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# Detection of Potential Occupational Health and Safety Risks (K3) in Nursing Education Laboratories

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## ABSTRACT

**Purpose –** This research was conducted with the aim of minimizing various hazard risks to students, educators, and staff in nursing education laboratories through the implementation of HIRARC (Hazard Identification, Risk Assessment, and Risk Control).

**Design/methods/approach –** This research adopts a descriptive-analytic approach focusing on Occupational Health and Safety (K3) in nursing education laboratories. The HIRARC method is used to analyze hazard risks through the processes of hazard identification, risk assessment, and risk control. Data from hazard identification and risk assessment serve as the basis for determining risk control measures.

**Findings –** Based on the analysis of occupational health and safety risk, it was found that the Nursing Laboratory at Blora, Poltekkes Kemenkes Semarang, has a low-risk hazard potential of 45%, a moderate-risk potential of 40%, and a high-risk potential of 15%. These risks stem from electrical equipment, sharp instruments, corrosive materials, and other laboratory environmental factors. The majority of the risks are low-level, and the results indicate that the Blora Nursing Laboratory is relatively safe for users to conduct activities.

**Research implications/limitations –** This research illustrates the remaining potential for moderate and high risks in the laboratory, highlighting the need for hazard controls such as understanding Standard Operating Procedures (SOPs), provision of Personal Protective Equipment (PPE), and the safe use of laboratory facilities and equipment.

**Originality/value –** The occupational safety and health risks in the Nursing Education Laboratory need to be regularly assessed as a basis for establishing hazard control measures in the laboratory.

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## Introduction

The nursing laboratory is a type of educational laboratory that serves as an academic support facility in higher education institutions (Khikmatul Arfiana & Noor Fanika, 2023). The use of equipment, materials, and facilities in laboratory practicals presents potential hazards, including physical, chemical, biological, and ergonomic risks, which could lead to workplace accidents in the laboratory. A hazard is an intrinsic factor associated with something (such as an object, activity, or condition), for example, pesticides on vegetables or heat emitted from an airplane engine (Sihombing, 2021)(Rofiani et al., 2023). This hazard remains a potential risk until it causes consequences or evolves into an accident, which only occurs if there is exposure to humans (Syeiba Badra Uyunillah et al., 2022). Based on the type, hazards can be classified into primary and secondary hazards. Primary hazards include physical, chemical, biological, ergonomic, and psychosocial risks (Cahyaningrum, 2020). Secondary hazards, also known as secondary risks, are those that arise as a result of the interaction between components of a task (which can also function as sources of primary hazards) (Bahtiar et al., 2024). This interaction is commonly referred to as work/system processes. Hazards can be identified through Job Safety Analysis, a method to examine potential hazards in each work step and determine ways to eliminate or reduce those hazards. Hazard identification is also understood as the process of recognizing events and processes that may cause workplace accidents and occupational diseases, so that preventive actions can be taken to avoid losses in the workplace (Awaluddin et al., 2020).

The method for recognizing hazards in the workplace can be carried out through hazard identification efforts. Without prior recognition, hazards cannot be controlled (Syeiba Badra Uyunillah et al., 2022). HIRA (Hazard Identification and Risk Assessment) is a method or technique used to identify events or conditions that potentially pose risks by examining the characteristics of potential hazards and evaluating the resulting risks through risk assessment using a risk assessment matrix (Pati et al., 2023)(Mohamed Nabil Attia et al., 2018). Risk assessment can be conducted using the equation Risk = Likelihood x Severity, where likelihood refers to the probability of an event occurring and severity refers to the level of impact. The likelihood scale ranges from 1 to 5, as does the severity scale (Daulay & Hidayah, 2021)(Alshammari et al., 2021). Risk control (RC) aims to minimize the risk level of existing hazards. Hazard control is carried out by considering a hierarchy of control measures such as elimination, substitution, engineering controls, administrative controls, and personal protective equipment (PPE).

Elimination is a permanent risk control that removes the source of the hazard from the workplace and should be attempted as the top priority option. Substitution involves replacing or separating hazardous materials or equipment with safer alternatives (Rahayu et al., 2022)(Maulana, 2024). This process is also supported by PPE controls, such as masks, to reduce exposure to harmful odors from certain substances (Rahmadhani, 2017). Engineering control refers to altering the structure of an object to prevent someone from being exposed to a potential hazard.

Administrative controls involve establishing or providing work systems that reduce the likelihood of exposure to hazards in the laboratory. The hierarchy of PPE control is used to create a boundary between the body and potential hazards, thus protecting individuals from exposure. PPE controls are the most widely applied and account for 44% of all control measures in laboratories. Safety glasses, hearing protection, face shields, respirators, and gloves are examples of PPE controls (Wahyunan et al., 2019).

Accidents that occur during work in nursing education laboratories reflect the experiences of users such as students, lecturers, and laboratory staff, and they highlight the need for increased vigilance when working in the laboratory. Several accident incidents that have occurred in the Nursing Education Laboratory in Blora over the past five years include needle injuries during recapping in injection practices, glass shards from opening ampul medication packages, splashes of alcohol and disinfectant chemicals on equipment, slipping in the equipment washing sink area, and other hazards that have not been further studied. Working in the laboratory should not involve careless actions when handling and using the equipment and materials present in the laboratory. This is aimed at reducing the likelihood of accidents in the laboratory.

Studies show that factors such as inadequate ventilation, limited personal protective equipment (PPE), and suboptimal standard operating procedures (SOPs) can increase the risk of accidents. For instance, in the State University of Makassar, limited PPE and poor ventilation in the laboratory were identified as recurring problems, thus highlighting the need for intensive training to improve compliance with safety standards in the laboratory (Datu et al., 2020). Research conducted at the University of Jember, focusing on SOPs for the use of hazardous chemicals and biological materials in educational laboratories, emphasized preventive measures such as the use of PPE and handwashing before and after handling hazardous materials. These practices have proven effective in reducing the potential for contamination and health risks (Atma et al., 2024).

The importance of awareness and safety culture among students is also highlighted by Cahyaningrum (2020), who stated that the implementation of a structured occupational health and safety (OHS) program can reduce accident incidents and promote safe behavior in the laboratory environment. This implementation requires commitment from all parties in the laboratory to eliminate risks through appropriate monitoring and training, as well as support from the institution in providing facilities that meet OHS standards (Cahyaningrum, 2020).

This research aims to identify potential hazards, assess the level of risk, and analyze follow-up actions to reduce or even eliminate existing sources of hazards in the Blora Nursing Laboratory through determining control measures, ranging from hazard elimination to the implementation of administrative controls in order to minimize work accidents during practical sessions. The urgency of this research lies in the fact that the Blora Nursing Laboratory is an educational facility located in a newly constructed building, and no Health and Safety Risk Analysis (K3) has been conducted for this laboratory. Therefore, a research is necessary to analyze the hazard sources that could pose a risk of accidents during practical activities in the laboratory and to provide recommendations for controlling these work-related accident risks in the educational laboratory.

## Methods

This study is a descriptive quantitative research using the Hazard Identification Risk Assessment and Risk Control (HIRARC) method. The researchers first conducted observations, followed by data analysis starting from identifying activities and field conditions in detail that have the potential to cause work accidents. Then, a risk assessment was carried out, and the risk level in the laboratory was determined. The data used in this study were obtained through several data collection steps, including: observation or identification of the environment, machinery/tools, work procedures, as well as risk measurement, respondent interviews, and literature review. The researchers observed to identify various activities and conditions in the laboratory in detail that could pose hazards, followed by a risk assessment and determination of the risk levels. This research was conducted at the Blora Nursing Laboratory of Poltekkes Kemenkes Semarang from May to August 2024. The study involved 213 respondents selected using purposive sampling, specifically nursing students who are users of the laboratory.

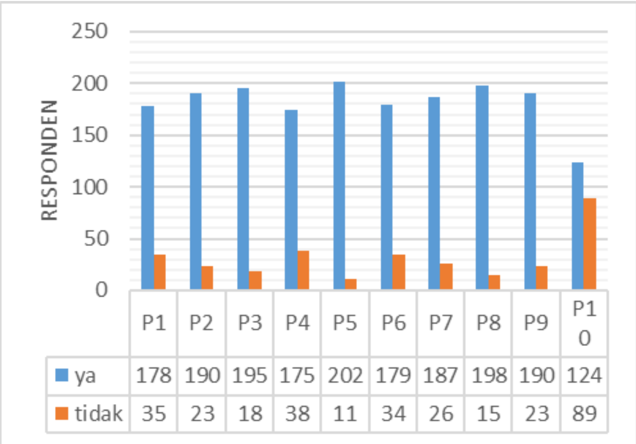
## Result

Based on the research results obtained through observations and interviews with respondents, some students who conducted practical work in the Nursing Laboratory of Blora Poltekkes Kemenkes Semarang were surveyed with 10 general questions regarding the implementation of Occupational Health and Safety (K3). The observations made aimed to identify hazards, assess risks, and control work accident risks caused by humans, materials, machines or equipment, substances, and the working environment in the laboratory.

### 1. Human Factors

**Figure 1**

*Distribution of Respondent Answers Regarding K3 in the Laboratory*




Note: *(Source: Primary Data, 2024)*

Figure 1, shows the research results obtained from interviews and observations with 213 respondents, who are users of the Nursing Laboratory at Blora Poltekkes Kemenkes Semarang. The results are as follows:

(1) In response to question 1, 178 respondents, or 83.56%, stated that K3 management has a significant impact on work accidents, while 35 respondents, or 16.44%, stated that K3 management has no significant impact on work accidents.

(2) In response to question 2, 190 respondents, or 89.20%, stated that the Nursing Laboratory has no K3 management system, while 23 respondents, or 10.80%, stated that the Nursing Laboratory has a K3 management system.

(3) In response to question 3, 195 respondents, or 91.54%, stated that the laboratory has a Standard Operating Procedure (SOP), while 18 respondents, or 8.46%, stated that the laboratory does not have an SOP.

(4) In response to question 4, 175 respondents, or 82.15%, stated that they follow the SOP in the laboratory, while 38 respondents, or 17.85%, stated that they do not follow the SOP in the laboratory.

(5) In response to question 5, 202 respondents, or 94.83%, stated that they understand the work procedures before conducting activities in the laboratory, while 11 respondents, or 5.17%, stated that they do not understand the work procedures before conducting activities in the laboratory.
(6) In response to question 6, 179 respondents, or 84.04%, stated that they maintain and take care of work equipment according to its function, while 34 respondents, or 15.96%, stated that they do not maintain and take care of work equipment according to its function.
(7) In response to question 7, 187 respondents, or 87.79%, stated that they return work equipment to its designated place, while 26 respondents, or 12.21%, stated that they do not return work equipment to its designated place.
(8) In response to question 8, 198 respondents, or 92.96%, stated that they always clean the area after working, while 15 respondents, or 7.04%, stated that they do not always clean the area after working.
(9) In response to question 9, 190 respondents, or 89.20%, stated that they dispose of trash in the designated place, while 23 respondents, or 10.80%, stated that they do not dispose of trash in the designated place.
(10) In response to question 10, 124 respondents, or 58.21%, stated that they always wear Personal Protective Equipment (PPE) while working in the laboratory, while 89 respondents, or 41.79%, stated that they do not always wear PPE while working in the laboratory.

## 2. Hasil *HIRARC* Laboratorium Pendidikan Keperawatan

**Table 1**

*Result of HIRARC in the Nursing Education Laboratory*

| No | Cause Factor | Potential Hazard | L (Likelihood) | S (Severity) | RR (Risk Rating) | Risk Control | |
|---|---|---|---|---|---|---|---|
| | | | | | | **Administrative Control** | **PPE/ (APD)** |
| **Material** | | | | | | | |
| **1** | Alcohol | Dizziness and drowsiness | 2 | 2 | 4 (Low) | Reading SOP before working, providing PPE and first aid kit | Use of PPE (handscoon, mask, apron, etc.) |
| **2** | Alcohol | Fire | 2 | 4 | 8 (High) | Reading SOP before working, providing PPE and first aid kit, Fire extinguisher (APAR) | Use of PPE (handscoon, mask, apron, etc.) |
| **3** | HCL | Skin burns | 1 | 3 | 3 (Low) | Reading SOP before working, providing PPE and first aid kit | Use of PPE (handscoon, mask, apron, etc.) |
| **4** | HCL | Skin allergies | 1 | 2 | 2 (Low) | Reading SOP before working, providing PPE and first aid kit | Use of PPE (handscoon, mask, apron, etc.) |
| **5** | Ampoule | Hand punctured by | 2 | 3 | 6 (Medium) | Reading SOP before working, | Use of PPE (handscoon, |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | ampoule shards | | | | providing PPE and first aid kit | mask, apron, etc.) |
| **6** | Oxygen tank leak – humidifier | Fire | 1 | 4 | 4 (Low) | Reading SOP before working, providing PPE and first aid kit | Use of PPE (handscoon, mask, apron, etc.) and installation of safety signs |
| **7** | Povidone iodine | Corrosive | 3 | 2 | 6 (Medium) | Reading SOP before working, providing PPE and first aid kit | Use of PPE (handscoon, mask, apron, etc.) |
| **Mechine** | | | | | | | |
| **8** | Syringe needle | Punctured hand by needle | 3 | 3 | 9 (High) | Reading SOP before working, providing PPE and first aid kit | Use of PPE (handscoon, mask, apron, etc.) |
| **9** | Hecting needle | Punctured hand by needle | 3 | 2 | 6 (Medium) | Reading SOP before working, providing PPE and first aid kit | Use of PPE (handscoon, mask, apron, etc.) |
| **10** | Surgical scalpel | Cut on hand | 1 | 3 | 3 (Low) | Reading SOP before working, providing PPE and first aid kit | Use of PPE (handscoon, mask, apron, etc.) |
| **11** | Simulator/ electrical equipment | Electric shock | 2 | 2 | 4 (Low) | Reading SOP before working, grounding the equipment | Use of PPE (non-conductive footwear) |
| **12** | Bed/ patient bed | Foot crushed by wheels | 3 | 2 | 6 (Medium) | Reading SOP/Device Instructions before practicum | Use of PPE (footwear) |
| **Method/ Work Procedure** | | | | | | | |
| **13** | Sterilization of tools and materials | Radiation exposure if oven is not properly closed | 3 | 2 | 6 (Medium) | Reading SOP before working, providing PPE and first aid kit | Use of PPE (handscoon, mask, apron, etc.) |
| **14** | Sterilization of tools and materials | Burns (blisters) when transferring products from the oven | 3 | 2 | 6 (Medium) | Reading SOP before working, providing PPE and first aid kit | Use of PPE (handscoon, mask, apron, etc.) |
| **Working Environment** | | | | | | | |
| **15** | Lighting | Eye strain and irritation | 1 | 2 | 2 (Low) | Check for insufficient lighting | Use of PPE (glasses) |
| **16** | Temperature | Dehydratio n | 2 | 2 | 4 (Low) | Adjust air conditioning temperature as needed, routine AC maintenance | Use of PPE (laboratory coat, footwear) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **17** | Noise | Disrupts concentration | 2 | 2 | 4 (Low) | Reading SOP before working, limiting people in the laboratory, enforcing penalties for violations | |
| **18** | Lack of fire extinguisher (APAR) | Fire | 2 | 3 | 6 (Medium) | Reading SOP before working, providing PPE, APAR, and first aid kit | Use of PPE (gloves, mask, lab coat, etc.) |
| **19** | Sink leakage | Slipping | 4 | 2 | 8 (High) | Drying pooled water, providing first aid kit | Use of PPE (safety shoes) |
| **20** | Glass storage cabinet | Glass scratches | 3 | 2 | 6 (Medium) | Using PPE | Installation of safety signs |

Note: *(Source: Primary Data, 2024)*

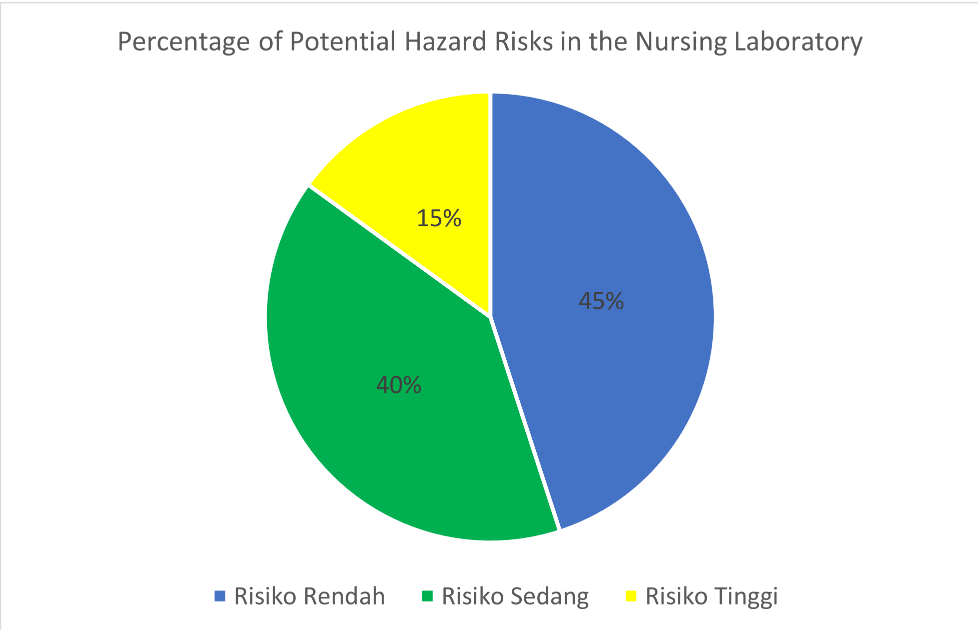
## Discussion

1. Hazard Identification

The primary classification of hazards can be divided into human factors, equipment, materials/chemicals, and the environment. Based on the results of the observation, the following are the percentages of hazard risks sourced from equipment, materials, and the environment in the Nursing Laboratory at Blora:

**Figure 2**

*Percentage of Potential Hazard Risks in the Blora Nursing Laboratory*




Note: *(Source: Primary Data, 2024)*

The results of the percentage indicate that the Nursing Laboratory has a potential hazard risk of 45% at a low level, followed by 40% at a moderate risk level, and 15% at a high-risk level. These data demonstrate that the Blora Nursing Laboratory is relatively safe for its users, with a significant percentage of low-level hazard risks.

The potential hazard risks can be caused by various factors, including material components, machinery, methods or procedures, and environmental factors. Hazards originating from materials may include alcohol liquids, HCl liquid, ampul packaging drugs, oxygen leaks from cylinders or humidifiers, and iodine solution. Hazards from machinery may arise from syringe needles, hecting needles, surgical knives, electrical or electrically-based simulator tools, and patient beds. Hazard risks can also be associated with work procedure methods, such as the sterilization of tools and materials. Additionally, environmental conditions can pose risks, including room lighting, temperature and humidity, noise, lack of fire extinguishers (APAR) in the building, leaks in sinks, and storage cabinets made of glass (display cases).

2. Risk Assessment

Risk assessment is a method used to calculate the severity of risks that may occur in the laboratory. A hazard risk is a condition that has the potential to cause injury to individuals, damage to equipment and buildings, material loss, or reduce the ability to perform a specific function that has been designated (Rofiani et al., 2023). Based on this understanding, risk can be defined as the probability of an impact or consequence arising from a particular hazard.

According to the analysis of the research results, the Blora Nursing Laboratory has various primary hazard sources that present low, moderate, and high risks. Low risks are derived from materials such as alcohol, HCl liquid, and oxygen; machinery or tools such as surgical knives and electric simulators; and environmental factors such as lighting, temperature, and noise. Moderate risks stem from materials like ampul-packaged drugs and povidone-iodine liquid, machinery/tools such as patient beds, sterilization methods, and environmental factors including the absence of fire extinguishers (APAR) and glass storage cabinets (display cases). High-level hazard risks can arise from materials such as alcohol (fire hazard), machinery/equipment like syringe needles, and environmental factors like sink leaks.

The primary hazard sources from alcohol materials can present both low and high risks. Alcohol 70% is commonly used as a disinfectant to clean wounds or surfaces and is not intended for ingestion. If someone accidentally inhales its fumes or is exposed to a large quantity, it may lead to side effects such as drowsiness and dizziness (Zuhri & Dona, 2021). This potential risk is classified as low but can escalate to high risk if stored at high temperatures or near equipment with flame sources. The flame of alcohol is often pale blue and may be difficult to see, especially during the daytime, which could lead to someone unknowingly being exposed to an open flame (Said et al., 2023).

Other hazardous liquid substances in the laboratory include HCl. In the nursing field, hydrochloric acid (HCl) is not directly used in its pure form due to its highly corrosive and hazardous nature. Instead, mixtures containing hydrochloric acid in specific forms (typically at very low concentrations or combined with other substances) are employed in cleaning or disinfecting products for medical equipment. HCl is a strong acid that can cause chemical burns on the skin and allergic reactions due to its highly corrosive properties, meaning it reacts easily with biological tissues (Khasibudin et al., 2019). When HCl comes into contact with skin, it begins to damage the protective skin layers and underlying tissues, causing chemical burns. The severity of these burns depends on the concentration of HCl and the duration of exposure.

HCl exposure can also make the skin sensitive, potentially triggering allergic reactions in susceptible individuals. Such reactions may include rashes, hives, or contact dermatitis. While not everyone will experience an allergic reaction, individuals with sensitive skin or a history of allergies may be more vulnerable. Additionally, inhaling HCl fumes can irritate the respiratory tract and may trigger allergic responses such as shortness of breath or coughing, especially in individuals with asthma or other respiratory conditions (Rahmah et al., 2020).

Another hazardous liquid material, povidone iodine, also poses risks, particularly by causing corrosion of medical instruments made from specific metals. If medical instruments are left in prolonged contact with povidone iodine without proper cleaning, the risk of corrosion increases. Long-term contact with this solution can accelerate the corrosion process, damaging instrument surfaces. Residual povidone iodine left on instruments after use, if not adequately cleaned and dried, can react with air and moisture, further accelerating corrosion (Khan et al., 2023).

Additional hazards include oxygen leaks from tanks or humidifiers. Oxygen is a powerful oxidizing agent. During laboratory practices, where oxygen is often used in patient care simulations (such as oxygen therapy), there is a high risk of fire if an ignition source or spark is present. Leaking oxygen or its concentration near medical instruments or patient clothing can cause rapid and dangerous fires.

Another material-related hazard is associated with ampule-packaged medications. Medications in glass ampules can pose risks of hand injuries or punctures when being opened. These injuries can result from the fragility of the glass, improper technique in opening the ampule, absence of personal protective equipment (PPE), the presence of microscopic glass shards, or suboptimal ampule design.

Bahaya terkait material lainnya terkait dengan obat yang dikemas dalam ampul. Obat-obatan dalam ampul kaca dapat menimbulkan risiko cedera tangan atau tusukan saat dibuka. Cedera ini dapat disebabkan oleh kerapuhan kaca, teknik yang tidak tepat dalam membuka ampul, tidak adanya alat pelindung diri (APD), keberadaan serpihan kaca mikroskopis, atau desain ampul yang tidak optimal.

Hazards in the laboratory cannot be separated from machine or equipment-related sources. Syringes pose a significant risk in the laboratory due to their high potential to cause needlestick injuries (Santa Novita Yosephin Silalahi & Yas Suriani, 2022). Needlestick injuries are among the most common accidents in nursing laboratories. These injuries can occur when syringes are not disposed of properly, during attempts to recap needles, or while handling used needles (Alifariki & Kusnan, 2019). Non-compliance with established safety procedures, such as wearing gloves, avoiding needle recapping after use, and immediately disposing of needles into a secure sharps container, significantly increases the risk of injury in the laboratory (Herlinawati et al., 2021). Similarly, other equipment like suturing needles and scalpels used in wound care procedure practices also present hazards. However, their risk levels are lower compared to syringes due to their relatively lower usage frequency in the laboratory.

The use of electrical simulators also carries a risk of electric shock, particularly if the cables or components of the simulator are damaged, such as cracked or stripped insulation. Damaged insulation can expose users to electrical currents, leading to potential electric shocks upon contact with exposed parts. This risk is further heightened when the equipment is not operated according to proper instructions, such as incorrect cable connections, failure to inspect equipment prior to use, or using electrical simulators in wet or damp environments. Moisture can act as a conductor, increasing the likelihood of electric current flowing through the user's body.

Work methods or procedures can serve as primary hazard sources in laboratories. The use of sterilization processes for tools and materials presents medium-level risks, primarily due to potential exposure to thermal radiation and burn injuries. Certain sterilization methods, such as gamma radiation, X-ray, or ultraviolet (UV) light, rely on radiation to eliminate microorganisms. While highly effective, these methods can be hazardous if individuals are exposed without proper protective measures.

Equipment sterilized in an autoclave becomes extremely hot, and mishandling such items post-sterilization can result in skin burns. Additionally, opening the autoclave too soon after the sterilization process may release hot steam, which can cause burn injuries upon contact with the skin. To mitigate this risk, adequate cooling time must be allowed before opening the autoclave.

Environmental factors can also pose hazards in the laboratory setting. Lighting, temperature, and noise levels generally present low risks. However, the absence of fire extinguishers (APAR) and the use of glass storage cabinets or showcases (etalase) are classified as medium-level risks. A more frequently encountered high-risk hazard in laboratory environments is sink leakage, which often leads to slipping incidents and potential physical injuries from falls or collisions.

### 3. Risk Control in Nursing Laboratories

Once hazard categories are identified, risk control or prevention measures must be implemented to prevent future occurrences. Risk control should begin with high-risk categories, followed by medium and low risks. Identified hazards must be addressed immediately, as risks can escalate from low to medium, medium to high, or even high to extreme levels.

For reducing the potential risks posed by laboratory materials, risks categorized as low and medium can be mitigated by reading and adhering to Standard Operating Procedures (SOP) prior to commencing work, ensuring the availability and use of Personal Protective Equipment (PPE), and providing a First Aid Kit (FAK). For high-risk hazards such as fire incidents caused by alcohol, preventive measures include equipping the laboratory with fire extinguishers (Portable Fire Extinguishers - PFE) (Wahyunan et al., 2019).

To minimize the risk of accidents caused by machinery, such as low and medium risk levels, control measures include reading the applicable SOP before work, the availability and use of PPE, and the provision of FAK. For needlestick injuries, safety measures such as installing warning signs and providing safety boxes can effectively reduce risks (Herlinawati et al., 2021)(Rivo Alfarizi Kurniawan, 2021).

Risk control measures to prevent potential hazards resulting from work methods or procedures, particularly medium-level risks, generally involve similar approaches. These include reading SOPs prior to laboratory work, ensuring the availability and use of PPE for those conducting activities, and equipping the laboratory with FAK (Rofiani et al., 2023).

To avoid accidents related to the working environment, such as low-risk potential, precautions include inspecting laboratory lighting to ensure it is adequate and wearing specific PPE, such as safety glasses, to prevent eye strain and discomfort. Additionally, adjusting air conditioning (AC) settings to a comfortable temperature and performing regular AC maintenance can prevent discomfort caused by unexpected AC failures, which may lead to dehydration and discomfort among laboratory users (Khanifaturrohmah et al., 2021)(Cahyo Puji Asmoro et al., 2024).

Noise risk control in the laboratory can be achieved by reading and adhering to Standard Operating Procedures (SOP) prior to beginning work, limiting the number of individuals allowed in the laboratory, and enforcing penalties for those who violate established rules. These measures aim to maintain focus and ensure a safe working environment in the laboratory. For medium-level risk control, preventive measures include providing readily available fire extinguishers (Portable Fire Extinguishers - PFE) and installing safety signs on glass storage cabinets.

To address high-risk potentials, preventive actions involve drying standing water to prevent slips or falls, using appropriate Personal Protective Equipment (PPE), such as safety shoes, and ensuring the laboratory is equipped with First Aid Kits (FAK). These measures are vital for mitigating accidents and ensuring a safer laboratory environment (Widiastuti et al., 2019)(Rofiani et al., 2023).

## Conclusion

The Blora Nursing Laboratory has a low-risk hazard potential of 45%, a medium-risk hazard potential of 40%, and a high-risk hazard potential of 15%. These data demonstrate that the Blora Nursing Laboratory is relatively safe for users to conduct activities or processes, given the significant percentage of low-risk hazard potential.

To prevent hazard risks from escalating into workplace accidents, the following risk control measures are recommended: 1) Developing comprehensive Occupational Health and Safety (OHS) management Standard Operating Procedures (SOPs) for the laboratory. 2) Providing and enforcing compliance with the use of Personal Protective Equipment (PPE). 3) Installing safety signs and/or posters related to Occupational Health and Safety in the Blora Nursing Education Laboratory. These preventive actions aim to create a safer laboratory environment and minimize the likelihood of incidents.

## Declarations

### Author contribution statement

This study involved three researchers who were responsible for the planning, implementation, and preparation of the research evaluation. The principal researcher is a nursing education laboratory practitioner certified in Occupational Health and Safety (OHS) and was tasked with designing the research framework, submitting ethical clearance, aligning perceptions with enumerators, collecting data from respondents, and conducting the analysis of the research results. The second author contributed by conducting a literature review, processing data, and coordinating the research respondents. Meanwhile, the third author was responsible for compiling the research data and documenting the research activities. Each researcher effectively carried out their respective roles in the study.

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### Data availability statement

The data used in this research is in accordance with the needs and objectives of the research. Data includes the results of surveys, observations and analyzes carried out during research, which are stored in digital or physical form. Access to the data may be granted to other researchers who have similar research objectives, provided that the use is in accordance with research ethics regulations and written consent from the relevant parties. To request further data or information, please contact [insert contact information, such as lead author's email]

### Declaration of interests statement

There is no conflict interest in this research

### Additional information

There is no additional information in this research

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