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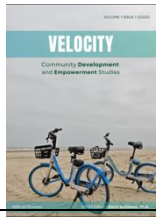

Public Health Education on the Dangers of Using Borax in Food for Parents of Kindergarten Students at Pertiwi School, Bojongmengger Village

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Abstract

Introduction: Food safety is a key public health concern. Borax, a chemical meant for industrial use, is sometimes illegally added to food to improve texture and shelf life. This practice is harmful, especially to children. This program aimed to educate parents of kindergarten students at Pertiwi School, Bojongmengger Village, about the health risks of borax and how to identify safer food options. **Objective**: This activity aimed to raise parental awareness of the dangers of borax, promote healthier food choices, and foster community vigilance in avoiding harmful food additives. **Method**: This community education program utilized an interactive educational session was conducted, including presentations on borax's chemical nature, legal status, and health risks. Visual aids posters were used to show real-life poisoning cases. Participants engaged in discussions and Q&A sessions, received educational leaflets, and completed pre- and post-test sheets to measure increased knowledge. **Result**: The program was attended by 30 parents. Evaluation results showed a significant improvement in knowledge, with 95,95% of participants able to identify borax risks and list safer food alternatives. Many committed to avoiding suspicious processed foods and sharing the information with others in their community. **Conclusion**: The public health education program successfully raised awareness among the parents about the risks of using borax in food. The increased knowledge is expected to lead to safer food choices and a healthier environment for the children in Bojongmengger Village. **Community Implication**: This initiative highlights the importance of community-based health education in improving food safety practices. Engaging parents as key agents of change can significantly reduce the exposure of children to harmful food additives. Follow-up programs are recommended to maintain awareness and to extend the reach of this health education to other community groups, including local food vendors and school staff.

Keyword: food safety, borax, health education, parental awareness, community engagement.

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Introduction

Food safety is a critical component of public health, particularly in developing countries where regulatory oversight and consumer awareness may be limited. Food additives are substances added to enhance flavor, texture, appearance, or shelf life of foods. Preservatives such as benzoates, sorbates, and sulfites are legally approved to inhibit microbial growth and oxidation. However, some illegal preservatives, like borax (sodium tetraborate), are still misused due to their strong preservative and firming properties(Aida *et al.*, 2023).

Among the banned industrial chemicals misused as food additives, borax technically known as sodium tetraborate decahydrate ($Na_2B_4O_7 \cdot 10H_2O$) is particularly problematic due to its widespread illegal use to enhance texture and shelf life in processed foods (Pada, 2025) (Zhang *et al.*, 2021). Food additives encompass a broad range of substances including preservatives, flavor enhancers, and texturizers used to prolong shelf life, improve appearance, and enhance taste. While many additives are approved and regulated, certain compounds like borax are strictly prohibited due to their toxicological profiles (Christina, Mahesa and Wirawati, 2024) . Borax's illegal addition especially to noodles, meatballs, dumplings, and tofu is driven by its ability to produce a firmer, springier texture that appeals to consumers (Rosita, 2023).

Misuse is well-documented in Southeast Asia. Studies have found 0.0045–0.0052% borax in meatballs and wet noodles sold in Semarang, Indonesia. In Gorontalo, borax was detected in meatballs to enhance elasticity, crispness, and firmness. In Kartasura village, borax contamination reached 101–166 mg/g in sempol snacks (Asyifa, Ariastuti and Qonitah, 2022).

Health risks are severe. Borax ingestion can cause gastrointestinal distress, kidney and liver damage, reproductive toxicity (testicular atrophy in animals), immune suppression, and possible genotoxicity (Pongsavee, 2009). An EFSA report confirmed its reproductive toxicity and set strict tolerable intake levels due to these risks (Opinion, 2013).

In response, food safety authorities have banned borax in food. The Centre for Food Safety in Hong Kong reported rice dumplings containing hundreds of ppm of borax, prompting reinforced monitoring and alternatives like freezing or using polyphosphates (Michelle, 2017). Scientific reviews emphasize replacing illegal preservatives with safer, regulated options (Faizal Alaudin, 2023).

Chemically, borax is a hydrated sodium borate with formula $Na_2B_4O_7 \cdot 10H_2O$, also known as sodium tetraborate decahydrate. Although it is banned in food, it has legitimate applications in glass and ceramics production, metal soldering flux, water softening, insecticides, fire retardants, and buffering agents in labs.

Consumption of borax is linked to acute and chronic health hazards. Animal studies have documented gastric ulcers at dosages common in contaminated foods (50–300 mg/kg for eight weeks). while human cases report vomiting, diarrhea, kidney damage, reproductive harm, and potential carcinogenicity (Centre for Food Safety 2017; Khoiroh et al. 2021). Moreover, Indonesia's consumer protection authorities warn of long-term liver cancer risks from years of exposur.

Several studies confirm the prevalence of borax contamination in traditional foods in Indonesia. Christina et al. (2023) found 0.0045–0.0052% borax in meatballs and

noodles from Semarang markets. Similarly, Zari et al. detected 8.82 mg/kg borax in siomay sold in Kendari, while Simra et al.'s Ambon survey reported 2.4–3.05 ppm in noodles and meatballs. Rumanta et al. (2016) analyzed food in Tangerang Selatan, finding extremely high levels up to 17,640 mg/kg in yellow noodles well above EFSA's maximum 4,000 mg/kg limit. Another Bantul study revealed 0.06–5.15% borax in meatball skewers from all 34 samples tested. Surveys indicate up to 74% of processed foods contained borax in local markets (Tarigan *et al.*, 2020).

It is important to distinguish borax's legal industrial applications such as in metal fluxes, ceramics, insecticides, and laboratory reagents from its illicit use as a food additive. While industrial uses are justified based on its properties, any addition of borax to food is illegal and harmful (Pratiwi *et al.*, 2020).

Indonesia firmly prohibits borax in food. The Indonesian Minister of Health Regulation No. 033/2012 classifies borax as a banned food additive (Kemenkes 2013). Enforcement by BPOM surveys shows misuse in nearly 9% of household food industries and 50% of street vendors in urban centers. Government efforts include educational programs, testing using turmeric-based reagents, and legal penalties for offenders (Khoiroh et al, 2024). In summary, food safety regulations are essential to protect public health from hazardous substances. Borax, while useful in various industrial processes, poses significant health risks when misused as a food additive. Its chemical form sodium tetraborate decahydrate facilitates food preservation but leads to gastric damage, reproductive toxicity, carcinogenic potential, and renal dysfunction upon consumption. Despite existing bans under Indonesian law, widespread misuse persists, as documented by recent academic studies across multiple regions. This situation underscores the ongoing need for strict enforcement, community education, surveillance, and safer alternatives to eliminate borax from the food supply chain.

Objective

This community service activity aims to promote healthy and safe food choices among families by providing practical knowledge on selecting, preparing, and consuming food without harmful chemical substances.

Method

Design and setting

The health education method was by giving lectures on the use of prohibited food additives, especially borax and its dangers, and providing leaflets. Before the explanation, participants first filled out the pre-test sheet and then filled out the post-test sheet. The activity was carried out for

Population and sampling

Community service was carried out for parents of Pertiwi Kindergarten students in Bojongmengger Village consisting of 30 mothers. sample is the entire population

Instrument and measurement

To evaluate the effectiveness of the health education activity titled *"Health Education on the Dangers of Borax for Parents of Kindergarten Students,"* a set of instruments and measurement methods were developed and implemented during the program. The main instruments used were structured questionnaires in the form of a pre-test and post-test sheets. The pre-test was conducted prior to the health education session to assess the

participants' baseline knowledge regarding the use and dangers of borax in food. The post-test was administered immediately after the session to measure any changes in knowledge and understanding as a result of the educational intervention.

Each questionnaire consisted of 10 multiple-choice questions covering key topics such as the definition of borax, its common names in the community, legal regulations regarding food additives, health risks associated with borax consumption, and how to identify food that may contain borax. The content validity of the questions was reviewed by public health experts to ensure relevance and accuracy.

The method of health education delivery was a face-to-face lecture (ceramah) facilitated by a public health educator. Visual aids and examples of borax-containing food products were shown to support participants' understanding. The lecture lasted approximately 45 minutes and was followed by an interactive Q&A session.

Data collection and analysis

Data collection in this community service activity was carried out using structured questionnaires administered before and after the health education session. The pre-test was given to participants at the beginning of the session to measure their initial level of knowledge regarding the dangers of borax in food. The same set of questions was used for the post-test at the end of the session to evaluate the improvement in their understanding.

Each questionnaire contained 10 multiple-choice questions that had been validated by public health experts to ensure the accuracy and relevance of the content. The questions focused on identifying borax, understanding its health risks, recognizing its common use in food, and knowing the legal implications of using borax as a food additive.

The collected data were analyzed using descriptive statistics. The average scores from the pre-test and post-test were compared to determine the increase in participants' knowledge. The results were presented in the form of mean scores and percentage improvements to highlight the effectiveness of the health education intervention.

In addition, the data analysis helped to identify specific areas where further education may be needed, as well as the overall impact of the session on participants' awareness. This information will be used to improve future community outreach and education programs.

Result

The results of the activity in the form of the level of knowledge of the community after being provided with health education about the dangers of using borax in food for 30 participants, who are mothers of students. The data from the activity shows the percentage of the participants' level of knowledge after filling out the pretest and post-test sheets.

Figure 1. health counseling session

Table 1. The level of knowledge of PKM participants regarding the dangers of borax before and after given of education.

Question number	The correct number		Increased knowledge (%)
	Pre-test (%)	Post-test (%)	
1	36	93	57
2	66,7	100	33,3
3	63,3	90	26,7
4	66,7	93,3	26,6
5	73,3	93,3	20
6	80	100	20
7	60	100	40
8	70	100	30
9	50	90	40
10	23,3	100	76,7
Average	58,93	95,95	37,02

Discussion

The results of community service activities show the change in knowledge levels among participants of the community service program (PKM) concerning the dangers of borax, measured before (pre-test) and after (post-test) the delivery of health counseling. The data reveal a substantial improvement in participants' understanding following the intervention.

Before the counseling session, the average percentage of correct answers was 58.93%, indicating a moderate level of baseline knowledge. The highest pre-test score was 80% on question 6, while the lowest was 23.3% on question 10, suggesting variability in participants' prior understanding of different aspects related to borax hazards.

After the health counseling session, the average score rose sharply to 95.95%, demonstrating a significant gain in knowledge. Most of the questions reached correct response rates of 90% or higher, with several questions (2, 6, 7, and 8) achieving 100% accuracy. This consistent improvement reflects the effectiveness of the educational intervention.

The average increase in knowledge was 37.02%, with the greatest increase observed in question 10 (76.7%), where the pre-test score was particularly low. This suggests that the counseling session was especially impactful in areas where participants initially lacked knowledge.

Overall, the results strongly indicate that structured health counseling significantly enhances community awareness and understanding of food safety issues, particularly regarding the dangers of using borax in food preparation.

Despite the significant improvement in participants' knowledge as shown in the pre- and post-test results, several limitations must be acknowledged in interpreting the findings of this study.

First, the sample size and participant diversity were not described in detail. A limited number of participants or a homogeneous group may reduce the generalizability of the results to other populations or settings. Future studies should include a larger and more diverse sample to strengthen external validity. Second, the assessment tool used to measure knowledge consisted of only 10 questions, which may not fully capture the breadth and depth of participants' understanding of borax-related health risks. Additionally, without validation of the questionnaire, the reliability of the instrument remains uncertain. Third, the study employed a pre-post test design without a control group, which makes it difficult to determine whether the observed improvements were solely due to the counseling intervention. Other external factors, such as prior exposure to related information or peer discussions, could have influenced participants' knowledge. Fourth, there is a potential for test-retest bias, as participants may have remembered some of the questions from the pre-test, which could have artificially inflated their post-test scores.

Finally, the study measured short-term knowledge gain, but did not assess long-term knowledge retention or behavior change. While immediate results are promising, it remains unknown whether participants will retain this knowledge or apply it in their daily practices regarding food safety.

Addressing these limitations in future research will help improve the robustness and impact of educational interventions related to public health.

Suggest Future Research

Based on the implementation and outcomes of this community service program, several suggestions can be made for future research and development are: Expand to Broader Target Groups Future research should consider involving a wider audience beyond parents of kindergarten students, such as food vendors, school canteen workers, and other community members, who are directly involved in food preparation and distribution, integrate Behavior Observation and Follow-up Monitoring In addition to knowledge assessments, future research should include behavioral observations and follow-up monitoring to determine whether the education program leads to actual changes in food safety practices over time, Evaluate the Effectiveness of Different Educational Methods is recommended to compare various health education strategies, such as interactive workshops, video-based counseling, or peer education models, to identify which approach yields the most lasting and meaningful impact, Incorporate Children's Education in Parallel Programs for kindergarten students may enhance the overall effectiveness of public health messages within the family, collaboration with Local Health

Authorities and educational institutions to ensure the continuity, scalability, and policy integration of food safety education campaigns, by pursuing these future directions, community-based health education programs can be enhanced in terms of effectiveness, reach, and sustainability, ultimately contributing to safer food consumption practices and better community health outcomes.

Conclusion

The community service activity focused on public health education regarding the dangers of using borax in food successfully improved the knowledge of participants, particularly the parents of kindergarten students at Pertiwi School in Bojongmengger Village. The significant increase in post-test scores compared to pre-test scores indicates that the health counseling session was effective in raising awareness and understanding of the health risks associated with borax consumption. Through a structured lecture and interactive discussion, participants were able to grasp key concepts about food additives, the illegal use of borax as a food preservative or texturizer, and its potential negative impact on health, especially for children. The intervention not only enhanced knowledge but also encouraged a more critical and cautious attitude toward food safety.

This program highlights the importance of targeted health education as a powerful tool for promoting safe food practices at the community level. It also reinforces the need for continued outreach and collaborative efforts between schools, health professionals, and local authorities to ensure a healthier environment for children and families.

Community Implication

The results of this community service program demonstrate that health education can serve as an effective strategy to improve public awareness and promote behavioral change regarding food safety. By focusing on parents of young children who play a central role in determining family dietary choices the intervention has the potential to create a ripple effect that positively influences the entire household.

Increased knowledge about the dangers of using borax in food empowers community members to make safer food choices, avoid harmful additives, and demand better food standards from local vendors and food suppliers. As awareness grows, the community can become more proactive in reporting or discouraging the use of illegal substances in food preparation.

Furthermore, this activity encourages collaboration between schools, health workers, and local authorities to institutionalize food safety education, especially among vulnerable populations. The positive outcomes of this program can serve as a model for similar initiatives in other villages, contributing to broader public health improvements and fostering a culture of prevention.

In the long term, sustained health education efforts like this can help reduce the risk of chronic illness caused by toxic substances in food and support the development of healthier, more informed communities.

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This initiative would not have been possible without the collaboration, trust, and commitment of all stakeholders involved. May this effort contribute to the ongoing improvement of public health awareness and food safety in the community.

Conflict of Interest

The authors declare no conflict of interest related to the implementation or publication of this community service program.

Ethical Clearance

This community service followed ethical principles of voluntary participation and informed consent. Although formal ethics board approval was not required for non-clinical community education, participant rights and confidentiality were fully respected.

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References

Aida, F. *et al.* (2023) 'REVIEW ARTICEL REVIEW : CIRCULAR ANALYSIS OF THE USE OF LEGAL AND ILLEGAL', 6(1), pp. 118–126.

Asyifa, N.S., Ariastuti, R. and Qonitah, F. (2022) 'Analysis of Borax Contaminants in Sempol Snacks in Gonilan Village Kartasura', 5(2).

Christina, O.D., Mahesa, S. and Wirawati, N. (2024) 'Determination of Borax Levels in Food Circulating in East Semarang Markets Using the UV-Vis Spectrophotometric Method', *Jurnal Farmasi & Sains Indonesia*, 6(2 SE-), pp. 168–173. Available at: https://doi.org/10.52216/jfsi.vol6no2p168-173.

Khoiroh (2024) 'Edukasi Zat Aditif Makanan Berbahaya dan Analisa Boraks', 6(1).

Opinion, S. (2013) 'Scientific Opinion on the re-evaluation of boric acid (E 284) and sodium', 11(10), pp. 1–52. Available at: https://doi.org/10.2903/j.efsa.2013.3407.

Pada, S.S. (2025) 'DETERMINATION OF BORAX CONTENT IN VARIOUS FOOD', 7(1), pp. 70–74.

Pongsavee, M. (2009) 'Journal of Occupational Medicine and Effect of borax on immune cell proliferation and sister chromatid exchange in human chromosomes', 6, pp. 1–6. Available at: https://doi.org/10.1186/1745-6673-4-27.

Pratiwi, Y.S. *et al.* (2020) 'Borax as a Non-Food Grade Addivite in the Perspective of Foof Safety and Human Resources Formation: A Literature Review', 2020, pp. 119–126. Available at: https://doi.org/10.11594/nstp.2020.0518.

Rosita, Y. (2023) 'Borax analysis with spectrophotometry on meat bakso of frozen food

that sold in modern markets and traditional markets in Palembang', 05(01), pp. 19–35. Available at: https://doi.org/10.32734/ijoep.v5i1.12342.
Tarigan, S.W. *et al.* (2020) 'Jurnal Mantik', 4(3), pp. 1941–1946.
Zhang, N. *et al.* (2021) 'Analytical methods for determining the peroxide value of edible oils: A mini-review', *Food Chemistry*, 358(January), p. 129834. Available at: https://doi.org/10.1016/j.foodchem.2021.129834.