

EVALUATION OF THE IMPLEMENTATION OF OCCUPATIONAL HEALTH, SAFETY, AND ENVIRONMENTAL (OHSE) MANAGEMENT SYSTEM IN HIGHER EDUCATION LABORATORIES: A CASE STUDY OF THE ANALYTICAL CHEMISTRY LABORATORY, STATE POLYTECHNIC OF LHOKSEUMAWE

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ABSTRACT

Occupational Health and Safety (OHS) is a crucial aspect in ensuring safe laboratory operations, both in academic and research settings. Laboratory risks include exposure to hazardous chemicals, physical hazards, and behavioral negligence that may lead to workplace accidents. This study aims to evaluate the implementation of OHS in the Analytical Chemistry Laboratory of the State Polytechnic of Lhokseumawe, with a focus on safety policies, compliance with the use of personal protective equipment (PPE), risk perception, and safety culture. The research employed a descriptive quantitative approach through observations, checklist assessments, and brief interviews with laboratory users. The evaluation results indicate that OHS implementation has been carried out but remains suboptimal; aspects such as safety facilities, planning, and management involvement still require improvement. These findings are consistent with the literature emphasizing the importance of risk management, safety culture, and continuous supervision in laboratories. Recommendations include strengthening training, enhancing technician supervision, and providing adequate OHS facilities to minimize the potential for workplace accidents.

Keywords: OHSE, laboratory, risk management, safety culture, OHS implementation

1. INTRODUCTION

Laboratories are vital facilities that support the teaching–learning process, research, and innovation in higher education institutions. However, laboratory activities carry high risks, including chemical, biological, physical, and ergonomic hazards, which may lead to fires, explosions, or infections if not properly managed [1,2]. Several global incidents, such as the methanol explosions in academic laboratories in Nevada and Illinois in 2014, resulted in serious injuries to students [3]. Meanwhile, the SARS infection case in a Singapore laboratory highlighted the global risks associated with poor biosafety practices [4]. In Indonesia, the Ministry of Research, Technology, and Higher

Education (Ristekdikti) recorded several cases of laboratory fires and accidents in universities that caused health, financial, and environmental impacts [5].

In addition to technical factors, human behavior is a major cause of accidents. Approximately 80% of workplace accidents are related to unsafe actions or worker negligence [6,7]. Approaches such as Behavior-Based Safety (BBS) and Total Safety Management emphasize the importance of strengthening safety culture through the Plan–Do–Check–Act (PDCA) cycle [8,9]. Risk perception also plays a significant role; workers often assess risks subjectively, based on fear, habits, or media information [10,11]. Studies have shown that high risk perception can improve compliance with safety

procedures, but it does not always guarantee safe behavior [12,13].

In public health laboratories, although safety guidelines are available, their implementation still shows gaps. For example, the focus of the Laboratory Quality Management System (LQMS) is more on patient safety and test result quality rather than laboratory worker safety [14,15]. Risk evaluations are also often inconsistent due to differences in staff knowledge, training, and perception [16].

Based on these conditions, the integrated implementation of the Occupational Health, Safety, and Environment Management System (OHSEMS) becomes essential. This study aims to evaluate the implementation of OHSEMS in higher education laboratories, including hazard control, risk perception, and safety behavior among students and laboratory staff

2. RESEARCH METHODS

2.1 Research Design

This study employs a quantitative descriptive approach to describe the level of OHSEMS implementation in the Analytical Chemistry Laboratory through observations, checklists, and interviews.

2.2 Research Location and Period

The study was conducted at the Analytical Chemistry Laboratory of the State Polytechnic of Lhokseumawe during the period of June–October 2024.

2.3 Population and Sample

The study population consisted of all laboratory users: practicum students, lecturers, and technicians. A total sampling method was employed, so all present users became respondents

2.4 Research Instruments

The instruments consisted of an observation checklist based on OHSEMS guidelines, covering:

1. OHS policies and commitment
2. OHS planning
3. Technical OHS implementation (PPE, layout, chemical handling)
4. Evaluation and monitoring
5. Management review

In addition, brief interviews were conducted with laboratory technicians to complement data on the implementation of OHS procedures.

2.5 Data Collection Techniques

1. Direct observation using an OHS checklist.
2. Structured interviews with laboratory technicians.
3. Photographic documentation of laboratory facilities and equipment related to OHS

2.6 Data Analysis Techniques

The data were analyzed descriptively using quantitative methods, processed as compliance percentages for each OHS aspect, and presented in tables and graphs

3. RESULTS AND DISCUSSION

3.1 Research Results

Based on observations and the completion of the OHS checklist in the Analytical Chemistry Laboratory, compliance data were obtained for the five OHS aspects

Table 1. Compliance Levels of OHS Implementation in the Analytical Chemistry Laboratory

OHS Aspects	Compliance Score (%)
Policies & Commitmen	55
Planning	40
Implementation	70
Evaluation & Monitoring	35
Management Review	20
Average	44

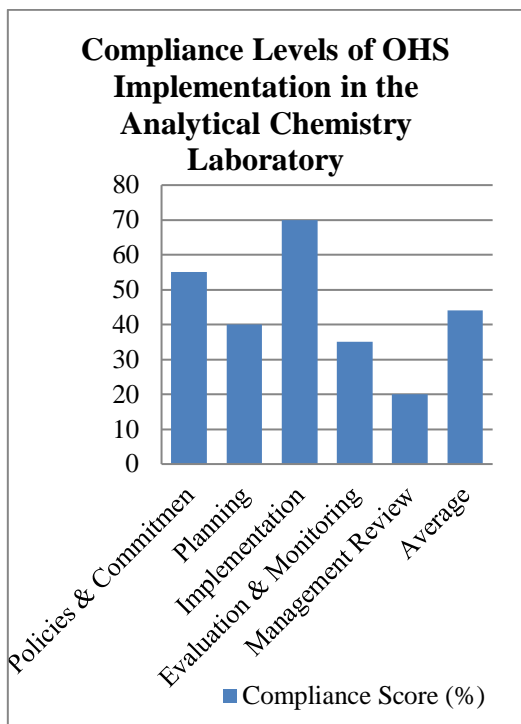


Figure 1. Compliance Levels of OHS Implementation in the Analytical Chemistry Laboratory

3.2 Discussion

The results of the study indicate that the compliance level of OHS implementation in the Analytical Chemistry Laboratory is still at a moderate level, with an average of 44%. The implementation aspect has the highest score (70%), while the management review aspect has the lowest score (20%)

The high compliance in the implementation aspect indicates that laboratory users have relatively applied basic OHS procedures, such as the use of personal protective equipment (PPE), chemical management, and workspace organization. This finding is in line with previous studies showing that the implementation aspect is generally easier to achieve because it is directly related to daily activities [17].

However, the low scores in the planning, evaluation, and management review aspects indicate that the OHS management system has not been

optimally implemented. This is consistent with previous research stating that OHS success is not only determined by technical implementation but also by strategic planning, monitoring, and management involvement [18].

The low compliance in the management review aspect (20%) also indicates a lack of leadership involvement in the OHS evaluation process. Management commitment is one of the most important factors in building a sustainable safety culture. Without evaluation and follow-up from management, OHS implementation tends to remain only at the operational level [9].

Thus, it can be concluded that the Analytical Chemistry Laboratory performs fairly well in the technical implementation of OHS, but improvements are still needed in planning, monitoring, and evaluation to achieve a comprehensive and sustainable OHS management system.

4. CONCLUSION

4.1 Conclusion

Based on the evaluation of Occupational Health and Safety (OHS) implementation in the Analytical Chemistry Laboratory, it can be concluded that:

1. OHS compliance in the Analytical Chemistry Laboratory is at a low–moderate level (44%).
2. The implementation aspect has the highest score (70%), while management review is the lowest (20%).
3. The OHS management system is not yet optimally integrated due to low levels of planning, evaluation, and leadership involvement.
4. A strong safety culture has not yet been established.

4.2 Suggestions

1. Strengthen management policies and commitment through written policies and regular reviews.
2. Conduct regular training for lecturers, technicians, and students on safety procedures.
3. Perform periodic evaluations and internal audits.
4. Provide complete OHS facilities, such as evacuation routes, PPE, first aid kits, and eyewash stations.
5. Enhance the safety culture through continuous socialization and active involvement of all laboratory users.

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