INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH AND ANALYSIS

ISSN(print): 2643-9840, ISSN(online): 2643-9875

Volume 08 Issue 10 October 2025

DOI: 10.47191/ijmra/v8-i10-39, Impact Factor: 8.266

Page No. 5881-5886

Characteristics of Poisoning Incidents Among Students at Nguyen Binh Khiem Secondary School, Dau Tieng District, Binh Duong Province

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ABSTRACT: In the context of growing societal concern regarding school food safety, particularly in response to incidents of food poisoning among students caused by unhygienic food sources, this study conducted at Nguyen Binh Khiem Secondary School aims to investigate the current situation, identify underlying causes, and propose preventive solutions for food poisoning among students. Employing field survey methods, descriptive statistical analysis, and structured interviews, data were collected from students, teachers, parents, and the local health station. The findings reveal that the majority of poisoning cases originated from unsafe food, predominantly purchased from vendors near the school gates. Approximately 50% of affected students performed self-treatment at home, whereas only 33.3% sought medical attention, indicating limited awareness and insufficient first-aid skills in handling food poisoning. The study highlights the need to enhance awareness of food hygiene and safety, emphasizing the importance of collaboration among schools, families, and health authorities to establish a safe, healthy, and sustainable school environment.

KEYWORDS: food safety; poisoning; students; Nguyen Binh Khiem Secondary School; Binh Duong

1. INTRODUCTION

Poisoning is one of the most common medical emergencies, particularly among school-aged children—a group that often lacks adequate understanding of the toxic properties of chemicals, medications, foods, and organisms in their environment. This condition not only poses serious threats to children's physical and mental health but may also result in long-term complications or even death if not detected and managed promptly. According to the World Health Organization (WHO), millions of poisoning cases are reported globally each year, with children accounting for a significant proportion. In developing countries, including Vietnam, the causes of poisoning are highly diverse, encompassing food, pharmaceuticals, household chemicals, pesticides, and animal toxins. With ongoing urbanization and industrialization, children's exposure to toxic agents has been increasing, making the issue of poisoning among this population increasingly complex and concerning (1).

In Vietnam, numerous studies have indicated that most cases of poisoning among children occur unintentionally — for instance, through accidental ingestion of medication or consumption of toxic food and chemicals due to insufficient adult supervision. Furthermore, both students and parents demonstrate limited awareness regarding food hygiene and safety (1; 2; 3). According to Lambraki et al. (2019), the majority of lower and upper secondary school students lack adequate understanding of food safety risks, particularly when consuming street food or fast food; many believe that "if it looks clean, it is safe," while paying little attention to preparation, preservation, or the origin of ingredients (4). Similarly, a study by Ho Van Son (2022) involving 580 secondary school students in Tan Phu Dong District, Tien Giang Province, revealed that only 20.86% of students possessed correct knowledge and 21.38% demonstrated appropriate practices regarding the consumption of street food (5).

Nguyen Binh Khiem Secondary School, located in Dau Tieng District, Binh Duong Province, is an educational institution situated in an area with a developing socio-economic context. Students in this region are frequently exposed to environmental factors that may pose potential poisoning risks, such as pesticides, street food, and various household chemicals. However, to date, no specific study has been conducted to examine the characteristics of poisoning incidents among students in this locality. Based on this practical need, the study ***"Characteristics of Poisoning among Students at Nguyen Binh Khiem Secondary School, Dau Tieng District, Binh Duong Province"*** was conducted to describe the current situation, causes, and characteristics of poisoning incidents among the school's students. The findings are expected to provide empirical data serving as a foundation for health

education and communication initiatives on poisoning prevention in schools, while also assisting health authorities and educational institutions in developing effective intervention measures to ensure student safety.

2. RESEARCH METHODOLOGY

To investigate the characteristics of poisoning among students at Nguyen Binh Khiem Secondary School, Dau Tieng District, Binh Duong Province, a **cross-sectional descriptive study design** with analytical components was employed to assess the relationships among relevant factors.

A total of **352 students**, evenly distributed across grades 6, 7, 8, and 9, participated directly in the survey process.

Data collected from the survey were entered using **EpiData 3.1** and analyzed with **Stata 18.0** software. Descriptive statistics were presented in terms of frequency and percentage (%). The associations between variables were examined using the **Chi-square test** and **Odds Ratio (OR)** with a **95% Confidence Interval (95% CI)** and **p-value**. **Multivariate logistic regression** was applied to control for confounding and interaction effects.

3. RESEARCH CONTENT

3.1. Overview of Poisoning

Poisoning refers to a pathological condition in which the body is adversely affected by the ingestion, inhalation, or dermal absorption of toxic substances originating from food, chemicals, or pathogenic microorganisms.

The clinical manifestations of poisoning vary depending on the causative agent (6). The most common types of poisoning include:

+ *Food poisoning:* The most prevalent form of poisoning, caused by consuming food contaminated with bacteria, viruses, or bacterial toxins. Common symptoms include vomiting, diarrhea, and abdominal pain.
+ *Chemical poisoning:* Occurs upon exposure to hazardous chemicals in the environment, such as pesticides, detergents, and industrial solvents.
+ *Drug poisoning:* Results from overdose or improper use of prescription or over-the-counter medications. Symptoms may range from dizziness to coma in severe cases.
+ *Alcohol poisoning:* Arises from excessive alcohol consumption, leading to symptoms such as nausea, headache, and, in severe cases, coma or death.
+ *Carbon monoxide (CO) poisoning:* Caused by inhaling CO gas produced from incomplete combustion, potentially leading to asphyxiation and death.

The severity of poisoning varies depending on the toxic agent and the amount of substance absorbed by the body:

+ *Mild poisoning:* Symptoms typically subside spontaneously within a few hours to a few days.
+ *Moderate poisoning:* Requires medical attention to prevent serious complications.
+ *Severe poisoning:* If not promptly identified and treated, it may result in respiratory failure, renal failure, or death. Certain toxins, such as botulinum toxin, can cause muscle paralysis and respiratory arrest, placing the patient in a critical condition.

3.2. Characteristics of Poisoning among Students at Nguyen Binh Khiem Secondary School

Dau Tieng is a district located in the northwestern part of Binh Duong Province, bordering Tay Ninh and Binh Phuoc provinces. The area is recognized as one of the province's key agricultural zones, characterized by extensive rubber plantations and a variety of short-term crops. The local socio-economic life is closely tied to agricultural production, with frequent use of pesticides, chemical fertilizers, and locally processed food products. While these characteristics contribute to economic development, they also pose potential risks to public health, particularly in relation to food and chemical poisoning.

Students at Nguyen Binh Khiem Secondary School, due to their living conditions and surrounding environment, are frequently exposed to manually processed foods, water sources, and living environments potentially affected by agricultural chemicals. Moreover, their spontaneous eating habits—such as consuming unregulated street food or snacks of unknown origin around the school area or in small local markets—further increase the risk of food poisoning among this age group.

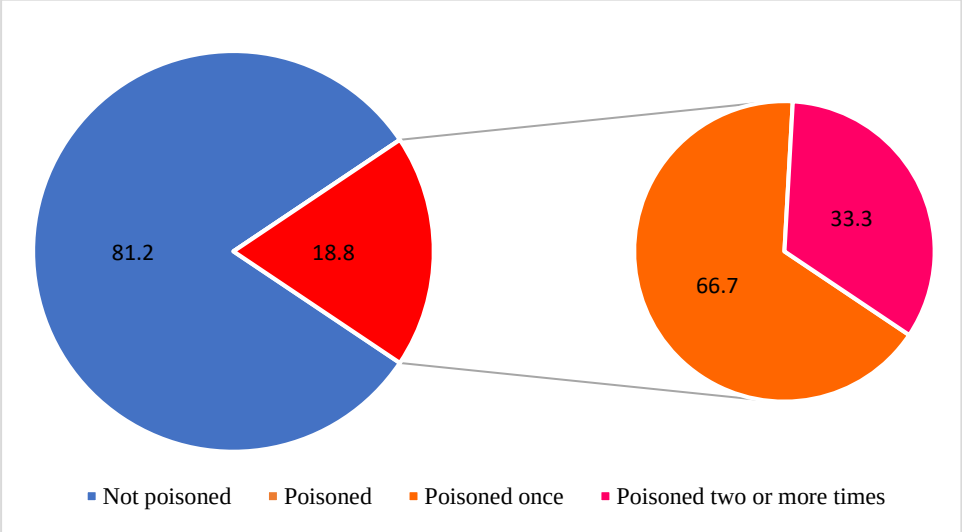

Figure 1. Percentage of Students Who Experienced Poisoning (n = 352)

A survey conducted in 2024 at Nguyen Binh Khiem Secondary School revealed that **18.8% of students had experienced poisoning**, a rate nearly **three times higher** than that reported among secondary school students in Ho Chi Minh City (6.5%) (4). The number of students who experienced poisoning **once** was **twice as high** as the number of those who experienced poisoning **two or more times**.

Poisoning incidents among students at Nguyen Binh Khiem Secondary School were predominantly attributed to **foodborne causes**. The primary factors included food products that failed to meet safety standards in terms of origin, processing, and preservation. Several cases indicated that food was supplied by facilities lacking proper hygiene conditions, using low-quality ingredients, or contaminated with harmful microorganisms such as *E. coli* and *Salmonella*. Additionally, improper food storage conditions—such as inadequate temperature control, prolonged exposure to air, or the reuse of leftover food—also contributed to an increased risk of food poisoning.

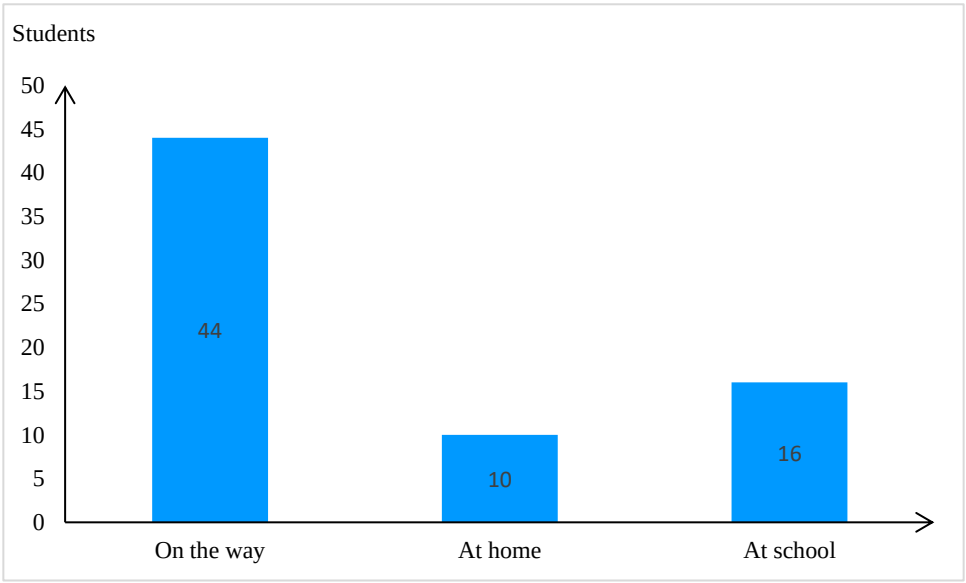

Figure 2. Locations Leading to Poisoning among Students at Nguyen Binh Khiem Secondary School

Poisoning among students at Nguyen Binh Khiem Secondary School was predominantly associated with **food consumption while commuting** (accounting for 66.7%), including snacks purchased near the school gate. Incidents occurring **within the school** accounted for a smaller proportion (24.2%), while **poisoning at home** was the least common (15.2%).

Street foods consumed during transit are often highly diverse and appealing, such as fried or deep-fried items (e.g., fried fish balls, beef balls, sausages, fried quail eggs, French fries, fried buns). These popular snacks are frequently prepared using repeatedly reused cooking oil, containing harmful substances and prone to spoilage. Other snack items include mixed rice paper, seasoned mango, pickled guava or tamarind, preserved fruits, traditional candies, popsicles, and iced desserts. Many of these are

prepared with additives of unknown origin, artificial colorings, or chemical sweeteners. Beverages, including milk tea, soft drinks, syrups, iced drinks, and iced coffee, may also contribute to poisoning, particularly when prepared with inadequately boiled water or ice made from unclean sources, leading to gastrointestinal disturbances. Fast food items, such as sandwiches, stuffed buns, sausages, baked goods, and roasted corn, are often sold without proper covering, exposing them to dust and insects, which increases the risk of microbial contamination.

Thus, it is evident that **street food consumed during commutes lacks strict food safety control**, with preparation and storage practices often insufficiently hygienic. In contrast, food consumed **at home or within schools** is generally safer due to stricter oversight, resulting in a lower risk of food poisoning.

The primary reasons why secondary school students frequently consume street food include **convenience, low cost, and appealing taste**. These foods are often sold along commuting routes, particularly near school gates, making them easily accessible for students during breaks or after school. Many students lack adequate awareness of food hygiene, while parents are often busy and have limited time to prepare supplementary meals, leading students to rely on street food as a daily habit. Additionally, some vendors, motivated by profit, use low-quality ingredients, repeatedly reuse cooking oil, and add unregulated additives and colorings, thereby increasing potential health risks. Food sold near school gates is frequently uncovered, poorly stored, and prepared under unhygienic conditions. A study published in the *Vietnam Journal of Medicine* (2021) also indicated that only about **70% of vendors possessed correct knowledge of food safety**, while proper practice rates were much lower, further elevating the risk of food poisoning among students (5, 7).

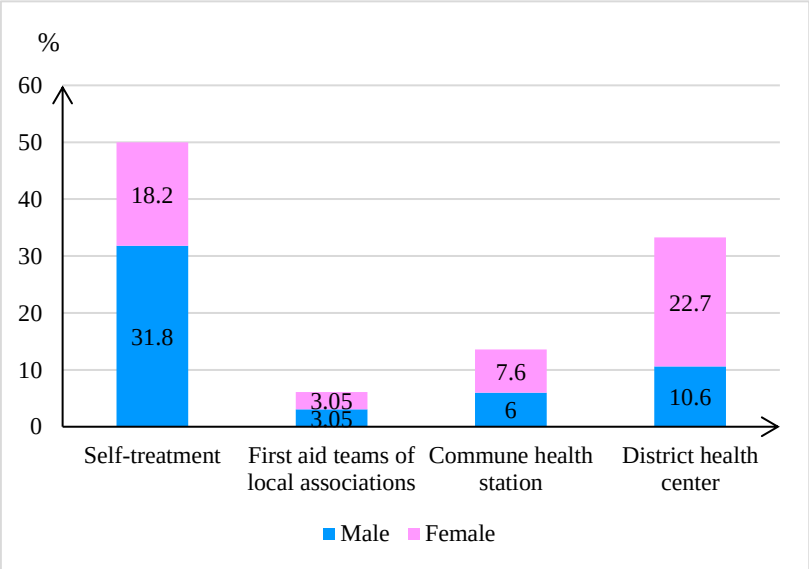

Figure. Initial Treatment Following Poisoning among Students at Nguyen Binh Khiem Secondary School

The consequences of consuming unsafe food are particularly severe for students in developmental stages. They may experience **acute food poisoning**, presenting with symptoms such as abdominal pain, nausea, diarrhea, and fever. If such episodes are prolonged or recurrent, they can adversely affect the **digestive system, liver, kidneys, and nutrient absorption**. In the long term, the consumption of contaminated food may lead to **malnutrition, reduced immunity**, and negatively impact both the **physical and cognitive development** of students.

In practice, following poisoning incidents, the majority of students (**50.0%**) self-treated at home, with **male students accounting for 63.6%** and **female students 36.4%**. This indicates that most parents or students tend to manage initial symptoms themselves rather than seeking medical care for proper examination and treatment. Self-treatment typically involves measures such as drinking warm water, saline solutions, or using traditional remedies, without medical supervision, which can lead to complications or prolonged recovery. Approximately **33.3% of students** received treatment at the **District Health Center**, which is equipped with professional medical staff and facilities capable of managing moderate to severe poisoning cases. The proportion of **female students treated at this center was higher than males (68.2% vs. 31.8%),** suggesting that parents of female students may be more cautious in seeking medical care. Additionally, only **13.6% of students** were taken to the **Commune Health Station**, and **6.1% received first aid from local health teams or nearby facilities**, reflecting limited coordination among schools, families, and local health services in managing food poisoning incidents.

3.3. Preventive Measures against Poisoning for Students at Nguyen Binh Khiem Secondary School

The current situation at Nguyen Binh Khiem Secondary School indicates that **initial first aid and guidance for students on how to respond to poisoning symptoms have not been adequately emphasized**. To ensure the health and safety of students, the school needs to implement **comprehensive and practical measures** that are adapted to local conditions, while strengthening **collaboration with health authorities** in the areas of food safety education, training, and monitoring.

According to Roberts et al. (2014), implementing a **school-based food safety program** based on the **HACCP (Hazard Analysis and Critical Control Points) principles**—a food safety management system designed to prevent food poisoning by controlling risks from the outset—significantly reduces the risk of poisoning and enhances kitchen staff awareness of proper food hygiene procedures. This suggests that applying similar standards at Nguyen Binh Khiem Secondary School could contribute to **improving the safety of school meals** (8).

Moreover, a study by Machado et al. (2014) indicated that the **knowledge and practices of individuals directly involved in food preparation or sale within schools significantly influence the risk of poisoning**. When vendors lack proper training or knowledge, behaviors such as preparing food on unsanitary surfaces, storing food at inappropriate temperatures, or repeatedly reusing cooking oil can lead to food contamination (9). Additionally, according to La Ngoc Quang et al. (2023), the **level of knowledge and practice regarding food safety among family meal caregivers directly affects children's health**. When parents are uninformed about selecting, storing, and preparing food, children are more likely to be exposed to unsafe food, increasing the risk of poisoning (10).

Based on these findings, several specific measures should be implemented:

First, schools need to develop **regular food hygiene and safety education programs**. Educational content should be integrated into class activities, flag-raising sessions, or extracurricular events under themes such as *"Say No to Unsafe Food"*. Students should be taught how to **recognize signs of food poisoning, properly store food, and respond appropriately when someone experiences poisoning** (11).

Second, it is essential to **strengthen inspection and supervision of food safety within and around the school**. The school should collaborate with the Parent-Teacher Association and local health authorities to regularly inspect food vendors near the school gate. If establishments fail to meet hygiene standards, authorities should be notified to enforce corrective measures or temporarily suspend operations. Additionally, for schools with canteens or boarding kitchens, the **"3 Checks – 3 Sample Retention"** procedure should be strictly implemented: verifying the origin of ingredients, monitoring the preparation process, and ensuring proper storage conditions; food samples should be retained for the prescribed period to facilitate traceability in case of incidents.

Third, training in **first aid and food poisoning response** should be organized for teachers, school health staff, and students. Local health stations can collaborate to provide practical guidance on essential skills, such as safe induction of vomiting, symptom monitoring, and immediate response to poisoning cases. This approach enhances the ability to react promptly and reduces the risk of complications before seeking professional medical care.

Fourth, parents should be educated to **enhance awareness of preparing hygienic meals** for their children. Schools can provide periodic recommendations regarding foods to avoid or guidance on selecting safe food, helping to reduce students' reliance on unsafe snacks purchased near the school.

Finally, **local authorities** should work to create a **"green – clean – safe" environment around schools**, including reorganizing street vending areas and encouraging vendors to comply with food hygiene regulations, thereby contributing to the protection of students' health.

Through the **coordinated implementation of these measures**, Nguyen Binh Khiem Secondary School can effectively enhance food poisoning prevention and ensure a **safe and healthy learning environment** for students.

4. CONCLUSION

Food poisoning among students at Nguyen Binh Khiem Secondary School represents a **significant concern**, reflecting the current inadequacies in food safety both **inside and around the school**. Survey results indicate that the majority of poisoning cases are associated with the consumption of **unsafe foods**, particularly **street foods sold near the school gate**. Contributing factors include students' indiscriminate eating habits, parental negligence, and limited inspection and supervision.

The consequences of food poisoning extend beyond immediate impacts on students' **physical and mental health**, also disrupting learning activities and causing anxiety among parents and teachers. In most cases, the response to poisoning incidents relies on **self- or family-managed interventions** rather than professional medical care, which may pose additional health risks. Therefore, **raising awareness of food safety** is of critical importance.

Through measures such as **educational campaigns, systematic monitoring, collaboration between schools, parents, and health authorities, and training in poisoning response skills**, Nguyen Binh Khiem Secondary School can proactively **prevent and reduce the risk of food poisoning** among students. Ensuring food safety in schools is not only the responsibility of the educational institution but also a **shared duty of families, communities, and local authorities**, contributing to the creation of a **safe, healthy, and sustainable educational environment** for students.

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