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Analysis of Factors of the Use of Food Additives in the Elementary School

Analisis Faktor-faktor dalam Penggunaan Bahan Tambahan Pangan di Sekolah Dasar

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ABSTRACT

Background: Merchants sell a variety of food for schoolchildren. In an attempt to make the food they offer more enticing and long-lasting, dealers frequently add food additives, sometimes prohibited food additives which is against the law. Predisposing conditions affect the addition of additives to snacks.
Objectives: The study aimed to determine the factors that influence the addition of food ingredients not allowed by snack vendors in snacks sold around elementary schools
Methods: This study used a survey approach with a cross-sectional design. The 99 traders that made up the study's sample were chosen randomly. The use of food additives was the dependent variable and the independent variables were gender, education, knowledge, age, and length of selling. Test kits were used in laboratories to analyze snack samples sold by traders in order to identify food additives (formalin, borax, Rhodamine B, and Yellow Methanol). Multivariate, bivariate, and univariate analysis were used in the research process. The multiple logistic regression with 95% Confident Interval and chi-square statistical tests were employed in this investigation.
Results: The number of snacks checked by test-kit with the result was 21.2% of snacks containing prohibited food additives with a good level of knowledge on the sword as much as 52.5%. The results of the chi-square test statistics for knowledge (p=0.001), age (p=0.010), length of sale (p=0.022) was related to the use of prohibited food additives. The results of multivariate analysis showed that knowledge was the most influential factor in the use of food additives.
Conclusions: Traders' knowledge about the use of food additives was the main factor, besides that relate factors were age and length of selling.

INTRODUCTION

School is a public facility or place available both in urban and rural areas which has many educational activities at every level. This is In accordance with the law No 20/2003 which states that education, culture, science, and technology are part of the development components that are the basic foundation of various national ideals[1]. The environment around the school is an economic location, especially for traders to sell snacks, because not all schools have canteens implementing the system of catering so that children can buy snacks outside the school. According to decision of Minister of Health of the Republic of Indonesia Number 942/MENKES/SK/VII/2003. In addition to the food offered by food services, restaurants, and hotels, snack food is defined as food and beverages prepared by food traders at points of sale and served as ready-to-eat food sold to the general public. Snacks are all kinds of snacks sold on street streets, roadsides, markets, residential areas and similar places[2].

There are various types or kinds of school children's snacks sold by merchants. In the school environment, snack food is sold at common place, so that children's consumption and habits for snacks affect the adequacy of energy and nutrients that can result in the condition of children's nutritional quality. In addition to being safe from physical, chemical, and biological hazards, food/drinks in the school cafeteria must also be nutritious[3]. Hazardous ingredients in snacks are usually obtained from food additives deliberately added by traders to their snacks. These food additives are types of preservatives, dyes and sweeteners. There are two food additives, which are permitted food additives and food additives that are not permitted[4].

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Prohibited Food additives have a negative impact on health, especially if consumed by children who are still in elementary school. Food additives must be considered both in type and concentration because if they are not appropriate, they will be carcinogenic for the body[5]. The addition of food additives that pose a risk to health by traders needs to know whether what is added is included in the allowable or impermissible class. The addition of food additives to snacks is influenced by knowledge. Knowledge is information obtained by a person, both in terms of description, hypothesis, theory, concept, principle and procedure obtained from reason and thought[6]. Two species of salted fish have been detected as positively containing formalin, and the degree of knowledge among salted fish vendors in the Kedungprahu traditional market is 20% lower[7].

Elementary school snack traders in the Kartasura region are easy to find, considering the number of elementary schools or similar institutions in the Kartasura region, counted 48 equivalent elementary schools. In accordance with the theme of the National Research Master Plan (RIRN) on the sub-theme of health and welfare, this research is important to be carried out in order to provide information related to food safety, especially snacks consumed by elementary school children in the Kartasura area. This research involved students who were compiling a final project with the same theme as the research we submitted. The purpose of this study was to identify the variables that affect food ingredient addition not allowed by traders in snacks sold around elementary schools in Kartasura District. This study was important to determine how food additive in snacks were usually consumed by the children especially in elementary school area.

METHODS

This study was a quantitative study that aimed to determine the correlation between factors that affected the use of food additives for school children's snack traders with the use of formalin, borax, Rhodamin B and Yellow Methanol. The design of this study was cross sectional with survey method where all variables were collected at the same time. Measurement of factors variables (age, knowledge, education and length of trade) was carried out using questionnaires while measurement of prohibited food additives (borax, formalin, Rhodamine B and Yellow Methanol) used test kits. Before taking data to respondents, questionnaires were tested for validity and reliability in snacks in the environment elementary school of Laweyan Surakarta area as many as 20 respondents with r table 0,6664. The questionnaire was equipped with a letter of inform consent and consists of data on name, gender, age, length of trade education level and 20 questions about knowledge related to adding food additives. This research was carried out during January-February 2024 in Kartasura, Sukoharjo and measurements of food additives in snacks were carried out at the Microbiology Laboratory of Health Science Faculty, Universitas Muhammadiyah Surakarta. The population of this study was all snack traders around elementary school in Kartasura as many as 99 traders, the sample of this study was taken by accidental sampling where traders who were selling at the time of the study were 99 snack samples. His research was conducted received approval from the Health Research Ethics Commission of the Universitas Muhammadiyah Surakarta Number: 246/KEPK-FIK/III/2024.

In order to collect data, questionnaires were given to all respondents who were snack traders and who we also purchased treats for added nutritional analysis. The questionnaire was filled out directly by the respondents with paper based. The questionnaire consisted of questions containing respondents' characteristics, length of trade, types of snacks sold and knowledge related to food additives. Other data taken were samples of snacks sold by the trader including *cilok* and sauce, *pentol* and sauce, fried vermicelli, fried Sausage, meatball tofu and tempura.

Three steps in the research analysis process were taken: univariate, bivariate, and multivariate analysis. In order to ascertain the frequency distribution and characterize the properties of the variable sample, univariate analysis was utilized to characterize the variables under investigation. Bivariate analysis was used to determine the correlation between independent variables (education, knowledge, age, length of trade) and dependent variables (use of food additives is not permitted). The chi-square test, with a 95% confidence level and a significant level of $p<0.05$, was the statistical test employed in this investigation. The determinants factors for the use of food additives that were prohibited were modeled using multivariate analysis and the several logistic regression test, based on several factors that were analyzed with a 95% Confidence Interval.

RESULTS AND DISCUSSIONS

This study was carried out in 19 primary schools in the Kartasura subdistrict, comprising 4 (four) private and 15 public elementary schools. Geographically, Kartasura is one of the sub-districts of Sukoharjo Regency. It occupies 2081 Ha, or roughly 4.25% of the regency's total size of 48,912 Ha, and is situated in a region that is 121 meters above sea level. based on information from Sukoharjo Regency's Central Statistics Agency in 2021, it is also known that the educational facilities available in Kartasura District include 57 kindergartens, 48 elementary schools, 9 junior high schools and 16 equivalent high schools, while Madrasah Ibtida'iyah has 7 schools, Tsanawiyah has 1 school and Aliyah has 1 school.

This study involved 99 respondents with 99 samples of snacks sold by traders around elementary schools in Kartasura sub-district. Measurement of respondents' knowledge was carried out using questionnaires that had been tested for validity and reliability. The snack samples obtained were laboratory tested using a test kit to identify the presence or absence of food additives that were not permitted by the government including borax, formalin, Rhodamine B and Yellow Methanol.

The use of food additives is not new in the food world. Research related to food additives is also often carried out and even supervision from various government parties is also often encountered. This research involved all elementary schools in Kartasura District, Sukoharjo Regency, totaling 19 elementary

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schools. The elementary school as the scope of the study had been surveyed and found vendors selling snacks outside the school (around the school). The number of snacks checked by test-kit was 99 snacks with the result that 21.2% of snacks contained prohibited food additives either borax, formalin, Rhodamine B or Yellow Methanol.

The respondents used in this study were traders from snacks used as a sample with a total of 99 traders. It was known that traders who had good knowledge of food additives as much as 52.5%. The following table displays the findings of the investigation that was conducted.

Table 1. The result of testing food additive in snacks

No.	Snack	Location code	Food Additives					
			Borax		Formalin		Food coloring	
			Positive	Negative	Positive	Negative	Rhodamin B	Yellow Methanol
1	*Cilok*	IA-1*	-	-	-	-		
2	*Pentol*	IA-2	-	-	-	-		
3	*Pentol Ayam*	IA-3	-	-	-	-		
4	Fried Vermicelli	KK-1	-	-	-	-		
5	*Tahu Bakso*	KW-2	-	-	+	-		
6	*Cilok Goreng*	KW-2	-	-	+	-		
7	*Cilok*	KW-2	-	-	+	-		
8	*Pentol Ayam*	IA-2	-	-	+	-		
9	Tempura	GO-1	+	-	-	-		
10	*Cilok Goreng*	PB-2	+	-	-	-		
11	*Tahu Bakso*	PB-3	-	-	-	-		
12	Tempura	GO-2	-	-	-	-		
13	Fried Vermicelli	GO-2	-	-	-	-		
14	*Tahu Bakso*	GO-2	-	-	-	-		
15	*Cilok Goreng*	GP-1	-	-	-	-		
16	Tempura	GP-1	+	-	+	-		
17	Fried Vermicelli	GP-1	-	-	-	-		
18	Fried Vermicelli	GP-1	-	-	+	-		
19	*Cilok*	GP-1	-	-	+	-		
20	Fried Vermicelli	GP-1	-	-	-	-		
21	*Cilok Goreng*	KT-1	-	-	+	-		
22	*Cilok*	KT-1	+	-	-	-		
23	*Pentol*	KT-2	-	-	+	-		
24	Fried Vermicelli	KT-2	-	-	-	-		
25	Fried Vermicelli	KT-2	-	-	+	-		
26	*Cilok*	KN-2	+	-	-	-		
27	*Cilok*	KN-2	-	-	-	-		
28	*Pentol Sapi*	MH-3	-	-	+	-		
29	*Tahu Bakso*	MH-3	-	-	+	-		
30	*Cilok*	MH-5	-	-	+	-		
31	*Pentol*	MH-5	-	-	+	-		
32	*Pentol Ayam*	NR-2	+	-	-	-		
33	*Tahu Bakso*	NR-2	+	-	+	-		
34	*Pentol*	NR-2	-	-	-	-		
35	*Tahu Bakso*	PB-3	-	-	-	-		
36	Tempura	PC-3	-	-	-	-		
37	*Pentol*	PC-3	-	-	-	-		

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No.	Snack	Location code	Food Additives					
			Borax		Formalin		Food coloring	
			Positive	Negative	Positive	Negative	Rhodamin B	Yellow Methanol
38	*Tahu Bakso*	PC-5	-	-	+	-		
39	Fried Vermicelli	PC-5	-	-	+	-		
40	Tempura	PC-5	-	-	+	-		
41	Fried Vermicelli	SP-1	-	-	-	-		
42	Fried Vermicelli	SP-1	-	-	-	-		
43	Tempura	SP-1	-	-	-	-		
44	*Bakso Goreng* Sauce	IA-1					-	-
45	Sausage Sauce	IA-2					-	-
46	*Pentol* Sauce	IA-3					-	-
47	*Bihun Gulung* Sauce	KK-1					-	-
48	*Cilok* Sauce	KW-2					-	-
49	Kentucky Sauce	KW-2					-	-
50	*Cilung* Sprinkle Seasoning	KW-2					-	-
51	*Cilor* Sprinkle Seasoning	IA-2					-	-
52	Syrup Ice	GO-1					-	-
53	Sausage Sauce	PB-2					-	-
54	*Basreng* Sauce	PB-3					-	-
55	Tofu Sauce	GO-2					-	-
56	*Sostel* Sauce	GO-2					-	-
57	*Pentol* Sauce	GO-2					-	-
58	*Cilok* Sauce	GP-1					-	-
59	*Cilok* Sauce	GP-1					-	-
60	*Telur gulung* Sauce	GP-1					-	-
61	Sausage Sauce	GP-1					+	-
62	*Pentol* Sauce	GP-1					-	-
63	*Telur Gulung* Sauce	GP-1					-	-
64	*Siomay* Sauce	KT-1					-	-
65	*Pentol* Sauce	KT-1					-	-
66	*Cilok* Sauce	KT-2					-	-
67	*Cilok* Peanut Sauce	KT-2					-	-
68	*Bihun Gulung* Sauce	KT-2					-	-
69	*Cilok* Sauce	KN-2					-	-
70	*Cilok* Sauce A	KN-2					-	-
71	Cilok Sauce B	MH-3					-	-
72	*Telur Gulung* Sauce	MH-3					-	-
73	Sausage Sauce	MH-5					-	-
74	*Pentol* Sauce	MH-5					-	-
75	*Telur Gulung* Sauce	NR-2					-	-
76	*Siomay* sauce	NR-2					+	-
77	*Pentol* Sauce	NR-2					-	-
78	*Cilok* Sauce	PB-3					-	-
79	Peanut Sauce	PC-3					-	-

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No.	Snack	Location code	Food Additives					
			Borax		Formalin		Food coloring	
			Positive	Negative	Positive	Negative	Rhodamin B	Yellow Methanol
80	*Bihun Gulung* Sauce	PC-3					-	-
81	*Pentol* Sauce	PC-5					-	-
82	*Cilok* A Sauce	PC-5					-	-
83	*Cilok* B Sauce	PC-5					-	-
84	Sausage Sauce	SP-1					-	-
85	Fried *Aci* Sauce	SP-1					-	-
86	*Siomay* Sauce	SP-1					-	-
87	*Es Campur*	IA-1					-	-
88	*Pentol* Sauce Soup	IA-2					-	-
89	*Cireng* Sauce	IA-3					-	-
90	Ice syrup	KK-1					-	-
91	*Mi Lidi* Sprinkle Seasoning	KW-2					-	-
92	*Batagor* Sauce	KW-2					-	-
93	*Telur Gulung* Sauce	KW-2					-	-
94	*Cireng* Sauce	IA-2					-	-
95	Fried *Cilok* sauce	GO-1					-	-
96	*Batagor* Sauce	PB-2					-	-
97	*Telur Gulung* Sauce	PB-3					-	-
98	*Cilok* Sauce	GO-2					-	-
99	Seasoning Sprinkle	GO-2					-	-

Bivariate analysis was used to determine the correlation between independent variables (knowledge, age, length of trade) and dependent variables (use of food additives is not permitted). The statistical test used in this study was the chi-square *test* with a confidence level of 95% with a significant level of p<0.05. Complete results of the study consisting of respondents' characteristics and food additives in snacks can be seen in Table 2.

Table 2. Respondent characteristic

Characteristic	Frequency	Percentage (%)	p-value
Gender			
Male	57	57.6	0.592
Female	42	42.4	
Age (years)			
20-30	14	14.1	**0.010***
31-40	45	45.5	
>51	9	9.1	
Education level			**0.022***
Elementary	73	73.7	
High school	26	26.3	
Knowledge level			**0.001***
Low	47	47.5	
High	52	52.5	
Length of selling (years)			
1-3	12	12.1	**0.022***
4-6	18	18.2	
7-10	42	42.4	
>10	27	27.3	
Food addictive			
Negative	78	78.8	
Positive	21	21.2	
Total	99	100	

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*chi-square (significant if p<0.05)

Table 3. Multivariate analysis

Variable	First model 95% CI		p-value	Rank
	Lower Bound	Upper Bound		
Knowledge	0.439	0.138	0.000*	I
Length of selling	0.000	0.035	0.048*	III
Age	0.023	0.004	0.007*	II
Education level	0.329	0.014	0.072	IV

*Multiple logistic regression (significant if p<0.05)

Food additives are substances added to food with the intention of changing the composition, form, or nature of food or food products, as per Government Regulation Number 28 of 2012. According to Minister of Health Regulation Number 033 of 2012, food additives are classified into two categories: permitted and prohibited. These groups include those that function as antioxidants, anti-clogging agents, preservatives, developers, emulsifiers, thickeners, hardeners, sweeteners, flavor enhancers, stabilizers, and others[8].

Food additives are substances that are purposefully added to food in tiny amounts to enhance its texture, flavor, and appearance while also extending its shelf life. In addition, it can also increase nutritional value such as protein, minerals and vitamins Food additives that are often used by traders are preservatives and dyes. Food additives that are prohibited to be mixed into food but are still often found in food are formalin, borax, Yellow Methanol and Rhodamine B. Snacks containing prohibited food additives are sometimes distinguished from those that are not added permitted food additives.

Food additives are regulated in several regulations including the Regulation of the Minister of Health of the Republic of Indonesia Number 33 of 2012 concerning Food Additives which explains that the types of formalin preservatives, types of borax preservatives and chewers, and types of textile dyes (Rhodamine B and Yellow Methanol) is a chemical that is prohibited from use in food products because it is harmful to health[8]. The role of food additives in food is considered important because by adding food additives food will be more durable, attractive and tastier. However, the use of food additives should be controlled by both producers and consumers because these food additives not only have a positive impact but also bring a negative impact. One reason traders continue to use hazardous materials in their merchandise is because they obtain greater profits. Lack of awareness of traders about the dangers of borax for health is often only punished by coaching and warnings from the officer so that there is no deterrent effect for the traders [9].

Knowledge has a correlation with the perceived risk of using food additives[10]. The importance of providing information about the negative effects of food additives on health and prevention, in the hope of increasing knowledge related to the negative effects of prohibited food additives[11]. When it comes to forming one's own activities, knowledge becomes a crucial domain. In terms of food additive selection, someone with good knowledge will choose or make the food safe for consumption. Trader knowledge is influenced by several factors, such as education level and length of selling or experience, because the higher one's education level and the more experience one has, the more knowledge one will gain. The results of the study conducted showed significant results between knowledge and education level, the correlation coefficient result revealed that the strength of the association between the variables under examination fell into the medium group and was unidirectional, meaning that knowledge increased with education level and vice versa[12]. When forming one's own acts, knowledge becomes a crucial domain. Knowledge is a crucial component since it interacts with other variables. According to one of them, 71.8% of boarding students had a moderate level of awareness about snack selection. When it came to boarding students' snack-selection behavior, 59.1% of them demonstrated good behavior[13].

A person's work experience is a measurement of how long they have worked and how well they have understood the jobs they have completed during that time[14]. It explains that work experience is a person's degree of mastery over the information and abilities they possess at work, and it is determined by the sort and duration of job they've done over a given period of time[14]. The experience that matters in trading is the amount of work put in. The duration of business is the amount of time a trader has spent managing his enterprise; this is typically expressed in years or months[15]. The duration of a business is significant since it can lead to business experience, and experience can influence an individual's behavior[16].

Age is the span of time between a person's birthday and birth. Age will affect a person's physical and psychological state. A person's physical and psychological characteristics (mental) will also alter as they age. An individual's strength and level of maturity increase with age, as does their capacity for thought and productivity. Age has an impact on health knowledge and awareness. One's comprehension and mentality regarding anything can also be influenced by age; as one ages, their comprehension and mindset get more developed, leading to a greater acquisition of knowledge. In terms of the selection of food additives, increasing age is expected to be able to influence someone to be wiser in choosing because as is known the mindset and comprehension of a person will increase with age[17]. According to other research, variations in age will lead to variations in product preferences and tastes, making age one of the individual elements influencing customer behavior[18]. Age has an impact on health knowledge and awareness. A

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person's perception and attitude toward something will also change with age. Selling plays a significant role because the duration of a business can caused business experience, which can affect a person's experience in behavior. Growing older is expected to be able to influence someone to make wiser decisions because it is well known that a person's mindset and comprehension will increase with age.

The chi-square test analysis yielded p-values <0.05 for each age level variability and length of selling, indicating a correlation between the age level and length of selling regarding the amount of food additives in snacks. A p-value of 0.001 (<0.005) was obtained for the knowledge level variable. Chi-square analysis revealed a significant correlation between traders' knowledge and the use of borax in food sold in schools in the area of Kartasura, although the results of research on the correlation between the level of knowledge and the use of food additive did not match the research conducted[19]. The absence of a significant correlation between the level of knowledge and length of selling with the use of coloring food additives (Rhodamine B) could occur due to several factors including bias in research and the acquisition of information about food additives by traders. Bias can occur because traders sometimes change the food products they use, especially if the availability of product stocks is running low or even runs out, so there is a possibility that food products that are checked for food additive content are prohibited from containing negative food additive which causes the factor to be studied to be invisible because it is covered by other factors. In terms of obtaining information, traders generally obtain information from various media, such as print and electronic media in the form of news circulating on social media. The acquisition of this information will influence the knowledge of traders to take a stance or action in the selection of food additives[20].

Food additives (food additives) are compounds that are not normally consumed as food by themselves and are not usually used as primary raw materials in food but are intentionally added in the manufacture, processing, preparation, care, packing, packaging, and transport of food to perform technological functions[21]. Use food additives aims to improve the quality of the final product and shelf life of foodstuffs in retail[22]. In general, the basic function of food additives is to make food look nicer, taste better, make food safer, and prevent oxidation or other chemical changes[23].

Formalin, borax, Rhodamine B and Yellow Methanol are examples of food additives that are prohibited from use. Formalin is a chemical compound in the form of a gas or solution and in it is added 10-15% methanol[24] and contains 37% formaldehyde. Formalin has no color and has a very pungent odor. Formalin is commonly used in medicine as a preservative for corpses. In addition, formalin can be used as an antibacterial and for needs homogeny, such as floor cleaners, and as laundry detergents[25]. According to studies on the description of formalin use and knowledge, vendors of salted fish in the Kedungprahu traditional market may know as little as 20% less than other vendors, and of the salted fish sold, two varieties have been found to be positively identified as containing formalin[7]. Borax is one of the dangerous chemicals that is often used as preservatives in food. Borax which has the chemical formula $Na_2B_4O_7.10H_20$ is in the form of a white fine powder odorless and when dissolved in water will form sodium hydroxide and boric acid[26]. Borax is used in food products because it can improve the structure and texture of food, for example, meatballs with borax added will be very chewy and durable when compared to meatballs without borax. Although eating meals containing borax does not directly harm a person, the material will gradually build up in the body due to cumulative absorption. Food high in borax will damage the kidneys, liver, and brain when consumed frequently. Borax enters the body through the skin in addition to through digestion. Borax can obstruct the function of metabolic enzymes[25].

An amino xanthene dye known as Rhodamine B (RhB) is widely employed in fluorescent dyes for a variety of uses, including glass, fireworks, paper, textiles, paint, drawings, and colored insecticides[27]. Humans should not consume rhodamine B as it is known to irritate the skin, eyes, and respiratory system. It has been demonstrated that rhodamine B causes cancer in both people and animals. It was categorized as a Group 3 carcinogen by the International Agency for Research on Cancer in 1978 and 1987[28]. Furthermore, animals are exposed to rhodamine B through genotoxicity, neurotoxicity, and chronic toxicity. Additional research conducted on animal models revealed that a three-month oral rhodamine B 1% diet caused significant weight loss and hepatic hypertrophy. The most notable problem found during autopsy was an enlarged liver. An in vitro study revealed that the liver methylation rhodamine B to produce three less harmful metabolites: 3,6-diaminofluoran, N,N'-diethyl-3,6-diaminofluoran, and monoethyl-3,6-diaminofluoran[29].

Yellow Methanol is a synthetic chemical used to make food brighter and more appealing. Yellow methanol is often used for economic reasons or inappropriate processing conditions. Yellow Methanol is a synthetic azo dye that is banned from food coloring, but is used by unscrupulous traders in many areas. Yellow Methanol has the chemical formula $C_{18}H_{14}N_3NaO_3S$ and a molecular weight of 375.4. Yellow Methanol is a yellow powder that dissolves in water under normal conditions[30]. The physical characteristics of foods containing this dye are that they are strikingly bright yellow, and there are white spots because they are not homogency[31]. Long-term consumption of Yellow Methanol can cause various health problems. If ingested, in the short term it can cause nausea, vomiting, diarrhea and abdominal pain[32]. A 2014 study reported that ingestion of Yellow Methanol for 30 days could cause histological changes in rat kidneys[33]. Yellow Methanol also showed acute oral LD50 toxicity in rats at concentrations in excess of 2000 mg/kg[32].

Traders who sold snacks around elementary schools in the Kartasura sub-district area had not received information related to food safety. They also did not have any groups to make coordination to control the products they sold so that they were free to sell any profitable snacks without paying attention to the safety of their goods. The snacks were not only sold in one

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location but moved around according to school breaks and student returns. Knowledge is the most influential factor in this study. Besides, it is known that age and length of selling also have a correlation with the use of food additives. This research had not identified food additives quantitatively level with method spectrophotometer or the other method and the respondents used were only those who were on site when the study was conducted. In other words, researchers did not conduct selection of respondents.

CONCLUSIONS

The use of food additives that were prohibited specifically formalin, borax, Rhodamine B and Yellow Methanol by traders was influenced by several factors, including knowledge, age and length of selling (experience). Traders' knowledge of food additives was a major factor in the selection of food additives used. In terms of food additive selection, someone with good knowledge will choose or make the food safe for consumption. Moreover, age and length of selling (experience) also had a correlation in terms of the use of food additives. This study had not tested the levels of food additives quantitatively so that it can be done by future researchers.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

The authors declare there is no conflict of interest in this article. This research received by Universitas Muhammadiyah Surakarta.

AUTHOR CONTRIBUTIONS

Conceptualization: R.A., R.A.W and W.N.W; Methodology: R.A., J.B.N., A., and F.; Formal analysis: R.A.; J.B.N, and D.A.; Writing—original draft preparation: R.A.; Writing—review and editing: R.A., and S.R.M.Y; Supervision: R.A. All authors have read and agreed to the published version of the manuscript.

REFERENCES

1. Kemdikbud. Permendikbudristek Nomor 13 Tahun 2022 tentang Perubahan atas Peraturan Menteri Pendidikan dan Kebudayaan Nomor 22 Tahun 2020 Tentang Rencana Strategis Kementerian Pendidikan dan Kebudayaan Tahun 2020-2024. *Kemdikbud* 1–249 (2022).
2. Kemenkes. Kepmenkes RI No 942/MENKES/SK/VII/2003 Tentang Pedoman Persyaratan Hygiene Sanitasi Makanan Jajanan Vol. 18, 22–27 (2003).
3. Supriyatno. Gizi Seimbang dan Kantin/Jajanan Sehat di Sekolah Dasar. 1–24 (2021).
4. Peraturan Pemerintah RI. Peraturan Pemerintah Republik Indonesia tentang Keamanan, Mutu dan Gizi Pangan. *Peratur. Pemerintah RI* 1–22 (2004).
5. Cahyadi, I. W. *Analisis & aspek kesehatan bahan tambahan pangan*. (Bumi Aksara, 2023).
6. Mambang. Pengetahuan, definisi, jenis dan faktor. (2020).
7. Wulandari, W. Gambaran Pengetahuan Pedagang Dalam Penggunaan Formalin Pada Ikan Asin Di Pasar Tradisional Kedungprahu. *PREPOTIF J. Kesehat. Masy.* **6**, 1341–1345 (2022).
8. Kemenkes. Peraturan Menteri Kesehatan Republik Indonesia Nomor 033 Tahun 2012 Tentang Bahan Tambahan Pangan. **66**, 37–39 (2012).
9. Sari, N. P. Penggunaan Bahan Tambahan Pangan Berbahaya (Boraks) Pada Bakso Tusuk Yang Dijual Di Sekolah Dasar Kecamatan Salo Kabupaten Kampar. *Avicenna J. Ilm.* **15**, 84–94 (2020).
10. Miao, P., Chen, S., Li, J. & Xie, X. Decreasing consumers' risk perception of food additives by knowledge enhancement in China. *Food Qual. Prefer.* **79**, 103781 (2020).
11. Azis, A. & Fauziah Noer, S. Dampak Negatif Bahan Tambahan Pangan Bagi Kesehatan Dan Pencegahannya. *J. Train. Community Serv. Adpertisi* **3**, 61–64 (2023).
12. Setyawati, U. G. & Mahmudiono, T. Media Gizi Indonesia. *Media Gizi Indones. (National Nutr. Journal)* **Vol. 18**, 56–62 (2023).
13. Mahmuda, A. N. & Kurnia, S. T. P. P. Hubungan Pengetahuan Dan Perilaku Mahasiswa Kos Mengenai Keamanan Makanan Jajanan Di Sekitar Kampus Universitas. (2021).
14. Dardi, S. & Kelen, F. L. Perawat Dengan Penerapan Protokol Kesehatan Covid-19. *Hub. Tingkat Pengetah. Dan Pengalaman Kerja Perawat Dengan Penerapan Protok. Kesehat. Covid-19* **17**, 27–31 (2022).
15. Wahyono, B. Analisis Faktor-Faktor Yang Mempengaruhi Pendapatan Pedagang di Pasar Bantul Kabupaten Bantul. *J. Pendidik. Ekon.* **6**, 388–399 (2017).
16. Sadono, S. *Mikro Ekonomi Teori Pengantar edisi ketiga*. (PT. Rajagrafindo Persada, 2016).
17. Fitriani, N. L. & Andriyani, S. Hubungan Antara Pengetahuan Dengan Sikap Anak Usia Sekolah Akhir (10-12 Tahun) Tentang Makanan Jajanan Di Sd Negeri Ii Tagog Apu Padalarang Kabupaten Bandung Barat Tahun 2015. *J. Pendidik. Keperawatan Indones.* **1**, 7 (2015).
18. B. S., I. N. *et al.* Hubungan Usia Dengan Pengetahuan Dan Perilaku Penggunaan Suplemen Pada Mahasiswa Institut Teknologi Sepuluh Nopember. *J. Farm. Komunitas* **7**, 1 (2020).
19. Sarwoko, S. & Sartika, M. Faktor-Faktor yang Berhubungan dengan Penggunaan Bahan Tambahan Pangan (BTP) Boraks Pada Makanan Yang Dijual di Taman Kota Baturaja. *Cendekia Med.* **3**, 53–62 (2018).
20. Aulia, S. H. Faktor-Faktor yang Berhubungan dengan Penggunaan Bahan Tambahan Pangan Pewarna (RHODAMIN B) pada Pangan Jajanan Anak Sekolah di Wilayah Kerja Puskesmas Pekayon Jaya Kota Bekasi Tahun 2020. (Poltekkes Kemenkes Jakarta II, 2020).

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21. The United Nations, F. and A. of. *General Standard For Food Additives (CXS 192-1995)*. (2017).
22. Martins, F. C. O. L., Franco, D. L., Muñoz, R. A. A. & De Souza, D. Organic and Inorganic Compounds Containing Selenium: Analytical Methods Review and Chemical Analysis Perspectives. *Quim. Nova* **40**, 1204–1214 (2017).
23. Saltmarsh, M. & Insall, L. Food Additives and Why They Are Used. *Essent. Guid. to Food Addit.* 1–13 (2013) doi:10.1039/9781849734981-00001.
24. BPOM. *Formalin: Larutan Formaldehid*. (2008).
25. Nurkhamidah, S. Identifikasi Kandungan Boraks Dan Formalin Pada Makanan Dengan Menggunakan Scientific Vs Simple Methods. *Sewagati* **1**, 26 (2017).
26. Melani MS, E. & Nur Afiah Putri Nandika, N. Uji Kualitatif Kandungan Boraks Pada Makanan Bakso Yang Beredar Di Pasar Cijerah Kota Bandung. *INFOKES (Informasi Kesehatan)* **5**, 39–51 (2021).
27. Nguyen, L. H. *et al.* Improving Fenton-like oxidation of Rhodamin B using a new catalyst based on magnetic/iron-containing waste slag composite. *Environ. Technol. Innov.* **23**, 101582 (2021).
28. Tatebe, C. *et al.* A simple and rapid chromatographic method to determine unauthorized basic colorants (rhodamine B, auramine O, and pararosaniline) in processed foods. *Food Sci. Nutr.* **2**, 547–556 (2014).
29. Cheng, Y. Y. & Tsai, T. H. A validated LC-MS/MS determination method for the illegal food additive rhodamine B: Applications of a pharmacokinetic study in rats. *J. Pharm. Biomed. Anal.* **125**, 394–399 (2016).
30. Sari, A. N., Rizkina, A. W., Syah, F. A. & Sabilla, F. Identifikasi methanyl yellow pada jajanan yang beredar di Kota Banda Aceh 11 Sari. *Amina* **5**, 11–15 (2023).
31. BPOM. Bahaya Methanyl Yellow Pada Pangan. *J. info POM* **14**, (2016).
32. Merck. *Metanil yellow Reag . Ph Eur*. (2017).
33. Yudha, A. A. Pengaruh Pemberian Methanyl Yellow Peroral Dosis Bertingkat Selama 30 Hari Terhadap Gambaran Histopatologi Duodenum Mencit Balb/c. (Universitas Diponegoro, 2014).

How to cite: *Asyfiradayati, R., Astuti, D., Ambarwati, A., Firmansyah, F., Kumala, J., Widyasari, R. A., Wati, W. N., Nindyasari, J. B., & Mohd Yatim, S. R. (2024). Analysis of Factors of the Use of Food Additives in the Elementary School: Analisis Faktor-faktor dalam Penggunaan Bahan Tambahan Pangan di Sekolah Dasar. Amerta Nutrition, 8(1SP), 96–104.*