Korelasi antara Pengetahuan dan Sikap terhadap Kontaminasi Arsenik pada Penjual Kerang Darah (*Anadara granosa*) di Pasar Tradisional di Surabaya Utara

Correlation between Knowledge and Attitudes on Arsenic Contamination among Blood Clam (*Anadara granosa*) Sellers at Traditional Markets in North Surabaya

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ABSTRAK

Latar Belakang: *Indonesia, dengan garis pantainya yang luas, telah menjadi eksportir utama produk perikanan, termasuk kerang, yang menghasilkan jutaan dolar pendapatan. Namun, kerang sering dikaitkan dengan penyakit terkait pangan, karena adanya polutan bahaya dari laut seperti arsenik.*
Tujuan: *Penelitian ini menguji hubungan antara pengetahuan dan sikap penjual terkait kontaminasi arsenik pada kerang darah yang dijual di pasar tradisional di Surabaya Utara.*
Metode: *Penelitian ini menggunakan metode potong lintang, mengumpulkan data primer melalui wawancara langsung dan kuesioner dari 35 penjual kerang darah di Surabaya Utara, serta data sekunder dari penelitian sebelumnya.*
Hasil: *Data dianalisis menggunakan uji chi-square, yang menunjukkan bahwa tidak ada hubungan yang signifikan antara pengetahuan dan sikap penjual ($p > 0{,}001$).*
Kesimpulan: *Dapat disimpulkan bahwa tidak ada hubungan antara pengetahuan dan sikap penjual terkait kontaminasi arsenik pada kerang darah yang dijual di pasar tradisional di Surabaya Utara, seperti yang terlihat dari skor sikap yang tinggi (terkait praktik kesehatan), tetapi skor pengetahuan yang rendah dalam kuesioner.*

Keywords: Arsenik, Keamanan Pangan, Kerang Darah, Pengetahuan, Sikap

ABSTRACT

Background: Indonesia, with its vast coastline, has become a major exporter of seafood products, including clams, generating millions of dollars in revenue. However, clams are frequently associated with foodborne illnesses, due to the presence of hazardous marine pollutants like arsenic.
Objective: This research examines the connection between the knowledge and attitudes of sellers, regarding arsenic contamination in blood clams sold at traditional markets in North Surabaya.
Method: The study employed a cross-sectional method, collecting primary data through direct interviews and questionnaires from 35 blood clam sellers in North Surabaya, as well as secondary data from previous studies.
Results: The data were analyzed using the chi-square test, which indicated that there is / was no significant correlation between the sellers' knowledge and attitudes ($p > 0.001$).
Conclusion: Consequently, it can be concluded that there is a lack of association between the sellers' knowledge and attitudes toward arsenic contamination in blood clams sold at traditional markets in North Surabaya, as evidenced by the high attitude scores (related to healthy practices) but low knowledge scores in the questionnaire.

INTRODUCTION

Indonesia has a seascape of 3.25 km^2 which can generate more than 5.72 US$ of exports in the fisheries sector, including shrimp, fish, and others. However, in shellfish production, there was a decrease of 19,933 tons from 2016 to 2017 (Kementrian Kelautan, 2018. This condition occurs when fishing levels are not balanced with management, causing fishing-associated pollution in coastal waters. The preservation of aquatic ecosystems is often caused by the accumulation of pollutant substances, which include chemical elements, pathogens/bacteria, and changes in the physical and chemical properties of water originating from industrial activities, port activities, oil spills, aquaculture, and household waste (Guntur et al., 2017).

Contaminated sea water in Northern Surabaya primarily contains diverse infectious pathogens (such as bacteria, viruses, and protozoa), as well as carcinogenic organic anions and cations, and inorganic pollutants (such as acids, salts, and toxic metals) (Ahamad et al., 2020). Arsenic heavy metal (As) is a type of pollutant in the environment, this metal has a specific gravity of >5g/m3 and has acid-soluble properties, and can bind to the body tissues causing toxic effects. When consumed, it has a significantly negative impact on human health. The accumulated effects can interfere with the body's metabolism, which may develop into clinical symptoms such as melanosis (excessive pigmentation), keratosis (bump on the skin), and leukomelanosis (reduced pigmentation), as well as allergies (Shrivastava et al., 2015). The arsenic itself is considered a teratogen (substances that cause congenital disorders) and a carcinogen (any substance that promotes the formation of cancer) (IARC, 2012).

The blood clam (*Anadara granosa*), a seafood commodity highly valued in Indonesia and Asia, contains significant levels of zinc and protein, which can have therapeutic benefits for malnourished children, particularly those with stunting (Ekawati & Yusmiati, 2018). It is also special with a red color, due to the hemoglobin fluid in its body. Because of this content, these shellfish can be beneficial for health, such as overcoming anemia and maintaining a healthy heart and nervous system (Putri, et al., 2021). The clam's natural environment, especially in Surabaya, is recognized for its elevated arsenic levels, which then travel / get integrated into its tissues due to its nature as a filter-feeding bivalve (Suryono et al., 2019).

Knowledge is the result of human curiosity about various things, obtained through specific methods and tools, which can take on different types and characteristics (Darsini et al., 2019), some of which have immediate results, while others take longer. In addition, some forms of knowledge are variable (changing), subjective, and specific, while others are constant, objective, and general. There are various factors that can affect the level of knowledge, including: level of education, information, culture, experience, and socioeconomic status (Notoatmodjo, 2012).

Attitude refers to assessment and evaluation made by individuals regarding a particular stimulus object, with variations observed in terms of the positivity or negativity and intensity of these attitudes, while including a wide range of objects, events, or experiences that can evoke feelings of liking or disliking (Maio, et. al., 2019). Attitude itself tends to occur before an action or activity, so that it is a predisposition to action. There are 4 levels of attitude, namely: accepting, responding, valuing, and being responsible (Notoatmodjo, 2012).

It is important to acknowledge that various factors contribute to ensuring safe food practices. Additional elements, such as access to information and knowledge, as well as the competence of personnel involved, play crucial roles in promoting and maintaining food safety standards, as highlighted by Ernawati et al. (2021).

For this research we define knowledge as A trader's understanding of contaminants, trace metal contamination and food contamination regulations, whereas attitude is interpreted as trader's statement of evaluation / judgement regarding pollution in blood clams. This study was conducted to identify the relationship between knowledge and attitudes of food safety among blood clam sellers in traditional markets in northern Surabaya. Hence, the primary objective of this study is to investigate the levels of knowledge and attitudes among blood clam (*Anadara granosa*) sellers at traditional markets in North Surabaya regarding the issue of arsenic contamination. Additionally, the study intends to explore any potential correlations between the knowledge levels of blood clam sellers and their attitudes towards arsenic contamination.

METHODS

This study was analytical, quantitative, observational research, where the researcher doesn't alter the exposure, employing a cross-sectional approach, which is a one-time measurement of the outcomes and exposures (Setia, 2016). The study was conducted on blood clam sellers operating in the North Surabaya area, Indonesia, from March to June 2022. The target population was shellfish traders in traditional markets within the North Surabaya region

that consisted of 58 sellers. The inclusion criteria included participants who demonstrate willingness to participate and complete the informed consent process. The sample size, determined using the proportion data formula (Lwanga et al., 1991), was 35 blood clam traders. The respondents were then collected using the simple random sampling method, which is a method of selecting a subset of individuals from a population in such a way that each individual has an equal probability of being chosen, ensuring a representative sample (Acharya et al., 2013). After the data was collected, statistical analyis was performed using the chi-square. Chi-square is a statistical test that examines the relationship between categorical variables and determines whether there is a significant association or difference between the observed and expected frequencies (Franke et al., 2011).

The independent variable was traders' knowledge regarding food safety, particularly concerning contamination, its consequences, and regulations. The dependent variable was traders' attitudes toward pollution, which included positive and negative statements regarding chemical pollution within sea products (clam included). Primary data collection involved direct interviews to gather respondents' demographic information and questionnaires to assess traders' knowledge and attitudes toward contamination. The knowledge questionnaire consisted of 15 items related to contamination, while the attitude questionnaire included 10 items using the 4-point Likert-scale. The Likert scale is a method that uses individuals' attitudes, opinions, or perceptions by providing a range of response options, typically from strongly agree to strongly disagree, making the quantitative analysis of subjective information (Joshi et al., 2015). The knowledge score was then categorized into three groups according to respondent's scores, that are: good ($\geq$75%), enough (56-74%), and not enough ($\leq$56%). On the other hand, the attitude score was also classified into sufficient (31-40) and medium (21-30). Ethical approval for this research was obtained from the Health Research Ethics Committee at the Faculty of Public Health, Universitas Airlangga, under approval number 26/EA/KEPK/2021.

RESULTS AND DISCUSSION

A total of 35 participants who completed the questionnaire, reflecting a diverse set of demographics. characteristics. All the respondents were female, with the highest proportion (42.9%) falling within the age range of 46-55 years, followed by 36-45 years (28.6%), 26-35 years (14.3%), 56-65 years (11.4%), and individuals above 65 years old (2.9%). In terms of education, the majority of the participants had completed elementary school (51.4%), while 25.7% had finished middle school,

and a significant proportion (20%) had not completed elementary education. Only one respondent (2.9%) had obtained a bachelor's degree. It is worth mentioning that a significant percentage of the sellers (91.4%) displayed limited knowledge regarding arsenic contamination in blood clams. In contrast, the majority of respondents (54.2%) exhibited a positive attitude towards addressing the issue of arsenic heavy metal contamination in blood clams.

No significant correlation was found between seller's knowledge and attitudes towards arsenic contamination in blood clams. This is shown in the results of the chi-square test in Table 2, where p value was not significant (p < .001)

Table 1. Respondents' Characteristic

Variable	n	%
Gender		
Male	0	0
Female	35	100
Age		
26-35 (Early adulthood)	5	14.3
36-45 (Late adulthood)	10	28.6
46-55 (Early elderly)	15	42.9
56-65 (Late elderly)	4	11.4
>65 (Aged)	1	2.9
Levels of Education		
Didn't graduate elementary	7	20.0
Graduated elementary	18	51.4
Graduated middle school	9	25.7
Graduated bachelor's	1	2.9
Knowledge		
Good	1	2.9
Sufficient	2	5.7
Low	32	91.4
Attitude		
Sufficient	19	54.2
Medium	16	45.7

Overall, the findings indicate that the sellers predominantly possess a constructive attitude towards the issue of arsenic heavy metal contamination. However, it is noteworthy that there exists a significant lack of knowledge among the sellers regarding the risks of arsenic contamination in blood clams. This is shown in table 2., where all of the respondents who has good and enough knowledge has mid attitude, while the respondents who has not enough knowledge exhibit good attitudes.

The issue of heavy metal pollution in blood clams is not extensively addressed within the surrounding community of North Surabaya, resulting in a limited understanding of the topic. Consequently, it is not surprising that community members possess insufficient knowledge regarding sea water contaminants in general, and trace metal contamination in, and regulations related to food

Table 2. Correlation among Knowledge and Attitudes on Arsenic Contamination in Blood Clam (*Anadara granosa*) Sellers at Traditional Markets in North Surabaya

Knowledge	Attitude				Total		P
	Medium		Good				
	n	%	n	%	n	%	
Good	1	100	0	0	1	100	
Enough	2	100	0	0	2	100	0.086
Not Enough	13	40.6	19	59.4	32	100	
Total	15	45.7	19	54.3%	35	100	

contamination. However, they may still hold constructive attitudes, which could be influenced by various factors such as cultural beliefs, personal experiences, or perceptions of the environment, which contribute to positive behaviors regarding healthy practices regarding blood clam processing.

There are not many studies explaining heavy-metal contamination of blood clams in Surabaya. However, in Bangladesh, arsenic pollution of the environment has become a concern, so measurements are taken to determine the degree to which people avoid this contamination. The results showed that people's knowledge of arsenic contamination was obtained through word-of-mouth and health campaigns (Aziz et al., 2006). Hence, running meaningful campaigns are recommended to help the blood clams sellers in North Surabaya to achieve better knowledge.

In the same Bangladesh city, Siddiky et al. (2022) conducted tests to determine food safety where the respondent was a chicken seller. Respondents were mostly illiterate (44.1%), the majority had below an acceptable (scored ≤10 out of 21 points) knowledge of food safety and safety practices, but have a productive (scored ≥8 out of 15 points) attitude towards food safety. Thus, the analysis indicated there were no significant relationship between knowledge, attitude, and practices within the chicken sellers.

However, another study also concluded that attitudes towards food safety are important because they mediate the relationship between knowledge related to food safety and Hazard Analysis and Critical Control Points (HACCP) practices. So someone who has a good knowledge and attitude will certainly practice HACCP well to avoid contamination (Ko, 2013). As good HACCP practice is crucial in food handling.

Similar research also shown that education and net income have a significant correlation with food safety knowledge, attitude and behavior, while there was no correlation between community, age, and gender with food safety knowledge, attitude, and behavior (Patra et al., 2020). In line with the research conducted by Miranti (2018), which examined the knowledge and attitude of food handlers in women's dormitories in Malang (Indonesia), this present study similarly found no correlation between knowledge and attitude. These findings imply that knowledge alone may not be the sole determinant influencing an individual's positive attitude towards food safety. Taking these additional factors into account, it becomes clear that ensuring a safe food environment requires a comprehensive approach that includes education, awareness, and competent personnel. This highlights the importance of implementing diverse strategies that go beyond knowledge alone to effectively shape positive attitudes and behaviors concerning food safety.

CONCLUSIONS

No significant correlation was found between the seller's knowledge and attitudes towards arsenic contamination in blood clams, meaning sellers' attitudes score were high for responsible behavior regarding safety procedures, while their knowledge scores were low regarding the relevant science. In other words, attitude itself is quite crucial because it can determine the seller's practice on food safety, especially regarding heavy metal contamination such as arsenic. Further research is recommended to expand the sample size of blood clam traders, add male respondents, and add more geographic areas, so the data may become more robust reliable.

conducted with utmost objectivity and integrity, solely driven by the pursuit of scientific knowledge and the advancement of understanding in the field. Transparency and impartiality are maintained throughout the research process, ensuring the reliability and credibility of the study's outcomes.

Author Contributions

AR: Article-writing, formal analysis NH: Investigation, writing-original draft, formal analysis TM: conceptualization, investigation, methodology, supervision, AS: Review and editing

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