Original Research Article
Consumers' level of awareness and safety perceptions of food additives

ABSTRACT

Aims: We aimed to measure the prevalence of Jeddah residents' knowledge and their awareness of these ingredients.
Study design: A cross-sectional study.
Place and Duration of Study: The study conducted in Jeddah, Saudi Arabia, during 2019.
Methodology: This study was cross-sectional via an electronic survey that was handed out, and 676 of 868 respondents fit the inclusion criteria: all individuals were eighteen and above in addition to residing in Jeddah in 2019. Data were entered using Excel, and a statistical analysis was performed using SPSS version 21. Pearson's chi-square was used to test association.
Results: The results showed that 63.5% of consumers needed more information about food additives. About 80.5% were familiar with preservatives which, in their opinion, were the most disconcerting food additives. Moreover, 37.2% desired easier and accurate labels to gain a better understanding of this topic, while 43.6% said that the most acceptable idea for disseminating information about food additives to the public was by animation in independent display areas.
Conclusion: The study's findings are examined in terms of the implications for future research and for the development of concrete communication materials to improve food additive awareness in Jeddah, Saudi Arabia. The level of knowledge was low, but it seems to be increasing. Further studies are needed to be done in Saudi Arabia about this topic.

Keywords: Consumers' level of awareness, consumers' safety perceptions food additives, Jeddah, Saudi Arabia.

1. INTRODUCTION

Food additives are chemical ingredients that can occur naturally or artificially. They are added to food as a marketing it by enhancing the flavor or appearance or are used as protection to delay rotting and expiration[1].

These additives are convenient and easily accessible but may cause side effects, food allergies, increased wa decreased absorption of minerals and vitamins, cancer, and more issues. Young people suffer the most because t exposed to these chemicals from infancy [2].

Processed food has markedly increased in its manufacturing and consumption rate over the years, and many fact affect food-related problems, such as gender, income rate, education, and age[3].

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Usually, ordinary consumers do not pay attention to the food additives information and warnings on packages. An essential factor of this phenomena is the lack of knowledge about preservatives' importance and effects, although some researches have shown that consumers want to be better informed about the effects of additives[4].

The use of food additives to hide food deterioration or spoilage or to cheat consumers is expressly forbidden by regulations governing the use of these items in foods. Moreover, food additives usage is stifled where comparable influences can be obtained by economic, good industry practices[5].

The most important element in processed foods production is the consumer, including which products and services are produced to satisfy the consumer's needs. Thus, consumers' decisions to purchase or reject a product is an essential factor[6].

Food additives health-related should be minimized. Also, food manufacturers must pay attention by checking food quality before offering it for sale, and consumers should be educated about food additives[7].

A previous study in South Korea in 2011 measured the public awareness of food additives with a participation rate of 94%, as 430 of 470 consumers responded. According to their answers, one of the main reasons for consuming processed food was its flavor[1]. In a study that took place at the University of Mauritius campus in 2014, 180 participants were interviewed, and it was found that 65% never checked food additives labels[3].

A point worth mentioning is that, when customers become more aware of the impact of certain items on health issues, they will want to make intellectual food choices.

There are no studies on this topic in our local Middle East area, especially in Saudi Arabia, but it is necessary for each country to pay attention because of the magnitude of health impacts caused by food additives. We aim to investigate the prevalence of consumers' awareness and their knowledge about food additives in Jeddah, Saudi Arabia, in 2019.

2. MATERIAL AND METHODS

A cross-sectional study was conducted in Jeddah, Saudi Arabia, during June 2019. The study was under the supervision of the Physiology Department and was approved by the Institutional Review Board (IRB) of King Abdul-Aziz University Hospital (KAUH). A sample size of 385 study subjects was calculated using a confidence level of 95% and a margin error of 5% and was conducted by an online questionnaire[1].

We calculated 676 out of 868 participants to decrease the margin of error.

The participants included Jeddah residents and excluded individuals under 18 years and who were visitors not permanently living in Jeddah. The following data were extracted from the survey: demographic data (age, education status, sectoral distribution, gender), whether participants had a habit of reading food labels, and whether they could understand the food additives information on the labels. Questions regarding the awareness of food additives included the following:

whether it is safe to buy processed foods containing food additives, the reason behind using food additives, the most known food additives, the participant's opinion on why the food additives information is inadequate, and what essential information about food additives should be given to the public.

The answers were in the form of options (usage purpose, contents of food additives, or information of harmless ratio), including from which source they get food additives information.

To find consumers' awareness and safety perceptions of food additives and processed food, the following questions about safety perceptions were included: whether participants suspect that legally permitted food additives are not safe and why, and their expectations of the government regarding food additives (controlling the ratio of additives in food, reducing the ratio of understandable labels, or including the most important information about food additives on the label). Data entry was done using Microsoft Excel 2016, and a statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 21.

3. RESULTS AND DISCUSSION

A statistical description of the respondents' demographic data is as follows. For gender, approximately 78.8% were female, and 21.2% were male. For age, 73.5% were younger than 30, 10.5% were in their 30s, 9.5% were in their 40s,

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5.8% were in their 50s, and 0.7% were older than 60. For social status, 69.5% were single, 27.4% were married, 1.9% were divorced, and 1.2% responded as other. In terms of household income, 20.3% earned less than 5,000 SAR, 10.7% earned between 5,001 and 7,000 SAR, 13.2% earned between 7,001 and 10,000 SAR, 16.7% earned between 10,001 and 15,0000 SAR, and 39.3% earned over 15,000 SAR. Slightly more than half of the respondents (54.4%) had a bachelor's degree, followed by secondary school (32.1%). About 85.2% were Saudi, and 14.8% were non-Saudi.

In terms of frequently purchased food, dairy products ranked the highest at 76.5%, followed by snacks such as chips at 70.9%, and the lowest was flavoring agents at 25.3%.

Table (1) Demographic data and general information

	Number of Survey respondents	**% of Survey respondents**
Are you over 18 years old?	Yes: 676	Yes: 100%
Do you live in Jeddah?	Yes: 676	Yes: 100%
Gender	Female: 533 Male: 143	Female: 78.8% Male: 21.2%
Social status	Single: 470 Married: 185 Divorced: 13 Other: 8	Single: 69.5% Married: 27.4% Divorced: 1.9% Other: 1.2%
Age	Less than 29.99: 497 Less than 39.99: 71 40–49.99: 64 50–59.99:39 Greater than 60: 5	Less than 29.99: 73.5% Less than 39.99: 10.5% 40–49.99: 9.5% 50–59.99: 5.8% Greater than 60: 0.7%
Family income	Less than 5,000 SR: 137 5,001–7,000 SR: 72 7,001–10,000 SR: 89 10,001–15,000 SR: 113 15,000+ SR: 265	Less than 5,000 SR: 20.3% 5,001–7,000 SR: 10.7% 7,001–10,000 SR: 13.2% 10,001–15,000 SR: 16.7% 15,000+ SR: 39.2%
Educational attainment	Illiterate: 2 Elementary: 3 Intermediate: 5 Secondary school: 217 Diploma: 28	Illiterate : 3% Elementary: 4% Intermediate: 7% Secondary school: 32.1% Diploma: 4.1%

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	Bachelor's degree: 368 Master's degree: 29 Doctorate: 24			Bachelor's degree: 54.4% Master's degree: 4.3% Doctorate: 3.6%		
Nationality	Saudi: 576 Non-Saudi: 100			Saudi: 85.2 Non-Saudi: 14.8%		
Types of frequently purchased processed foods		Yes	No		Yes	No
	Snacks	479	197	Snacks	70.9%	29.1%
	Sugars	420	256	Sugars	62.1%	37.9%
	Meat	451	225	Meat	66.7%	33.3%
	Fish	289	387	Fish	42.8%	57.2%
	Noodles	334	342	Noodles	49.4%	50.6%
	Beverage	465	211	Beverage	68.8%	31.2%
	Dairy products	517	159	Dairy products	76.5%	23.5%
	Frozen foods	28	393	Frozen foods	41.9%	58.1%
	Flavoring agent	171	505	Flavoring agent	25.3%	74.7%
Frequency of purchasing processed foods	Daily: 75 2–3 times a week: 194 Weekly: 170 Every three weeks: 70 Monthly: 86 Every three months: 37			Daily: 11.12% 2–3 times a week: 28.7% Weekly: 25.1% Every three weeks: 10.4% Monthly: 12.7% Every three months: 5.5%		
Retail shop of preference for obtaining processed foods	Supermarkets: 514 Grocery stores: 93 Convenience stores: 69			Supermarkets: 76% Grocery stores: 13.8% Convenience stores: 10.2%		
		Yes	No		Yes	No
Vital facet when purchasing processed foods in your viewpoint	Nutritional value	385	290	Nutritional value	57.0%	42.9%
	Taste	640	36	Taste	94.7%	5.3%
	Price	505	171	Price	74.7%	25.3%
	Convenience	471	205	Convenience	69.7%	30.3%
	Brand of company	424	252	Brand of company	62.7%	37.3%

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	Others:	136	513	Others	24.1%	75.9%

About 45.1% of the participants believed that the reason behind using food additives was to extend the shelf life of processed foods. Even though 62.7% of the participants answered “Maybe,” 24.4% thought food additives were not safe. More than half thought they lacked sufficient knowledge of food additives. Most respondents (42.2%) selected the Internet as the most effective medium for transmitting information on food additives, whereas 22.6% chose product packages.

We asked the population about important food additives information. The highest results were 28.4% for the types of foods containing food additives and 21.7% for intake guides, while the lowest result of 13.8% was for labeling standards. Of the participants, 28.7% purchased processed food two to three times a week. The majority (76%) responded that they preferred buying their food from supermarkets.

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Food preservatives (80.5%) were the most common food additives the participants were aware of, as they were found to be the most worrisome in processed food (37.4%), while 24.9% reported that colorants were more concerning, When asked about participants’ behavior toward food preservatives and whether they would still use preservatives in the future, 60.7% answered “Sometimes” while only 26.8% responded with “No.” Further, 66.4% reported that they would consider purchasing an acceptable daily intake of preservatives. The highest vital facets when purchasing processed foods were taste (94.7%), price (74.7%), nutritional value (57%), and “others” (24.1%).

Moreover, 37.9% of consumers stated that their primary need from the government was easy and accurate labels, and 73.2% will use information if it is provided in the store,

Table (2) Awareness level of food additives

		Yes	No		Yes	No
Food additives that you are aware of	Artificial sweeteners	478	198	Artificial sweeteners	70.7%	29.3%
	Colorants	508	168	Colorants	75.1%	24.9%
	A bleaching agent	487	189	A bleaching agent	72.0%	28.0%
	Antioxidants	251	425	Antioxidants	37.1%	62.9%
	Preservatives	544	132	Preservatives	80.5%	19.5%
	Flavoring agent	532	144	Flavoring agent	78.7%	21.3%
	Others	192	484	Others	28.4%	71.6%
Most disconcerting food additives	Artificial sweeteners : 102 Preservatives: 253 Colorants: 186 Antioxidants: 66 Bleaching agents: 19 Flavoring: 36			Artificial sweeteners : 15.1% Preservatives: 37.4% Colorants: 24.9% Antioxidants: 9.8% Bleaching agents: 2.8% Flavoring: 3.5%		

	Others: 32			Others: 4.7%		
The reason behind using food additives in processed foods	To enhance the taste or flavor: 277 To enhance the color or shape of the food: 58 To extend the shelf life of processed foods: 305 To supplement insufficient nutrients in the food: 36			To enhance the taste or flavor: 41.0% To enhance the color or shape of the food: 8.6% To extend the shelf life of processed foods: 45.1% To supplement insufficient nutrients in the food: 5.3%		
Do you think food additives approved by the government are safe?	Yes: 87 No: 165 Maybe: 424			Yes: 12.9% No: 24.4% Maybe: 62.7%		
Do you think you have sufficient knowledge of food additives?	Yes: 45 No: 429 Maybe: 202			Yes: 6.7% No: 63.5% Maybe: 29.9%		
Why do you think the information on food additives is insufficient?		Yes	No		Yes	No
	Insufficient labeling	392	284	Insufficient labeling	58%	42%
	Difficulties understanding the subject of food additives	233	443	Difficulties in understanding the subject of food additives	34.5%	65.5%
	Not necessary			Not necessary		
	Others	631	45	Others	93.3%	6.7%
		605	71		89.5%	10.5%
Effective mediums to transmit information	Mass media: 108 Internet: 285 Friends/family/colleagues: 40 Advertisement & poster in store: 64 Package of processed foods: 153 Book or booklet: 15 Others: 11			Mass media: 16.0% Internet: 42.2% Friends/family/colleagues: 5.9% Advertisement & poster in store: 9.5% Package of processed foods: 22.6% Book or booklet: 2.2% Others: 1.6%		
Information needs on food additives	Types of foods containing food additives: 192 Intake guide for food additives: 147 Labeling standards for food additives: 93 Usage purpose of food additives: 111 Content/amount of food additives: 133			Types of foods containing food additives: 28.4% Intake guide for food additives: 21.7% Labeling standards for food additives: 13.8% Usage purpose of food additives: 16.4% Content/amount of food additives:19.7%		

Consumer needs from the government regarding food additives	Easy and accurate label: 256 Reduce the use of food additives: 188 Education and public relations: 50 Stronger legal regulations and standards for food additives: 182	Easy and accurate label: 37.9% Reduce the use of food additives: 27.8% Education and public relations: 7.4% Stronger legal regulations and standards for food additives: 26.9%
Would you use information if it is provided in the store?	Yes: 495 No: 34 Maybe: 147	Yes: 73.2% No: 5.0% Maybe: 21.7%

Thirds of the consumers 34.6% chose independent display areas as the best places to present the information, with 10.8% preferring the events section, and 34.6% choosing posters as the desired method. Of all participants, 62.0% admit that they will check the information labels.

Table (3): Safety perceptions of food additives

A place to receive information on food additives	The entrance of the store: 189 Independent display area: 234 Cashier counter: 98 Event section: 73 Others: 82	The entrance of the store: 28% Independent display area: 34.6% Cashier counter: 14.5% Event section: 10.8% Others: 12.1%
A preferred method for receiving information on food additives	Small booklet (pamphlet, leaflet): 120 Salesperson: 50 Animation: 215 Poster: 234 Others: 57	Small booklet (pamphlet, leaflet): 17.8% Salesperson: 7.4% Animation: 31.8% Poster: 34.6% Others: 8.7%
In the future, I will check the information label for food additives when I purchase processed food	Yes: 419 No: 28 Maybe: 229	Yes: 62% No: 4.1% Maybe: 33.9%
In the future, I will purchase processed foods containing preservatives	Yes: 85 No: 181 Maybe: 410	Yes: 12.6% No: 26.8% Maybe: 60.7%

In the future, I will consider acceptable daily intakes of preservatives when I purchase processed foods	Yes: 449 No: 50 Maybe: 177	Yes: 66.4% No: 7.4% Maybe:26.2%

In this study, we aimed to measure the prevalence of consumers' knowledge and their awareness about food additives. Of the participants, 78.8% were female because the data collection area included many more females than males, in addition to females being more cooperative in filling out the surveys and their interest in the food additives subject. This is a similar result to Dr. Serap Kayışoğlu's study[8].

We found a significant relationship between "Marital status and frequency of purchasing processed food," whereby single people (22.6%) usually purchase small amounts of processed food (2–3 days' worth) rather than a larger amount that can be consumed over a longer period, for example, a month (p = 0.001).

We found an association between family income and the frequency of purchasing processed food, with 10.5% of high-income participants that make over 15,000 SAR per month buying food additives twice or thrice per week. Their financial stability leads to the overconsumption of processed food, whether it was used for essential nourishment or self-indulgence (p = 0.470). Participants who mainly had a high-income rate (39.2%) stated that their family income was over 15,000 SAR per month. Further, 76% of participants with different family income rates chose supermarkets, which can be a little costlier, as their preferred processed food shopping site but trade in trustworthy products more than grocery and convenience stores (p = 0.331). These results are similar to a study in Western Europe that stated a higher future income would reduce consumer price sensitivity[9].

Most of our respondents were Saudi (85.2%), and their most frequently purchased food was dairy products (64.2%). Since dairy products have a short expiration date, they must be bought frequently. Also, in the Arabian culture, dairy products are everyday essentials for making different types of food (p = 0.079).

According to the survey's results about participants' knowledge of food additives, 80.5% responded with "Yes" they were familiar with food preservatives, 78.7% with flavoring agents, 75.1% with colorants, 72% with bleaching agents, and 70.7% with artificial sweeteners. Food preservatives ranked as the most known and worrisome food additive subtype (31.1%, p = 0.264), and 93.3% of participants chose to justify their lack of knowledge of other food additives because they found them unnecessary. Further, 60.7% of respondents said they will sometimes purchase preservatives in the future (p = 0.039), while 66.4% want to keep their intake level of food additives within an acceptable daily range.

Of the participants, 12.4% who knew about artificial sweeteners were concerned about the possibility of their children getting certain diseases, such as obesity, diabetes, and dental caries (p = 0.009). C Brockman's study showed consumer requirements for reducing the additives in food products by removing artificial colors, flavors, and preservatives in many meals to obtain clean-label products[10].

The most preferred method of receiving food additives information for bachelor's degree holders were posters (19.5%). Academically advanced individuals have most likely acquired the habit of reading information and possibly even made posters during their academic years, so they are more familiar with them, while people with lower educational levels may not be as interested in posters and might prefer animation or other visually clear and more uncomplicated methods (p = .000), Almost all generations agreed that the most effective way to transmit information was via the Internet (42.2%), and they selected it over mass media, social relations, poster advertisement, packages, and books or booklets. Up to 70% of the participants were from age group 1 (29 years and less), and 34.6% preferred the Internet (p = 0.00). Although individuals with higher educational attainments (12.9%) had a different opinion of using packages of processed food as an alternate method, due to such qualities as easy accessibility and packages being an ultimate source of information (p = 0.015), the most accepted idea of presenting food additives information was an animation used in independent display areas (10.8%) due to its visual clarity and understandability, which facilitate the information reaching various age groups (p = 0.00).

Of the respondents, 94.7% picked "taste or flavor" as their first vital facet, while nutritional value (57%) was their last choice. This explains the fact that they will purchase more food preservatives (p = 0.009). The spread of processed food and its easy accessibility over that of a healthy nutritious meal was a high factor occupying consumer attention, as 54% of participants think of food additives as convenience products they will purchase in the future (p = 0.014).

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We found that 62.7% of participants are not entirely sure that food additives—which are approved by the Saudi Food and Drug Authority—are safe. A similar percentage said they would continue to purchase additives. Therefore, there should be an increase in the government's care toward educating the public on such substances (p = 0.009). More than half the participants (63.8%) wanted simpler, accurate labels that can be easily understood. It showed that the public wants to increase their knowledge about additives and the food components they eat (p = 0.003). "Types of food items that contain food additives" was the highest choice for consumers needing information, while labeling standards was the lowest, which indicates a difficulty in understanding them. Therefore, consumers tend to choose types of food that contain these substances instead of recognizing them on hard-to-understand labels. Only 11.8% realize that the most important demand of the government is to provide smooth and accurate labels, as mentioned before (p = 0.108).

A total of 62% of participants plan to read food labels. While 63.5% of the sample thought they did not have enough information about food additives, only 36.8% are willing to check and read nutritional labels in the future (p = 0.016).

A limitation of this study is that it is a cross-sectional design that utilized a self-administered survey questionnaire, so we recommend using interview methods instead.

4. CONCLUSION

This study aims to measure the prevalence of consumers' awareness, purchasing methods, information needs, and behavior toward processed food among Jeddah residents over eighteen years old. We found that participants will check labels in the future and keep their additives in check, as most were aware and concerned about preservatives. The consumers' behavior will not change if they are not more aware of food additives, so we must establish companies to disseminate information to the general public and to raise awareness using independent display areas to present more information. This study opens doors for further similar Saudi studies.

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CONSENT (WHERE EVER APPLICABLE)

All authors declare that 'written informed consent was obtained from the partecipants for publication of this study. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal."

ETHICAL APPROVAL (WHERE EVER APPLICABLE)

All authors hereby declare that the study was approved by the ethical committee, faculty of medicine, King Abdulaziz University, Jeddah , Saudi Arabia, the IRB is (Reference No 364-19)

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