

Safety and health risk assessment of a traditional Indonesian market

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Abstract

Background: The activities of traders and visitors in the market have potential hazards that pose safety and health risks. Thus, understanding the risks and the threats is a necessity.

Objective: This study aimed to identify hazards, analyze safety and health risks, and design risk control efforts that market managers can apply.

Methods: This research was qualitative research with an observational approach. The informants were selected purposively: the head of the Siteba Market Technical Implementation Unit, security officers, traders, and visitors at the Siteba Market, Padang City, Indonesia. The instruments used were checklists and interview guides. Risks were analyzed manually based on the AS/NZS 4360 standard matrix.

Results: The research results using the elicitation method identified ten potential safety and health hazards in Siteba Market. The safety and health risks for traders and visitors to Siteba Market consisted of seven high risks and three medium risks. Potential high risks were accidents, pickpockets, fatigue, slipping, falling, and jostling during emergencies and fires. Meanwhile, the potential risks consisted of traffic jams, indigestion, and scattered merchandise.

Conclusion: Traders and visitors were potentially exposed to safety and health. Community organizing efforts through the occupational health business post need to be activated by the health centers to carry out preventive and promotive measures for safety and health in the market.

Keywords: safety; risk; trader; market; assessment; Indonesia

Background

The Siteba Market was originally a traditional market located on the outskirts of Padang city, Indonesia. However, this market is related to history, and its location differs from other conventional markets. Along with the city's development, Siteba Market, located on Siteba Highway, is surrounded by densely populated residential areas, making Siteba

Market always crowded with buyers every day and throughout the day.

Siteba Market has been around since the 1960s; the first location of this market was beside the Batang Kuranji River, which passes through Nanggalo District or approximately 400 m south of the current Siteba Market. People at that time knew it as the Nanggalo Morning Market. Around the 1970s,

traders and buyers selling at Siteba Market began to experience an increase in transactions that made traders and community leaders look for new market locations. So that the market location is now in the Surau Gadang area, Nanggalo District, Padang City.

The results of initial observations show that several activities are usually carried out at the Siteba Market, such as buying and selling, culinary activities, market management, mechanics, and security. These activities as a whole can have the potential to cause adverse impacts or consequences for both visitors and traders. Such as fires due to electrical short circuits, flammable objects or items, gas stove explosions from culinary activities, and the danger of being electrocuted. There have been many fires in other traditional markets in Indonesia, namely the Senen Market in Jakarta fire on 25 April 2014, Klitikan Market on 18 September 2014, and Klewer Market in Solo on 24 December 2014. Overall short circuits have become the cause of traditional market fires. In addition to electrical hazards, there is also a gravity hazard as the cause of people being crushed by goods or property on the market. Environmental hazards include poor environmental hygiene, sanitation from food sold, and waste in the market area (Januarti et al., 2020).

Gas leaks and sparks from charcoal during cooking activities can also be the cause of market fires (Addai et al., 2016). This condition is why the industrial sector has a very high fire risk, especially the market. A report issued in New Zealand said that more than a thousand cases of fires during the period from 2010 to 2012. Market fires are one of the most prominent health and safety hazards faced by traders in Ghana (Alfers, 2009).

The increase in the number of visitors to the Siteba Market creates unsafe conditions for visitors. Unsafe conditions that usually occur in traditional markets can be seen from the type and area of the kiosk unit, the effectiveness of space utilization, the width of the circulation path, zoning (regional determination), accessibility and circulation system, air conditioning, public facilities, and clean water utilities and dirty water utilities (Gusti, 2020). This can interfere with the comfort and safety of visitors when shopping. Therefore, the market manager is responsible for the convenience of traders and visitors while moving, both in terms of health and safety.

Siteba Market stands on an area of $\pm 217,250$ m² with land belonging to the Padang City Government. The number of traders who occupy shops or kiosks and stone tables is approximately 170, and street vendors are 350. The commodities sold are generally primary and secondary goods with retail trade nature and local service scale. To get what they want causes visitors to jostle. This condition can cause problems or make evacuation in a disaster or emergency difficult. Unsafe conditions and unsafe actions can cause accidents and health problems in Siteba Market. Supposedly the safety and health of visitors and traders in the market can be guaranteed if the market manager makes anticipatory efforts to manage occupational safety and health risks in the market environment.

From the description above, it can be seen that there is a need to implement occupational safety and health-related efforts to carry out risk assessments in the market. In addition, a risk assessment is needed to identify, assess and prevent a more severe impact and can be an effort to avoid the occurrence of a risk (Aven, 2016). Therefore, this research focused on identifying potential hazards and assessing occupational safety and health risks and their control efforts in the Padang City Siteba Market environment.

Methods

Study Design

This was qualitative research with an observational approach aimed to observe the type of activity, and the location of the activity assumed to be a potential hazard to the occupational safety and health of the community in the Siteba Market.

Participants

The number of informants in this study was seven: three traders, three visitors, and one head market officer. All informants were selected purposively with the principles of adequacy and accuracy.

Data Collection

Data collection techniques were elicitation and observation confirmed by interviews. Informants only served as confirmation of the identification by researchers because they understand the situation and their daily activities in the Siteba Market. Hazard identification elicited 45 respondents consisting of 20 visitors, 20 traders, and five market managers.

Risk analysis and control are carried out by triangulation through informants.

Data Analysis

The data were analyzed using the Miles and Huberman model consisting of three steps: data reduction, data presentation, and drawing conclusions or verifications. First, the data was compared to the 2014 AS/ZNS 43260 standard (Australia, 2003), categorizing the results of observations based on activities and working environmental conditions. The next stage was assessing the risk level based on severity (consequence) and the frequency level (probability). Finally, the observation data was confirmed by interview results related to potential hazards, risk assessment, and control efforts that have been

carried out based on the risk/hazard control hierarchy for Siteba Market managers.

Ethical Considerations

Ethical consideration was obtained from the Ethical Committee of the Faculty of Public Health, Universitas Andalas, Indonesia.

Results

Identification of the Potential Hazards

Hazards identified in each activity and location resulting from the elicitation of answers from respondents are then prioritized by taking the highest rank as a potential hazard. The results of identifying these potential hazards can be seen in

Table 1.

Table 1 Identification of potential hazards

Activity	Hazards	Risks
Parking and traffic in front of the market	Busy traffic on weekends or holidays	Accident
	There are no entrance and exit signs	Congested
Buying and selling activities	Narrow lane	Pickpocket
	No zoning	Fatigue
Culinary activities	Food is not covered	Foodborne illness
Building structure, trading desk, and floor condition	The floor of the meat/fish stall is watery and slippery	Slip
	The toilet is dark and inadequate.	Fall accidentally
Safety and wild animals	Cats and goats enter the market	Merchandise scattered
Emergency access	There is no indication of the evacuation route	Crowded during an emergency
	No light fire extinguisher	Fire

Risk Assessment and Control

Risk control management was carried out by evaluating each risk impact or consequence of the hazards in each activity and location, then making recommendations for management options. Occupational safety and health risk assessment use a matrix where Likelihood/ Probability (P/likelihood) is multiplied by Severity/ Consequence (K/severity), each of which has a coverage value of 1 to 5 points for severity (K) and A to E. for probability (P)—then compared with the standard AS/ZNS 43260 2014. Risk assessment and control based on activities at the Siteba Market in Padang City can be seen in **Table 2.**

Discussion

The Siteba Market has sources of hazards and potential occupational safety and health risks for visitors and traders who are grouped by activity and

location. The first is the potential risk to occupational safety and health in traffic and parking activities at the Siteba Market. The risk of accidents may occur due to the heavy traffic on weekends and holidays in front of the market. Therefore, the recommended control is to ask personnel for assistance from the Transportation Agency to manage traffic on weekends and holidays.

In addition to heavy traffic on weekends and holidays, the potential danger of vehicular traffic in the Siteba Market is the absence of entry and exit signs and parking signs. This condition poses a second risk of congestion at the entrance and exit and potential damage to the vehicle body due to collisions or friction between vehicles. For this reason, it is recommended that market managers provide exit and entry signs and parking instructions for both 4-wheeled and 2-wheeled vehicles.

Table 2 Risk assessment and control

Risk	Risk Assessment		Risk Level	Current Control	Control Recommendations
	Consequently	Probability			
Accident	3	B	High		Administrative: <ul style="list-style-type: none"> Requesting personnel assistance from the Transportation Agency to manage traffic on weekends and holidays.
Traffic jam	2	C	Moderate	Arranged by the parking attendant	Technique: <ul style="list-style-type: none"> Provide exit and entry lane signs as well as parking arrangements for both 4-wheeled and 2-wheeled vehicles
Pickpocket	3	B	High		Technique: <ul style="list-style-type: none"> Provides a one-way line Administrative: <ul style="list-style-type: none"> Reprimand traders arrange their displays to avoid hindering the buyer's path.
Fatigue	3	C	High		Technique: <ul style="list-style-type: none"> Rearrange merchant zoning
Indigestion	2	C	Moderate		Elimination: <ul style="list-style-type: none"> Carry out vector control in collaboration with the Health Office. Administrative: <ul style="list-style-type: none"> Separate the location of the food seller from the grocery seller. Reprimand the food seller who did not close his wares.
Slip	3	B	High	Traders mop every day. Merchants always remind visitors to be careful.	Technique: <ul style="list-style-type: none"> Replacing the floor with a mat surface. Personal Protective. Equipment: <ul style="list-style-type: none"> Using boots
Fall accidentally	2	B	High		Technique: <ul style="list-style-type: none"> Improved toilet lighting and increased the number of toilets in market locations
Merchandise scattered	1	B	Moderate		Elimination: <ul style="list-style-type: none"> Cooperate with the Animal Husbandry Service to eradicate wild animals Administrative: <ul style="list-style-type: none"> Outreach to pet owners to confine their pets
Crowded during an emergency	3	C	High	Socialization by market officers	Technique: <ul style="list-style-type: none"> Installing evacuation directions Administration: <ul style="list-style-type: none"> Periodic socialization among traders and market visitors
Fire	4	D	High		Technique: <ul style="list-style-type: none"> Provide a fire extinguisher in each zone or block. Administrative: <ul style="list-style-type: none"> Conduct training on using Light Fire Extinguishers for traders and market managers in an emergency.

The second potential occupational safety and health risk in the Siteba Market are in buying and selling activities. Narrow lanes between the stalls of traders may be a potential risk of pickpocketing for visitors. The second potential risk is the fatigue experienced by visitors because there is no merchant zoning, so visitors have to go back and forth to find their needs. Traders stated that there was no firmness from market officials, and traders' indiscipline was the cause of the non-operation of traders' zoning. The stakeholders in the Sindangkerta Market, West Bandung Regency, traders, visitors, and government officials want an arrangement to create order and comfort for all parties (Sriharyati & Marlina, 2021).

The recommended recommendation for narrow lanes is to provide one-way lanes and admonish traders to arrange their displays to prevent buyers' paths. But on the other hand, proper environmental arrangements can provide convenience for traders and attract visitors' sympathy (Utari et al., 2021). Thus, market managers should rearrange the zoning of traders with careful analysis, considering the convenience for visitors and market traders.

The third is the potential health and safety risks in culinary activities at the Siteba Market. The potential risk in culinary activities at the Siteba Market is indigestion due to foodborne illnesses from unhygienic food presentation. Traditional food markets are often associated with the spread of zoonotic diseases and foodborne disease outbreaks (World Health Organization, 2006). In addition, unsafe foods containing bacteria, viruses, parasites, or harmful chemicals cause more than 200 illnesses ranging from diarrhea to cancer (Bintsis, 2017; Gizaw, 2019).

Some traditional food markets represent a food safety and health risk that can only address by improving hygiene and sanitation conditions (World Health Organization, 2021). The risk level for digestive disorders at Siteba Market is moderate; the impact is mild and can occur anytime. The recommended control for the risk of indigestion due to foodborne illness in the Siteba Market is elimination and administration. By eliminating by carrying out vector control in collaboration with the Health Office and administratively separating the location of food sellers from food sellers and

reprimanding food sellers who do not close their wares.

Fourth is the potential risk to the building structure, trading desk, and floor conditions. The first potential risk of slipping is the danger of slippery and watery floors. A slip is defined as a loss of traction on the foot. Slips and falls are primary sources of injury at work, at home, and in our leisure activities (Chang et al., 2016; Li et al., 2019). The potential risk of slipping due to slippery and watery floors is high because it may occur with the impact of a moderate injury that requires medical treatment. In addition, this condition is one of the leading causes of losing competition between traditional markets and supermarkets due to weak management and poor traditional market infrastructure (Smeru, 2007).

The control recommendation for the potential danger of falling and slipping is to replace the floor surface with a more mat and encourage traders to wear boots (safety shoes), in the form of shoes with a rubber base, thereby reducing the risk of slipping due to slippery floors (Work Safe, 2021). The second potential risk is falling due to dark toilets and scrambling due to the inadequate number of toilets. Finally, the bad image of traditional markets, which are slums, chaotic, dirty, and a source of traffic jams, must receive great attention because it is related to the livelihoods of many people (Purwanti, 2017). Suggested recommendations are to improve lighting, increase the number, and improve toilets' cleanliness and appearance or beauty in market locations.

The five potential safety and health risks on the security sector and wild animals entered and left the market. The potential risk of wild animals entering the Market area is scattered merchandise due to animals entering the market. In addition, health risks are also likely to occur due to bites from wild animals. Pets that are not correctly cared for are likely to be in a box with an animal infected with rabies, resulting in the bite of a rabies-positive animal (Kakang et al., 2017). Therefore, the recommended recommendation is to eliminate wild animals in collaboration with the Animal Husbandry Service to eradicate wild animals and administratively through socialization to animal owners to confine their pets.

The last is the potential risk to occupational safety and health in emergency access at the market. The first risk is crowding each other during an emergency such as an earthquake or fire. The second is the uncontrollability of small fires so that they have the potential to grow because of the unavailability of light fire extinguishers. Market fires are still a frightening specter in Indonesia. Safety is the user's assessment criteria regarding the guarantee of his safety during activities in the market area (Ferguson et al., 2020). The recommendation for control is to make evacuation route signs and periodically socialize with traders and market visitors about disaster mitigation. Market managers are to provide fire extinguishers in each market zone or block and provide training on using fire extinguishers for traders and market managers.

The application of risk management helps ensure business continuity by reducing the risk of any activities that contain hazards and reducing costs for dealing with unwanted events (Torabi et al., 2016). Therefore, the Padang City government needs to coordinate the implementation of risk management by activating the occupational health unit in the market, considering that there are many potential hazards. Determining the control must consider the control hierarchy starting from elimination, substitution, technical management, administrative, and PPE.

Conclusion

The Siteba Market has a variety of activities and locations that can pose occupational safety and health risks for visitors and traders. Potential hazards identified based on activities and locations in the Siteba Market consist of ten types, and occupational safety and health risks also comprise ten types. The occupational safety and health risks for traders and visitors to Siteba Market consist of seven high risks and three medium risks. Potential high risks are accidents, pickpockets, fatigue, slipping, falling, and jostling during emergencies and fires. Meanwhile, the potential risks consist of traffic jams, indigestion, and scattered merchandise.

The most crucial process of risk management is risk control efforts. Control efforts are carried out to reduce occupational safety and health risks in each activity and location at the Siteba Market, Padang City. Local government institutions are crucial to

improving the working conditions of traders. Community organizing efforts through the Occupational Health Business Post need to be activated by the health center with the Siteba Market work area so that preventive and promotive safety and work activities in the market can be carried out sustainably. Market managers need to consistently give warnings to traders and visitors about the dangers of fire and provide training on the use of light fire extinguishers to traders, educate street food vendors to cover the food they sell, and remind fish and meat traders to use personal protective equipment such as boots and wear gloves—rubber gloves to prevent the risk of slipping and getting injured.

Declaration of Conflicting Interest

All authors declared no conflict of interest in this study.

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Author Contribution

AG wrote the article, conducted the study, and supervised all the data collection. FY supervised the research protocol design. All of the authors checked the paper before submitting it to be published.

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