International Journal of Business and Quality Research

https://e-journal.citakonsultindo.or.id/index.php/IJBQR
E-ISSN: 2985-9468

Hazard Identification And Risk Assessment In MS Bubble Laundry

Rietias Sarinastiti Nurmin[1*], Salafudin[2], Andhini Putri Fitriani[3], Hendrika Octaviani N.[4], Jono Suhartono[5], Dyah S. Pratiwi[6], and Choerudin[7]

[1,2,3,4,5,6,7]Program Studi Teknik Kimia, Institut Teknologi Nasional Bandung, Indonesia

*Corresponding author: rietias.sarinastiti@mhs.itenas.ac.id
https://orcid.org/0000-0002-7867-270X

Abstract

Every workplace contains potential hazards that can cause occupational injuries or illness; therefore, systematic hazard identification and risk assessment are important components of occupational safety and health management. This study aimed to identify workplace hazards and assess their risk levels at Ms Bubble Laundry using the Hazard Identification, Risk Assessment, and Risk Control (HIRARC) approach. A qualitative case-study design was applied through direct observation and interviews of laundry activities, followed by assessment of likelihood and severity. The observed activities included receiving, sorting, loading, washing, drying, hanging, ironing, folding, and packaging clothes. The identified hazards comprised biological, physical, chemical, electrical, and ergonomic hazards. The risk assessment showed that most identified hazards were within low-to-high risk ranges, with notable concerns associated with biological exposure during handling of dirty clothes, falls and manual handling during drying activities, heat and fire hazards during ironing, chemical irritation, and ergonomic fatigue. Risk controls should prioritize hazard elimination or engineering measures where feasible, followed by administrative controls and appropriate personal protective equipment. The findings provide a practical basis for strengthening occupational safety practices in small-scale laundry operations.

Keywords: Laundry, Hazard Identification, Occupational Safety, Risk Assessment, HIRARC

INTRODUCTION

Workplaces contain a combination of physical, chemical, biological, electrical, and ergonomic hazards that may affect workers' safety, health, and productivity. Occupational health and safety risk assessment is therefore an important process for identifying hazards,

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

evaluating their consequences and likelihood, and determining appropriate control measures (Liu et al., 2023). A systematic assessment is particularly relevant for small and informal businesses, where occupational safety programs may not be implemented as comprehensively as in larger organizations.

Laundry operations involve repeated handling of clothing, water, detergents, heat-generating equipment, electrical installations, and manual material handling. Previous studies have reported chemical, physical, biological, and ergonomic exposures among laundry workers, including contact with cleaning agents, wet surfaces, heat, electrical hazards, and musculoskeletal strain (El-Wahed et al., 2020; Sari et al., 2023). In Indonesia, laundry workers have also been reported to experience work-related musculoskeletal problems, indicating that ergonomic risks deserve attention in addition to conventional accident hazards (Suarjana & Negara, 2024).

HIRARC is widely used to identify hazards, determine risk levels from likelihood and severity, and formulate control measures. Indonesian studies have applied HIRARC in production and industrial workplaces to prioritize risks and develop controls such as safety signs, training, engineering measures, administrative controls, and personal protective equipment (Noviyanti, 2020; Amanda, 2022; Wahyudi et al., 2022). The approach is also consistent with the broader occupational risk-assessment framework in which hazards are identified, risks are evaluated, controls are selected, and the assessment is reviewed periodically (Liu et al., 2023).

Ms Bubble Laundry is a small-scale laundry business in which several work activities are performed manually and involve direct interaction with equipment and cleaning materials. Based on preliminary observation, potential hazards may arise during receiving and sorting clothes, washing, drying, hanging, ironing, folding, and packaging. Therefore, this study aimed to identify the hazards and assess the occupational safety and health risks associated with these activities using the HIRARC method. The results are expected to provide a basis for improving preventive measures and strengthening occupational safety practices in the workplace.

THEORETICAL REVIEW

Hazard identification is the process of recognizing sources, situations, or actions that have the potential to cause injury, illness, property damage, or other losses. Risk assessment then evaluates the likelihood and severity associated with the identified hazards so that priorities for intervention can be established. A systematic review by Liu et al. (2023) describes occupational health and safety risk assessment as a multidisciplinary process involving hazard identification, risk evaluation, and control of occupational hazards.

HIRARC integrates three sequential components: hazard identification, risk assessment, and risk control. In practical applications, the likelihood of an event is considered together with its severity to determine a risk score and prioritize corrective

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

International Journal of Business and Quality Research
https://e-journal.citakonsultindo.or.id/index.php/IJBQR
E-ISSN: 2985-9468

actions (Mayadilanuari, 2020; Amanda, 2022). The effectiveness of the control should also be considered because risk management is not completed by identifying a hazard alone.

Laundry activities may generate several hazard categories. Chemical exposure can originate from detergents, cleaning agents, fragrances, and other laundry chemicals, potentially causing skin irritation or respiratory discomfort. Physical hazards may include hot surfaces, slips, falls, vibration, electrical contact, and fire. Biological hazards may arise when workers handle contaminated or dirty clothes, while ergonomic hazards may result from lifting, prolonged standing, awkward postures, and repetitive activities (El-Wahed et al., 2020; Sari et al., 2023; Suarjana & Negara, 2024).

Risk control should follow a hierarchy that prioritizes the most effective interventions. Elimination and substitution are preferred where feasible, followed by engineering controls, administrative controls, and personal protective equipment (NIOSH, 2024). In laundry operations, this principle can be implemented through safer equipment and layouts, maintenance of electrical installations, housekeeping, work procedures, training, and appropriate PPE.

METHOD

This study used a qualitative case-study approach to identify and assess occupational hazards at Ms Bubble Laundry. Data were obtained through direct observation of work activities and interviews with workers. The observation covered routine activities from receiving clothes through packaging. The collected information was organized according to the HIRARC sequence: hazard identification, risk assessment, and risk control.

During hazard identification, each work activity was examined to determine the source of the hazard, the potential consequence, and the hazard category. The hazard categories included biological, physical, chemical, electrical, and ergonomic hazards. Risk assessment was performed by assigning likelihood and severity ratings based on the scoring framework used in the source study. The risk score was interpreted as the product of likelihood and severity. The risk categories were used to prioritize control recommendations.

The assessment framework used four likelihood levels and four principal severity levels, as presented in Tables 1 and 2. The risk matrix was then used to obtain a score from the combination of likelihood and severity. Because one observation in the original field table used a likelihood value of 5 and one used a severity range of 3–5, those values were retained transparently in the results rather than being replaced by unsupported assumptions.

Table 1. Qualitative likelihood scale

Level	Description	Explanation
A	Almost Certain	May occur at any time.

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

International Journal of Business and Quality Research
https://e-journal.citakonsultindo.or.id/index.php/IJBQR
E-ISSN: 2985-9468

B	Likely	Likely to occur frequently.
C	Possible	May occur occasionally.
D	Unlikely	Rarely occurs.

Table 2. Qualitative severity scale

Level	Description	Explanation
1	Insignificant	No injury; minor financial loss.
2	Minor	Minor injury; moderate financial loss.
3	Moderate	Moderate injury requiring medical treatment; major financial loss.
4	Major	Serious injury to one or more persons; major loss or production disruption.
5	Catastrophic	Fatality to one or more persons; very large loss and extensive impact.

Table 3. Risk matrix

Likelihood / Severity	1	2	3	4
1	1	2	3	4
2	2	4	6	8
3	3	6	9	12
4	4	8	12	16

RESULTS

The observation identified hazards throughout the laundry workflow, from receiving and sorting clothes to packaging. The hazards included biological exposure from dirty clothes, physical hazards associated with machinery and hot equipment, chemical irritation, electrical hazards, ergonomic strain, and fire-related hazards. These findings are consistent with previous reports that laundry work can involve multiple simultaneous hazard types rather than a single dominant risk category (El-Wahed et al., 2020; Sari et al., 2023).

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

International Journal of Business and Quality Research
https://e-journal.citakonsultindo.or.id/index.php/IJBQR
E-ISSN: 2985-9468

Table 4 summarizes the identified hazards and the likelihood and severity values reported in the field assessment. Risk scores were calculated from the reported likelihood and severity values. For entries with a severity range, the resulting risk is also presented as a range.

No.	Activity	Potential hazard and risk	Hazard type	Likeli-hood	Sever-ity	Risk level
1	Receiving clothes	Possible exposure to unidentified viruses or bacteria from customer clothing.	Biological	2	4	8 (Medium)
2	Sorting clothes	Bacteria or viruses from dirty clothes may be transferred to workers' hands.	Biological	2	4	8 (Medium)
3	Loading clothes	Fingers may be caught in the washing-machine door.	Physical	4	1	4 (Low)
4	Manual washing	Laundry soap may cause skin allergy or irritation.	Chemical / Physical	3	2	6 (Medium)
5	Machine washing	Incorrectly connected or short-circuited electrical cables may cause electric shock, especially with wet hands.	Electrical / Physical	2	3	6 (Medium)
6	Drying	Equipment vibration during operation may cause injury.	Physical	1	2	2 (Low)
7	Hanging clothes	Workers may fall from stairs because clothes are dried on the second floor.	Physical	3	2	6 (Medium)
8	Hanging clothes	Lifting clothes that are too heavy may cause musculoskeletal problems.	Ergonomic	4	2	8 (Medium)
9	Ironing	Poorly connected gas on a steam iron may leak and cause respiratory discomfort.	Chemical	2	3	6 (Medium)
10	Ironing	Hot iron surfaces may contact the skin and cause burns.	Physical	3	3	9 (High)
11	Ironing	Prolonged standing may cause fatigue.	Ergonomic	4	1	4 (Low)
12	Ironing	Leaving an iron switched on for too long may cause fire.	Physical	2	3–5	6–10 (Medium–High)
13	Ironing	Repeated iron movement may damage the cable and cause electrical sparks.	Electrical / Physical	2	2	4 (Low)
14	Ironing	Fragrance ingredients may cause skin irritation.	Chemical	4	3	12 (High)
15	Folding clothes	Prolonged standing may cause leg muscle fatigue and discomfort.	Ergonomic	5	1	5 (Medium)*
16	Packaging	Using a stapler to attach labels may cause finger injury.	Physical	3	3	9 (High)

**The field assessment reported a likelihood value of 5, although the principal matrix presented in Table 3 uses a four-level likelihood scale. The value is retained as reported and is not treated as a newly collected value.*

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

International Journal of Business and Quality Research
https://e-journal.citakonsultindo.or.id/index.php/IJBQR
E-ISSN: 2985-9468

DISCUSSION

The hazard identification indicates that Ms Bubble Laundry has a broad range of occupational risks. Biological hazards were identified during receiving and sorting because workers may handle clothing containing unidentified microorganisms. Although the present study did not quantify microbial exposure, the observation is consistent with literature describing contaminated or soiled laundry as a potential source of biological exposure (El-Wahed et al., 2020). Accordingly, hand hygiene, appropriate separation of dirty and clean clothes, and suitable protective equipment should be incorporated into routine procedures.

Chemical hazards were mainly associated with detergent, soap, and fragrance products. The risk of skin irritation is important because laundry workers may have repeated or prolonged contact with cleaning chemicals. Sari et al. (2023) specifically highlighted the need to improve workers' understanding of laundry chemical risks and the use of PPE. Therefore, chemical handling should be supported by clear labeling, safe storage, worker training, and appropriate gloves and other PPE.

Physical and electrical hazards were observed in machine operation and ironing. Finger entrapment, electrical shock, hot surfaces, damaged cables, and fire represent preventable hazards when equipment is properly maintained and safe work procedures are consistently followed. HIRARC studies in industrial settings similarly emphasize the importance of safety signs, training, equipment improvement, administrative controls, and PPE as part of risk reduction (Noviyanti, 2020; Amanda, 2022). Engineering measures, such as maintaining electrical installations and protecting damaged cables, should be prioritized before relying only on worker behavior.

Ergonomic hazards were identified during hanging, ironing, and folding activities. Manual handling of heavy clothing and prolonged standing may contribute to musculoskeletal discomfort and fatigue. This finding is particularly relevant because recent Indonesian research has documented work-related musculoskeletal disorders among laundry workers (Suarjana & Negara, 2024), while studies of ironing activities have also identified moderate-to-high ergonomic risks related to working posture (Gumilang et al., 2020). Practical interventions include reducing load per lift, improving work heights, alternating tasks, allowing adequate rest periods, and providing ergonomic training.

The risk assessment shows that the highest individual scores in the observed activities were associated with hot iron contact and fragrance-related skin irritation, both classified as high risk in the present scoring. The fire hazard from leaving the iron switched on produced a medium-to-high range because the original severity value was reported as 3–5. These findings indicate that ironing should receive particular attention in the control program. A combination of equipment maintenance, automatic shut-off or other engineering safeguards where feasible, safe operating procedures, housekeeping, and worker training can reduce the likelihood and consequences of these events.

Overall, the HIRARC approach provides a structured way to prioritize the observed hazards. However, risk assessment should not be treated as a one-time exercise. Occupational risk assessment literature emphasizes periodic review and adaptation of

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

controls as work conditions, equipment, and processes change (Liu et al., 2023). For Ms Bubble Laundry, follow-up assessment should therefore be conducted after corrective actions are implemented to determine whether the residual risk has been reduced.

CONCLUSION

The study identified biological, physical, chemical, electrical, and ergonomic hazards across the main activities at Ms Bubble Laundry. Using the HIRARC approach, the observed risks ranged from low to high, with the most prominent concerns associated with hot iron contact, fragrance-related skin irritation, fire potential during ironing, biological exposure from dirty clothes, and manual handling or prolonged standing. The findings indicate that occupational safety management should be strengthened through a combination of engineering, administrative, housekeeping, training, and PPE measures. Periodic reassessment is recommended to verify the effectiveness of implemented controls and to identify new hazards resulting from changes in work practices or equipment.

RECOMMENDATIONS

The following measures are recommended: (1) conduct periodic inspection and maintenance of washing machines, dryers, irons, gas connections, and electrical installations; (2) provide and enforce appropriate PPE, particularly gloves and other protection suited to chemical and biological exposure; (3) improve housekeeping to minimize wet-floor slip hazards and maintain safe access to elevated drying areas; (4) establish clear procedures for handling dirty clothes and separating dirty and clean laundry; (5) provide chemical safety information and training for detergents, fragrances, and other laundry products; (6) introduce ergonomic improvements for lifting, prolonged standing, and repetitive tasks; and (7) provide visible safety signs and routine K3 training. These recommendations are consistent with the hierarchy of controls, which prioritizes elimination, substitution, and engineering controls before administrative measures and PPE (NIOSH, 2024).

LIMITATIONS AND SUGGESTIONS FOR FURTHER STUDY

This study was based on a qualitative case assessment at a single small-scale laundry business and relied on observation and interviews. The assessment did not include quantitative measurements of noise, chemical concentrations, microbial contamination, electrical parameters, or ergonomic exposure using specialized instruments. Future studies should combine HIRARC with quantitative measurements and validated ergonomic assessment tools, and should evaluate residual risk after controls are implemented. Broader sampling across several laundry businesses would also improve the generalizability of the findings.

REFERENCES

Amanda, P. (2022). Analisis resiko kecelakaan kerja di PT Jaya Beton Indonesia dengan metode HIRARC (Hazard Identification Risk Assessment and Risk Control). Jurnal

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

Ilmiah Teknik Industri Prima (JURITI PRIMA), 4(1). https://doi.org/10.34012/juritiprima.v4i1.1618

El-Wahed, S. M. H. A., Ali, S. A., Mohamed, H. A., & Farg, H. K. (2020). Occupational hazards among hospital laundry workers at Ismailia City, Egypt. American Journal of Nursing Research, 8(4), 471–476. https://doi.org/10.12691/ajnr-8-4-7

Gumilang, P. G. A., Adiputra, L. M. I. S. H., & Griadhi, I. P. A. (2020). Gambaran tingkat risiko musculoskeletal disorders (MSDs) berdasarkan metode REBA saat proses menyetrika pada pekerja laundry di Denpasar, Bali. E-Jurnal Medika Udayana, 9(3), 63–68. https://doi.org/10.24843/MU.2020.V09.i3.P12

Liu, R., Liu, H.-C., Shi, H., & Gu, X. (2023). Occupational health and safety risk assessment: A systematic literature review of models, methods, and applications. Safety Science, 160, 106050. https://doi.org/10.1016/j.ssci.2022.106050

Mayadilanuari, A. M. (2020). Penggunaan HIRARC dalam identifikasi bahaya dan penilaian risiko pada pekerjaan bongkar muat. HIGEIA (Journal of Public Health Research and Development), 4(2), 245–255. https://doi.org/10.15294/higeia.v4i2.30908

National Institute for Occupational Safety and Health. (2024). Hierarchy of controls. Centers for Disease Control and Prevention. https://www.cdc.gov/niosh/hierarchy-of-controls/

Noviyanti, A. (2020). Penerapan Hazard Identification Risk Assessment and Risk Control pada area proses produksi. HIGEIA (Journal of Public Health Research and Development), 4(Special 1), 136–146. https://doi.org/10.15294/higeia.v4iSpecial%201.38752

Sari, I. P., Safitri, D. M., Septiani, W., & Su'udi, B. C. (2023). Penyuluhan risiko bahan kimia laundry serta penerapan keselamatan dan kesehatan kerja (K3) di industri laundry. Abdimas Universal, 5(2), 198–204. https://doi.org/10.36277/abdimasuniversal.v5i2.306

Suarjana, I. W. G., & Negara, N. L. G. A. M. (2024). Prevalence of work-related musculoskeletal disorders among laundry workers in North Sulawesi Province, Indonesia. International Journal of Occupational Safety and Health, 14(2), 237–246. https://doi.org/10.3126/ijosh.v14i2.60842

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.

Wahyudi, A. A., Priyana, E. D., & Jufriyanto, M. (2022). Identifikasi bahaya kerja dengan metode Hazard Identification, Risk Assessment and Risk Control (HIRARC) pada bagian produksi PT XYZ. SITEKIN: Jurnal Sains, Teknologi dan Industri, 20(1). https://doi.org/10.24014/sitekin.v20i1.20502

Copyright to the author of some rights reserved This work is licensed under aCreative Commons Attribution-ShareAlike 4.0 International License.