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# Determining the Knowledge Level of Students on Food Additives

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## Abstract

**BACKGROUND/AIMS:** Food additives are substances which are not consumed as a food alone, having no nutritious value, and they are not used as a characteristic component of any food. This study aimed to determine the knowledge level of students on food additives.

**MATERIALS AND METHODS:** This descriptive study was carried out between the 20th and the 30th of May 2019. 363 voluntary students at the Faculty of Nursing and Dentistry participated in this study. They were asked questions on their knowledge about packaged processed foods, whether they have information on the nature of additives, their sources on obtaining information related to additives, and for what purpose additives are used.

**RESULTS:** 38.9% of the students stated that they consumed packaged processed food every day, 41.6% for nourishment, and 43.5% due to its pleasant taste. 23.4% of the students indicated that they consumed all types of packaged food, 55.9% of them cared about the brand when buying it and 63.4% of them were affected by the taste and smell while buying these food items. In addition, 47.7% of the students stated that they did not care about food ingredients when buying packaged processed food and 46% of them did not have any information on the additive content of packaged processed food.

**CONCLUSION:** It is considered that the knowledge level of students on food additives is insufficient, and thus, they should be informed. Governments and universities should alleviate food safety-related fears on time and appropriately, and ensure the food safety of consumers by explaining the necessary information in a timely and understandable way.

**Keywords:** Food additives, nutrition, food, student

## INTRODUCTION

Food additives are substances which are not consumed as a food alone having no nutritious value and they are not used as a characteristic component of any food. They or their by-products are expected to become an ingredient of that food directly or indirectly as a result of being added to food during the production, handling, processing, preparation, packaging, transportation or storage in line with a technological purpose.[1-3]

The number and types of additives used in prepared foods have increased rapidly in parallel with rapid developments in the food industry and prepared food production.[2] Additives are chemical compounds without any nutritional value bringing the appearance and taste of foods in line with the demands by society, being put into foods during production in order to prevent adulteration and to allow for storage for a longer time. The benefits of these chemical substances when they are put in food are as follows:[3-6]

- allow food to have a longer life,

- make foods have better tastes, flavours and smells,

- correct their shapes and colours,

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- allow foods to have a better appearance.

- protect their quality and stiffness,

- prevent the formation of microorganisms causing disease,

- help to protect nutritional and biological values.

However, when these chemical substances are consumed particularly on a regular basis and excessively, the following results may occur:

- can spoil the natural flavour of the food,

- nutritional elements are at risk of being lost,

- if their shelf lives are not adhered to, they have the risk of poisoning the food.

Today, there are more than 10,000 additives approved by the U.S. Food and Drug Administration (FDA) for the purposes of preserving, packaging and changing tastes, appearances, tissues or nutrition in food. Increasing scientific evidence has shown that of the synthetic chemicals used as a food additive, the ones put into food directly for various reasons during processing and the ones used later in order to extend the shelf-life have negative effects on human health, especially children.[1,7] While some of these substances allowed by responsible organisations do not cause any problems regarding health, some may lead to serious dangers if they are consumed continuously.[8] Many effects such as food allergies, food intolerance, cancer, multiple sclerosis, attention deficit hyperactivity disorder, brain damage, nausea, and heart disease were reported in a review article examining studies on the effects of food additives and preservatives on human health.[9] For example; artificial colouring agents or sodium benzoate preservatives (or both of them) cause an increase in hyperactivity in the whole population and in children in 3, 8/9 years old.[10]

In the event that the food with additives is consumed excessively, a person may develop diseases such as skin rash, asthma, obesity, metabolic syndrome, liver function impairment, and even cancer.[4,5] The substances added in order to increase the nutritional value of prepared food or for fraudulent purposes are not included in this group.[3]

The size of this threat is increasing, especially for children.[6,7] Considering the above-mentioned reasons, we aimed to investigate the knowledge of our students and to create an awareness in society and among our students regarding these substances which are not natural and are added with commercial goals in mind. The goal of this study was to determine the knowledge of students on food additives. Students studying in health-related departments have social responsibilities. They are guides for society in the protection and promotion of health. This research was carried out in order to determine the knowledge level and awareness of students at Near East University Faculty of Nursing and Dentistry about the use of additives in processed food.

This study aimed to determine the knowledge level of students on food additives.

## MATERIALS AND METHODS

This study, which was designed as a descriptive study, was carried out with the students of a nursing and dentistry faculty in Turkish Republic of Northern Cyprus in the spring semester of the 2018-2019 academic year. The sample of the research was determined to include the universe and an attempt was made to reach all 490 senior students registered to the Nursing and Dentistry faculties in that semester. A total of 363 students who agreed to participate in this research and completed the questionnaires were included in the study. Approximately 74% of the universe was reached.

The students were asked questions on their knowledge about packaged processed food, whether they had any information on the nature of additives, their sources of obtaining information related to additives, and for what purposes additives are used.

Demographic information was obtained in the first part of a questionnaire form, created by searching the related literature,[2-10] and in the second part, students were asked about their packaged food consumption and what additives were, the purpose of putting additives into food and thus, it was attempted to determine their knowledge levels. In the third part, they were asked about the intended use of additives in the mixture forming the prepared food, and it was investigated to what extent they had correct information on additives.

### Ethical Considerations

Ethics committee approval was received for this study from the Near East University Ethics Review Board (appoval number: 2019-68-815). The purpose and method of this research and questionnaires were explained to the students, and their consent was obtained after notifying them that their participation in the research was voluntary. Permission was obtained from the related faculties.

### Statistical Analysis

21.0 version of the Statistical Package for the Social Sciences (IBM Corp.; Armonk, NY, USA) package program was used for the statistical analysis of the responses obtained from the data collection forms. Descriptive statistics, such as percentage and frequency, were used in order to interpret the results.

## RESULTS

A total of 363 students participated in this study. 47.4% of them were enrolled at the faculty of nursing, and 52.6% of them studied at the faculty of dentistry. 51.5% of these students were female and 48.5% male with an age average of 23±2.05 years.

38.9% of the students indicated that they consumed packaged processed food every day, and 40.2% sometimes. 41.6% consumed packaged processed food for nourishment, 43.5% for its good taste. 23.4% of the students stated that they consumed all packaged products, 26.7% of them consumed chocolate the most, 55.9% of them paid attention to the brand of the packaged processed food when buying it and 63.4% of them were affected by the taste and smell of this food while buying it (Table 1).

While 47.7% of the students stated that they did not pay attention to the content of the packaged processed food when buying it, 46% of them indicated that they had no information on the additive content of the prepared packaged food. Furthermore, 56.2% of the students specified that they used the internet as a source of information regarding packaged processed foods and their additives. 80% of the students stated that food additives are put into prepared packaged food so that it could have a longer shelf-life, 62% said that food additives enhanced

**Table 1. Responses of students on packaged food consumption (n=363)**

| Questions on packaged food consumption | | Number (n) | Percent (%) |
|---|---|---|---|
| How often do you consume packaged processed food? | Several times a day | 17 | 4.7 |
| | Very rare | 28 | 7.7 |
| | Once a week | 31 | 8.5 |
| | Everyday | 141 | 38.9 |
| | Sometimes | 146 | 40.2 |
| For what purpose do you consume packaged processed food in general? | No idea | 23 | 6.3 |
| | For fun | 31 | 8.6 |
| | For nourishment | 151 | 41.6 |
| | For its good taste | 158 | 43.5 |
| What is the type of packaged processed food you consume the most?* | Biscuits | 52 | 14.3 |
| | Chips and similar products | 63 | 17.4 |
| | Fast food | 79 | 21.8 |
| | All products | 85 | 23.4 |
| | Chocolate | 97 | 26.7 |
| What do you pay attention to when buying packaged processed food?* | Package | 24 | 6.6 |
| | Advertisement | 28 | 7.7 |
| | Friends' advice | 59 | 16.3 |
| | Nutritional value | 73 | 20.1 |
| | Brand | 203 | 55.9 |
| What affects you the most while buying packaged prepared meals?* | Its advertisement | 4 | 1.1 |
| | Its nutritional value | 39 | 10.7 |
| | Its package | 45 | 12.4 |
| | Its brand | 53 | 14.6 |
| | Its taste, smell | 230 | 63.4 |

*multiple options can be selected.

the risk of poison to the food if their shelf-lives were not adhered to, and finally, 83.5% of them indicated that in the case that food with additives are consumed excessively, this may lead to obesity/metabolic syndrome (Table 2).

Most of the students responded that they did not know anything on the intended use of food additives. While some of the students indicated that sodium nitrite (29.8%) and sodium benzoate (20.9%) are used for preservative purposes, the rest expressed that aspartame (32.8%), caramel (52.9%) and fructose syrup (63.7%) are used for flavouring purposes. 41.6% of students specified that caramel is used as a flavour enhancer while the rate for Epsom salt was 22.9% and it was 23.7% for fructose syrup. Additionally, 15.7% of the students indicated that beta carotene is used as a colouring agent, and 23.1% of them stated that niacin is used for vitamin purpose (Table 3).

## DISCUSSION

The concern regarding food additives has increased much in the last two decades due to studies revealing endocrine system disorders and other negative health effects.[10,11] In this regard, this study was conducted in order to determine the knowledge levels of our students on food additives. Of the 363 students who participated in this study, 47.4% of them were enrolled in the faculty of nursing, 52.6% of them studied in the faculty of dentistry. 51.5% of these students were female and 48.5% were male with an age average of 23±2.05 years.

Related to their responses on packaged food consumption, 38.9% of the students stated that they consumed packaged processed food every day and 40.2% sometimes. 41.6% stated that they consumed packaged processed foods for nourishment, and 43.5% for its pleasant taste. 23.4% of the students indicated that they consumed all types of packaged food, 26.7% of them consumed chocolate the most, 55.9% of them cared about the brands when buying it and 63.4% of them were affected by the taste and smell while buying these foods (Table 1).

Studies found that the most commonly consumed processed foods were packaged cakes, cookies and chocolate, packaged milk and dairy products, chicken and chicken products, whereas the least commonly consumed processed foods were canned goods, salami, and sausage.[2,12,13] Gökçe et al.'s[13] studies demonstrated that almost half of students consumed processed foods daily, 32.8% consumed them 2-3 times a week, 11.2% consumed them once a week, while 1.4% never consumed processed foods.

In responses to the questions on the ingredients and additives in the second section, 47.7% of the students stated that they did not pay attention to ingredients when buying packaged processed food and 46% of them did not have any information on the additive contents of packaged processed food (Table 2). Our results showed a great similarity to prior studies.[12,14-17]

Research carried out on 488 consumers in 2013 investigated the criteria which consumers cared about related to the food additives

**Table 2. Responses of students on packaged food additives (n=363)**

| Questions about food additives | | Number (n) | Percent (%) |
|---|---|---|---|
| Do you pay attention to the content of packaged processed food when buying? | Yes | 190 | 52.3 |
| Do you have information about the additive content of packaged processed food? | Yes | 196 | 54.0 |
| What information source do you generally use about packaged processed foods and additives?* | Newspaper | 8 | 2.2 |
| | Advertisements | 32 | 8.8 |
| | TV | 38 | 10.5 |
| | Other | 46 | 12.7 |
| | Friend circle | 58 | 16.0 |
| | Internet | 204 | 56.2 |
| What do you think are the reasons for putting food additives into packaged processed food?* | Increase nutritional value | 30 | 8.3 |
| | Help to protect nutritional and biological values | 68 | 18.8 |
| | Prevent the formation of microorganisms causing diseases | 112 | 30.9 |
| | Contribute food to protect their quality and strength | 126 | 34.7 |
| | Make their appearances better | 170 | 46.9 |
| | correct their shapes and colours | 170 | 46.9 |
| | Allow them to have better tastes, flavours and smells | 231 | 63.6 |
| | Allow food to have a longer life | 289 | 80.0 |
| What happens when additives, which are chemical substances, are used excessively?* | Nothing | 33 | 9.1 |
| | Natural tastes of food may spoil | 155 | 42.7 |
| | There is a risk of losing nutritional elements | 177 | 48.8 |
| | If their shelf-lives are not adhered to, they increase the risk of poison for food | 225 | 62.0 |
| What can food with additives cause when consumed excessively?* | Asthma | 48 | 13.2 |
| | Skin rashes | 99 | 27.3 |
| | Liver function impairments | 202 | 55.6 |
| | Cancer risk | 231 | 63.6 |
| | Obesity, metabolic syndrome | 303 | 83.5 |

*multiple options can be selected.

**Table 3. Responses of students on intended use of food additives (n=363)**

| Additive/classification* | Preservative | | Flavouring | | Flavour enhancer | | Colouring agent | | Vitamin | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n | % |
| Aspartame | 72 | 19.8 | 119 | 32.8 | 17 | 4.7 | 11 | 3.0 | 1 | 0.3 |
| Sodium nitrite | 108 | 29.8 | 18 | 4.9 | 19 | 5.2 | 9 | 2.5 | 3 | 0.8 |
| Caramel | 7 | 1.9 | 192 | 52.9 | 151 | 41.6 | 26 | 7.1 | 1 | 0.3 |
| MSG (epsom salt) | 56 | 15.4 | 58 | 16.0 | 83 | 22.9 | 13 | 3.6 | 6 | 1.7 |
| Fructose syrup | 4 | 1.1 | 231 | 63.7 | 86 | 23.7 | 23 | 6.3 | 7 | 1.9 |
| Niacin | 34 | 9.4 | 17 | 4.8 | 11 | 3.0 | 21 | 5.8 | 84 | 23.1 |
| Beta carotene | 34 | 9.4 | 12 | 3.3 | 16 | 4.4 | 57 | 15.7 | 47 | 12.9 |
| E120 carmine | 45 | 12.4 | 15 | 4.1 | 13 | 3.6 | 16 | 4.4 | 42 | 11.6 |
| Sodium benzoate | 76 | 20.9 | 20 | 5.5 | 12 | 3.3 | 13 | 3.6 | 9 | 2.5 |

*multiple options can be selected.

used in prepared and semi-prepared food. It was found that most of the subjects (72.4%) did not know the definition of food additives completely but more than half of them (57.5%) were informed about some food additives. It was revealed that of the subjects, the older ones had a more negative opinion, had more awareness and attempted to take precautions against food additives.[12]

56.2% of the students in this study indicated that they used the internet as a source of information about packaged processed foods

and additives (Table 2). We are of the opinion that this source is not sufficient for correct information due to information pollution in numerous advertisements. 80% of students expressed the opinion that food additives are put into prepared packaged food so that they have a longer shelf-life, 62% said that food additives add to the risk of poison for the food if their shelf-lives are not adhered to, and finally, 83.5% of them indicated that in cases where food with additives are consumed excessively, this may lead to obesity/metabolic syndrome (Table 2). Our students were found to have sufficient knowledge on obesity since it is a common issue with different sources, and they had sufficient knowledge on the shelf-life of food which differs from other studies.[15,17]

In one study conducted with students in different educational institutions, it was found that medical students had a significantly higher knowledge level (92.2%) on food additives compared to engineering students (80.4%). In addition, it was seen that students' daily consumption of food with additives was quite high despite having a high knowledge level on food additives. This showed that more research and effective responses are required in order to turn knowledge into action.[13]

The responses received in the last section questioning additives and their intended uses were highly challenging. Most of the students responded that they did not know anything on the intended use of food additives. While very few of the students indicated that sodium nitrite and sodium benzoate are used for preservative purposes, the rest stated that aspartame, caramel and fructose syrup are used for flavouring purposes. 41.6% of the students specified that caramel is used as a flavour enhancer while the rate of Epsom salt was 22.9% and it was 23.7% for fructose syrup. Additionally, 15.7% of the students indicated that beta carotene is used as a colouring agent, and 23.1% of them stated that niacin is used for vitamin purposes (Table 3). It was seen that the responses on the intended uses of additives excluding caramel, aspartame and fructose syrup were insufficient.

Consumer awareness and safety perception were investigated by a survey of 430 subjects by MiShim et al.[14] It was found that their subjects were very concerned about preservatives, colouring agents and flavourings in food, but more than two-thirds of them had insufficient knowledge on food additives. It was concluded that this lack of knowledge originates from difficulties regarding the subject of food additives, inadequate education and insufficient public relations.[14] Kim et al.[15] reached similar conclusions in their study carried out with 360 secondary school students. They found that few of them examined additives in prepared foods and nearly all of them had insufficient knowledge on additives.[15] In another study conducted with 2,782 subjects, the knowledge of consumers on additives before education intervention was assessed. The questionnaire performed before the intervention revealed that many of the consumers did not have the correct information on food additives and they were concerned in this respect. It was seen that food additive safety awareness was raised from 33.1% to 78.6% following this process.[16] It was found in a face-to-face interview made with consumers in Mauritius University that 65% of the subjects never read food labels regarding additives.[17] The conclusions of that study and the approaches of our students who had insufficient knowledge on the intended use of food additives have many similarities.

It is clearly seen that the knowledge levels of consumers on food additives in our country is insufficient, which is in line with prior studies. Consumers should be informed adequately on these additives, some of which are quite dangerous. In this regard, all state institutions, especially universities, have a significant duty. It is crucial that the awareness of consumers be raised. They should be informed about food additives in the light of the huge number of studies conducted in this field.[16,18,19]

## CONCLUSION

It is considered that the knowledge levels of students on food additives is insufficient, and thus, they should be informed.

### MAIN POINTS

- Governments and universities should alleviate food safety-related fears on time and appropriately and ensure the food safety of consumers by explaining the necessary information in a timely and understandable way.

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### ETHICS

**Ethics Committee Approval:** Ethics committee approval was received for this study from the Near East University Ethics Review Board (appoval number: 2019-68-815).

**Informed Consent:** Their consent was obtained after notifying them that their participation in the research was voluntary

**Peer-review:** Externally peer-reviewed.

#### Authors' Contributions

Concept: T.Y., Ü.D.Y, Design: T.Y., Ü.D.Y., Supervision T.Y., Resource: T.Y., Ü.D.Y., Data collection and/or processing: T.Y., Ü.D.Y., Analysis and/or Interpretation: T.Y., Literature review: T.Y., Writing: T.Y., Ü.D.Y., Critical Reviews: T.Y.

### DISCLOSURES

**Conflict of Interest:** The authors have no conflicts of interest to declare.

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