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What do parents of children know about food additives in selected foods?

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Abstract

Introduction: Food additives are used in foods by manufacturers to prevent unfavourable changes in colour, taste and smell and to extend shelf life. Consumption of highly processed products containing large amounts of food additives can lead to accumulation of these substances in the body and cause adverse health effects.

Aim: The aim of the study was to assess parents' knowledge of selected food additives and their impact on the health of preschool children.

Material and methods: The original survey was conducted in March 2022. In total, 112 parents of preschool children attending kindergartens in the Silesian Voivodeship were interviewed. The questionnaire consisted of information and 18 questions, including the respondents' awareness of the presence of food additives in food and their impact on human health. The survey results were prepared in Microsoft Office Excel 2019 and Statistica.

Results and discussion: It was found that less than half of those surveyed (45.53%) thought that the information provided on food additives was easy to understand. More than half of those surveyed (52.68%) did not know that the consumption of products with added benzoic acid can lead to hypersensitivity reactions in patients with bronchial asthma, allergic rhinitis and skin allergies.

Conclusions: The potential health effects of consuming foods containing selected food additives were not known by most of the parents surveyed. Educational activities to increase parents' knowledge about food additives are recommended.

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1. INTRODUCTION

In recent years, there has been a significant increase in the number of different chemical compounds in use as food additives. The use of such substances has a long tradition. For centuries, people have used salt to preserve food. They also used various herbal spices to improve the taste of food, but also to help food keep longer. The ancient Romans often sweetened food and preserved wine with lead acetate. This was called lead sugar and was made from grape juice or wine in lead vessels.[1,2] As defined in Regulation (EC) No 1333/2008 of the European Parliament and of the Council of 16 December 2008 on food additives,[3] a food additive is any substance not normally consumed as a food in itself and not used as a characteristic ingredient of food, irrespective of its possible nutritional value, the intentional addition of which to food for technological reasons during its manufacture, processing, preparation, treatment, packaging, transport or storage results in, or may reasonably be expected to result in, that substance or its derivatives become, directly or indirectly, an ingredient of that food.[3]

Food safety is one of the most important aspects of human nutrition. The Codex Alimentarius Commission, established in 1962 by the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO),[4] and the European Food Safety Authority (EFSA) play a key role in this respect.[5] The basis for raw material and food standards is the Codex Alimentarius, which sets out the requirements for maintaining good hygiene and technological practices in food processing.[6] A high degree of food processing and modification involves the use of food additives, for which it is necessary to establish the maximum acceptable intake of a given food additive. The safety of consumption of each substance is determined by its acceptable daily intake (ADI), expressed in mg/kg of human body weight. The ADI is the total amount of a substance that can be ingested daily from all sources over a lifetime without harming the body.[5]

Based on their technological use, food additives are divided into food constient, food ingredient and food additive. A food constituent is a food additive that is present in the original composition of a given product. A food ingredient, on the other hand, is a substance that, when added to a product, becomes part of it; a food additive is a compound that is added to food to improve its smell and taste and to extend its shelf life. It usually has no nutritional value. It is an important production factor for food producers because it helps in food processing, preparation and transportation, thereby reducing production costs.[6,7]

Food additives are divided into:

- preservatives based on their technological functions;
- antioxidants;
- dyes;
- emulsifiers;
- substances: sweetening, anti-foaming, anti-caking, filling, thickening, binding, foaming, humectant, raising, gelling and glazing;
- acidity regulators;
- stabilizers;
- flavor enhancers;
- media;
- modified starches;
- contrast enhancers; improvers;
- packaging gases and carrier gases.[8]

All food additives are marked with a code that begins with the symbol E and is consistent with the international identification system International Numbering System (INS) for Food Additives. The identification system applies to all producers throughout Europe.[7]

The use of some food additives can raise concerns about the health effects they may cause. For example, studies have shown that tartrazine can cause various allergic reactions (itching of the lips and tongue), inflammation, insomnia, depression, reduced tolerance to non-steroidal anti-inflammatory drugs (NSAIDs) and anaphylaxis. It has been suggested that this dye in combination with benzoates may cause attention deficit hyperactivity disorder (ADHD) in children.[7,9,10] Tartrazine can interfere with the proper functioning of human internal organs such as the kidneys and liver, even at low levels. Children eat products containing this colour several times a day because it can be found in products such as chocolate, chewing gum, chips and drinks. Tartrazine can be converted by the intestinal flora into aromatic amines, which in turn are converted into nitroisamines – which are carcinogenic.[9]

2. AIM

The aim of the study was to assess parents' knowledge of selected food additives and their impact on the health of preschool children.

3. MATERIAL AND METHODS

The study was carried out in March 2022. In totasl, 113 people took part in the study, but 112 people filled in the questionnaire correctly, so 1 questionnaire was rejected. Randomly selected parents of children attending kindergartens in towns in the Silesian Voivodeship, where the management agreed to conduct the study, were eligible for the study. The respondents were between 25 and 55 years old. The method of direct questioning was used. The survey was anonymous and each participant was informed about it at the beginning of the study. The questionnaire consisted of a form and 18 questions, mostly with a single answer. The data section included questions about the gender, age, education, place of residence and occupational status of the parents surveyed. The questions included in the author's survey included: parents' awareness of the presence of food additives in food, the safety and harmfulness of selected food additives, and sources of information on food additives. The results of the original survey were prepared in Microsoft Office Excel 2019 and presented in tabular form. The existence of differences between the levels of

Table 1. Characteristic of the study group (*N* = 112; 100%).

Study group	*N*(%)
Gender	
Female	88(78.57)
Male	24(21.43)
Age, years	
25–35	49(43.75)
36–45	60(53.57)
46–55	3(2.68)
Level of education	
Primary	2(1.79)
Secondary	33(29.46)
Higher	72(64.29)
Vocational	5(4.46)
Place of residence	
Village	4(3.57)
City less than 100 000 inhabitants	95(84.82)
City more than 100 000 inhabitants	13(11.60)
Professional status	
Unemployed	9(8.04)
Employed	98(87.50)
Other	2(1.79)
Student	1(0.89)
Parental leave	2(1.79)

Comment: *N* – number of respondents.

knowledge and education of the respondents was examined using the Statistica programme by Statsoft, using the χ^2 test. *P* less than 0.05 was considered statistically significant.

4. RESULTS AND DISCUSSION

The general characteristics of the study group are shown in Table 1. The study group consisted of 112 people – parents of preschool children. The majority of respondents were women – 88 people of the total group (78.57%), while the group of men consisted of 24 people (21.43%). Most respondents were between 36 and 45 years old (60; 53.57%). In terms of education, 72 people (64.29%) had higher education, 33 people (29.46%) had secondary education, 5 people (4.46%) had vocational education and only 2 people (1.79%) had primary education. There were 95 people (84.82%) living in a town with a population of up to 100,000, 13 people (11.60%) in a town with a population of over 100,000 and 4 people (3.57%) in a village. When analysing the professional status of the respondents, the vast majority of the respondents were professionally active – 98 persons (87.50%), the rest were: unemployed (9; 8.04%), students (1; 0.89%), on parental leave (2; 1.79%) and had other professional status (2; 1.79%).

Of all respondents, only 22 people, or 19.64%, said they always read labels before buying food. Most respondents only sometimes read food labels (69; 61.61%). Most re-

Table 2. Responses of the study group, taking into account differences in the level of knowledge of participants depending on education (*N* = 112; 100%).

Parents responses	*N*(%)	Test results for variables higher and non-higher education		
		X^2	*df*	*P*
1. Do you read labels before you buy food?				
Yes, before every purchase	22(19.64)	4.129	3	0.248
Yes, but only sometimes	69(61.61)			
I don't really read labels	15(13.39)			
I never read labels	6(5.36)			
2. Are you aware that food products may contain food additives that affect their shelf life, smell, taste or colour?				
Yes	95(84.82)	11.834	3	0.008
Probably yes	12(10.71)			
I don't think so	4(3.57)			
No	1(0.89)			
3. Do you think the information on food additive labels is understandable to consumers?				
Yes	18(16.07)	0.731	3	0.866
Probably yes	33(29.46)			
I don't think so	49(43.75)			
No	12(10.71)			
4. Do you think that food additives can be dangerous for children's health?				
Yes	71(63.39)	6.271	3	0.099
Probably yes	31(27.68)			
I don't think so	9(8.04)			
No	1(0.89)			
5. Which of the following food additives do you think might cause 'Chinese restaurant syndrome'?				
monosodium glutamate	85(75.89)	1.025	3	0.795
sodium carbonate	2(1.79)			
sodium benzoate	18(16.07)			
benzoic acid	7(6.25)			
6. Which of the following food additives do you think can cause angioedema in children and adults after ingestion?				
xanthan Gum	29(25.89)	2.522	3	0.471
guar gum	54(48.21)			
locust bean gum	16(14.29)			
gellan gum	13(11.61)			
7. What symptoms do you think you might experience after eating food containing the colour tartrazine?				
allergic reactions	46(41.07)	6.058	6	0.417
inflammations	5(4.46)			
insomnia	3(2.68)			
depressive states	2(1.79)			
all answers mentioned	56(50.00)			
8. Are you aware that people who suffer from bronchial asthma, allergic rhinitis and skin allergies may experience increased hypersensitivity reactions as a result of consuming products containing a preservative in the form of benzoic acid?				
Yes	53(47.32)	0.290	3	0.961
No	16(14.29)			
I don't know	43(38.39)			

Comments: *n* – number of respondents, *df* – degrees of freedom, *P* – statistical significance.

spondents were aware that food products may contain food additives that can affect their shelf life, smell, taste and colour (95; 84.82%). When asked whether the information on food additive labels was understandable to them, most respondents said that the labels were not understandable (49; 43.75%). As many as 71 people, or 63.39% of the parents surveyed, believed that food additives could cause adverse health effects in children. When asked which of the food additives mentioned could cause 'Chinese restaurant syndrome,' most respondents answered monosodium glutamate correctly (85; 75.89%). On the other hand, when asked about a food additive that could contribute to the occurrence of angioedema in children and adults, the vast majority of respondents (96; 85.71%) did not know that locust bean gum could cause angioedema. We also asked respondents about the symptoms that can occur after eating foods containing the colour tartrazine. Only 50% of the respondents gave the correct answer – selecting all possible variants, i.e. regarding: insomnia, allergic reactions, inflammation, depression. More than half of the respondents (59; 52.68%) were not aware that people suffering from bronchial asthma, allergic rhinitis and skin allergies may experience increased hypersensitivity reactions as a result of consuming products containing benzoic acid. The results of the χ^2 test showed no correlation between education and respondents' answers ($P > 0.05$), except for the answer to the question about respondents' awareness that food products may contain food additives that affect their shelf life, smell, taste and colour ($P < 0.05$). Examples of the questions asked to the respondents and a summary of their answers are shown in Table 2.

We asked respondents to give their opinion on which foods contain the most food additives. Respondents could choose more than one answer. According to respondents, most food additives are found in candies, bars, cookies, cakes and other sweet snacks (85.71%), instant products and soups (84.82%), fast food products (77.68%) and chips (63.39%). According to the respondents, the lowest levels of food additives are found in in vegetable products (8.03%) (Table 3).

Table 3. Foods that respondents believe contain the most food additives.

Groceries	*N*(%)
Canned fruit and vegetables	21(18.75)
Canned meat and fish	48(42.86)
Fast food products	87(77.68)
Instant products and soups	95(84.82)
Frozen foods (pizza, dumplings)	35(31.25)
Chips	71(63.39)
Sweet still, carbonated and energy drinks	83(74.11)
Vegetable products	9(8.03)
Candies, bars, cookies, cakes and other sweet snacks	96(85.71)

Comment: *N* – number of respondents.

DISCUSSION

The quality of the diet during childhood is of great importance for proper development and health in adulthood. It is possible to provide optimal amounts of micro- and macroelements by following the principles of good nutrition.[11] The use of food additives has become widespread and plays a key role in the modern food industry. In order to meet consumer demands, many processed foods have appeared in the last decade, in which food additives have become an indispensable ingredient. This is also related to the increase in world population and changes in consumer food preferences. Although food additives include substances of natural origin, synthetic substances are often used, which may raise health concerns.

Our own study sought to assess parents' knowledge of selected food additives and their impact on the health of preschool children. The vast majority of parents surveyed in this study reported that they pay attention to the levels of food additives in the foods they buy (79.47%). In a study by Kim et al., respondents were asked what they look for first when buying processed foods, apart from the sell-by date. Most consumers reported that they paid attention to the origin of the product (162; 40.2%) and its main ingredients (104; 25.7%), and only 18% paid attention to the presence of food additives in the food (73).[14] Food labels, and in particular information on food additives, are an important source of information for consumers and should be easy to understand. This study showed that less than half of the respondents (45.53%) thought that the information on food additives on the labels was understandable, of which only 16.07% strongly agreed. This suggests that there is a need to improve the information about food additives on food labels. This is an important issue from the point of view of protecting consumers' health and providing them with reliable information to enable them to make informed choices about the products they consume.[15]

In the study by Kang et al., 42.3% of the respondents stated that food additives are the biggest threat to food safety.[16] Similarly, 41.5% of respondents in the Kim et al. study considered food additives to be the most dangerous factor affecting food quality.[14] In our own study, 91.07% of respondents were convinced that food additives can be dangerous to health. A study by Song et al. showed that consumers considered food without additives to be healthier.[17] According to the parents in the Kim et al. study, the most dangerous food additives were preservatives.[18] In our own study, when respondents were asked whether they were aware that people suffering from bronchial asthma, allergic rhinitis and skin allergies may experience increased hypersensitivity reactions as a result of consuming products with an added preservative in the form of benzoic acid, more than half of the respondents (52.68%) did not know or were not aware of possible health consequences. It has been found that people who suffer from asthma are more hypersensitive to food additives and other chemical compounds, such as acetylsalicylic acid, than people who do not suffer from asthma.[1]

Another food additive is tartrazine, a colouring agent that can cause symptoms such as insomnia, depression, allergic reactions and inflammation.[7,10] With regard to these symptoms, in our own study, respondents were asked a question in which they had to answer which of the given symptoms was caused by tartrazine. The correct answer was all of the above, but only 50% of respondents gave such an answer.

Few scientific studies have investigated parents' knowledge of food additives, and most of them have focused on the general perception of food additives by adult consumers. It seems justified to conduct research in this direction, as the health risk of chemical agents to children is higher than that of adults.[19] The proper growth and development of children depends on the provision of the right amount of nutrients. In addition, children consume more food per unit of body weight than adults and have different eating patterns.[20] Children's bodies also undergo different metabolic processes that are responsible for the biotransformation of active substances. It is also important to note that children do not make independent purchasing decisions, so their nutritional status and diet depend on their parents or guardians.11 For this reason, the knowledge and awareness of children's parents about the food additives used is of great importance. As a result of industrialisation and increasing globalisation, the consumption of processed foods is estimated to have increased worldwide over the last 20 years, reaching 50%–60% of daily energy requirements in high-income countries.[21–23] In middle-income countries, processed foods account for between one-fifth and one-third of daily energy intake.[24] The consumption of processed foods involves the ingestion of many xenobiotics (e.g. acrylamide, phthalates, bisphenol), but also food additives which, despite many benefits, have many negative health effects and are a public health concern.[12,25]

Taking into account the results of our own research as well as numerous reports in the literature on the adverse effects of some food additives on human health, it is prudent to carry out continuous monitoring of food safety at national and international level and to conduct scientific research aimed at understanding other health effects caused by exposure. on food additives, as well as continuous education of children and adults to minimise health risks.

CONCLUSIONS

(1) Parents' knowledge of food additives should be improved.
(2) Most parents were not aware of the potential health effects of consuming foods containing selected food additives.
(3) It is recommended that educational activities are carried out to increase parents' knowledge in this area.

Conflict of interest

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