of the dietary recommendation advocating for a preference for minimally processed foods and avoidance of ultra-processed ones in the Brazilian dietary guidelines, in contrast to the dietary guidelines of the European countries of the study, which do not make any reference to industrial processing.[25] In a similar research carried out in Uruguay with 2,183 participants, it was found that the majority of them correctly identified ultra-processed foods as products of high industrial processing, often containing additives and other artificial ingredients, thereby underscoring their limited nutritional value.[26] Furthermore, in a study that investigated the cognitive level of French dietitians and nutrition students regarding ultra-processed foods, they appeared to have inadequate knowledge of the NOVA food classification system.[27] Similar results were presented in a study involving nutrition professionals of different nationalities who, despite recommending restricted consumption of ultra-processed foods, did not appear familiar with the NOVA classification system. A significant finding of the aforementioned study is the dietitians' inability to accurately classify packaged and ready-to-consume whole grain products as ultra-processed food, due to their oversight of the disparity between the advantages of consuming whole grains cereals and the disadvantages of the high degree of processing, defined by NOVA.[28]

The interpretation of the findings of the current study should consider its limitations. In particular, as this is a cross-sectional epidemiological study, our results cannot establish a causal relationship between the consumption of ultra-processed foods and the knowledge and perceptions of the respondents concerning them. Furthermore, the study employed a convenient sampling method rather than random stratified sampling, which limits the generalization to the entire Greek population. At the same time, stratification based on various socio-demographic characteristics (sex, age distribution, marital status, educational level, place of residence) was not achieved, potentially compromising the representative nature of the statistical analysis of the sample for the referent population. Additionally, participants' income and employment sector were not examined due to the sensitive nature of the content of these questions. Finally, the research was based on self-reported data which may deviate from reality, as respondents may be subject to underestimation or overestimation errors in reporting their anthropometric characteristics and dietary behaviors.

In conclusion, the presented findings revealed that a significant portion of the adult Greek population lacks knowledge and has limited awareness of the dietary profile of ultra-processed foods and their health consequences. At the same time, a significant part of the studied sample consumes at least one ultra-processed food on a daily basis. Therefore, there is an urgent need for the development of public health campaigns and policy initiatives aimed at providing proper nutrition education on a national and international scale. It is imperative to enhance the production process and improve the economic affordability of minimally processed or unprocessed foods within the framework of the global food market.

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ΠΕΡΙΛΗΨΗ

Γνώσεις, αντιλήψεις και κατανάλωση υπερ-επεξεργασμένων τροφίμων στον ελληνικό πληθυσμό: Συγχρονική επιδημιολογική μελέτη

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ΣΚΟΠΟΣ Η αξιολόγηση των γνώσεων, των αντιλήψεων και της συχνότητας κατανάλωσης υπερ-επεξεργασμένων τροφίμων από τον ελληνικό πληθυσμό. **ΥΛΙΚΟ-ΜΕΘΟΔΟΣ** Συγχρονική επιδημιολογική μελέτη, που διεξήχθη μέσω τυποποιημένου, διαδικτυακού και αυτοσυμπληρούμενου ερωτηματολογίου και βολική δειγματοληψία, σε 374 άνδρες μέσης ηλικίας (τυπική απόκλιση, ΤΑ) 34 (15) ετών και 652 γυναίκες 35 (14) ετών, από όλες τις περιφέρειες της Ελλάδας, τον Μάιο του 2023. Η κατηγοριοποίηση των υπερ-επεξεργασμένων τροφίμων έγινε με βάση το σύστημα ταξινόμησης NOVA. Για την αξιολόγηση των γνώσεων και των αντιλήψεων χρησιμοποιήθηκαν 16 ερωτήσεις, βάσει των οποίων δημιουργήθηκε ένας δείκτης συνολικής αποτίμησης αυτών, εύρους πιθανών τιμών 0–100. Για την αξιολόγηση της κατανάλωσης χρησιμοποιήθηκε ένα σύντομο ερωτηματολόγιο συχνότητας κατανάλωσης τροφίμων. **ΑΠΟΤΕΛΕΣΜΑΤΑ** Το 29% των ατόμων του δείγματος δήλωσαν καθημερινή κατανάλωση υπερ-επεξεργασμένων τροφίμων. Σε εβδομαδιαία βάση, τα υπερ-επεξεργασμένα τρόφιμα με τη μεγαλύτερη κατανάλωση ήταν τα συσκευασμένα αρτοσκευάσματα (62% του δείγματος), τα δημητριακά πρωινού και οι μπάρες δημητριακών με ζάχαρη (49%), καθώς και τα συσκευασμένα γλυκά (48%). Σχετικά με τις γνώσεις και τις αντιλήψεις, το 40% των συμμετεχόντων δήλωσαν ότι δεν γνώριζαν/γνώριζαν ελάχιστα τον όρο υπερ-επεξεργασμένα τρόφιμα. Η μέση τιμή (ΤΑ) του δείκτη γνώσεων και αντιλήψεων στο σύνολο του δείγματος ήταν 63/100 (19). Παρατηρήθηκε αντίστροφη σχέση μεταξύ του δείκτη γνώσεων και αντιλήψεων και του δείκτη συνολικής κατανάλωσης υπερ-επεξεργασμένων τροφίμων (p=0,05). **ΣΥΜΠΕΡΑΣΜΑΤΑ** Η παρούσα έρευνα ανέδειξε ένα μέτριο επίπεδο γνώσεων παράλληλα με μια αυξημένη κατανάλωση υπερ-επεξεργασμένων τροφίμων στον ελληνικό πληθυσμό. Είναι λοιπόν επιτακτική η συνεργασία των υγειονομικών λειτουργών (ιατρών, διαιτολόγων) με σκοπό την ευαισθητοποίηση του πληθυσμού και την καθοδήγηση αυτού προς υγιεινότερες διατροφικές επιλογές.

Λέξεις ευρετηρίου: Αντίληψη, Γνώση, Κατανάλωση, Διατροφή, Υπερ-επεξεργασμένα τρόφιμα

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