

Analysis of Chemical Use in Room Cleaning by Room Attendants at Lion Hotel Manado

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Abstract

Purpose: This study aimed to analyze the use of cleaning chemicals in room cleaning activities performed by Room Attendants, evaluate compliance with Standard Operating Procedures (SOPs), and identify strategies to optimize chemical use at Lion Hotel & Plaza Manado.

Research Methodology: A descriptive qualitative approach was used. Data were collected through direct observation, semi-structured interviews with seven Room Attendants and two Housekeeping Supervisors, and documentation of housekeeping SOPs and operational records. Data were analyzed using the interactive model of Miles, Huberman, and Saldaña, which includes data reduction, data display, conclusion drawing, and verification.

Results: The findings indicate that chemical use generally follows housekeeping operational procedures, particularly in the selection of cleaning chemicals according to their functions and cleaning areas. However, several deviations from the SOPs were identified, including chemical dilution without standardized measuring tools, inconsistent implementation of recommended contact times, and irregular use of Personal Protective Equipment (PPE). These deviations were primarily influenced by the work habits, operational workload, and limited cleaning time.

Conclusion: Chemical use generally met operational requirements; however, SOP implementation requires improvement through standardized dilution practices, regular training, stronger supervision, and consistent PPE use to enhance operational effectiveness and occupational safety.

Limitations: This study was conducted in a single hotel using a qualitative approach, which limits the generalizability of the findings.

Contribution: This study provides practical recommendations for improving chemical management, strengthening SOP compliance, and promoting occupational safety in hotel housekeeping operations, while enriching the empirical evidence on housekeeping practices in Indonesian hotels.

Keywords: *Chemical Use, Hotel Housekeeping, Housekeeping, Room Attendant, Standard Operating Procedure*

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1. Introduction

The hospitality industry relies heavily on service quality, with room cleanliness representing one of the most important determinants of guest satisfaction and overall hotel performance ([El Madja et al., 2026](#)). Clean, hygienic, and well-maintained guest rooms not only enhance customer experience but also strengthen hotel competitiveness and operational excellence. Within the housekeeping department, Room Attendants are primarily responsible for maintaining room cleanliness through the proper use of various cleaning chemicals, including bathroom cleaners, glass cleaners, multipurpose cleaners, disinfectants, and air fresheners.

The effectiveness of these chemicals depends not only on the selection of appropriate products but also on correct dilution ratios, proper application techniques, adequate contact time, and adherence to occupational safety procedures. Improper chemical handling may reduce cleaning effectiveness, increase chemical consumption, damage hotel facilities, and expose employees to occupational health risks ([Maczukin et al., 2026](#)). Hotels establish Standard Operating Procedures (SOPs) to regulate the selection, dilution, storage, and application of cleaning chemicals to maintain consistent housekeeping quality ([Nadila et al., 2026](#)). Nevertheless, employee compliance with these procedures remains inconsistent because it is influenced by workload, managerial support, and organizational commitment ([Dasgupta & Islam, 2024](#)). A positive organizational safety climate and effective supervision have been shown to improve employee compliance with operational procedures ([Deban et al., 2026](#)). Continuous supervision and regular training are essential to ensure compliance with occupational safety standards during chemical handling ([Kadir et al., 2026](#)).

Preliminary observations at Lion Hotel & Plaza Manado revealed that several Room Attendants diluted cleaning chemicals based on personal estimation rather than standardized measuring tools. In addition, the recommended chemical contact times were not consistently implemented, and the use of Personal Protective Equipment (PPE) varied according to employees' perceptions of risk. Previous studies have mainly investigated chemical management in healthcare facilities or have focused separately on operational efficiency and occupational safety ([Boyce, 2016](#)). Research specifically examining housekeeping chemical management in Indonesian hotels, particularly in Manado, is limited ([Kotsiou et al., 2026](#)).

This study offers a more comprehensive analysis by integrating direct observation, interviews with Room Attendants and Housekeeping Supervisors, and an evaluation of compliance with housekeeping Standard Operating Procedures. Unlike previous studies, which primarily examined operational efficiency or occupational safety independently, this study simultaneously evaluates operational practices, procedural compliance, and occupational safety within hotel housekeeping operations. Therefore, this study aims to analyze the implementation of chemicals in room-cleaning activities, evaluate compliance with housekeeping SOPs, and formulate strategies to optimize chemical management at Lion Hotel & Plaza Manado.

2. Literature Review

2.1 Housekeeping Operations and Room Cleaning

Housekeeping operations play a fundamental role in maintaining hotel service quality because they ensure that guest rooms remain clean, hygienic, and comfortable throughout the guest's stay ([El Madja et al., 2026](#)). Room Attendants play a pivotal role in housekeeping operations because they are responsible for daily room cleaning, sanitation, and preparation before guest occupancy. Their performance determines not only room cleanliness but also service consistency and operational productivity of the hotel ([El, Rumawak, & Usulu, 2026](#)). Therefore, Room Attendants must possess adequate knowledge of cleaning techniques, chemical handling, occupational safety, and compliance with Standard Operating Procedures (SOPs). According to [Putri et al. \(2026\)](#) and [Hussien and Ayad \(2025\)](#), effective housekeeping operations depend on employee competence, adherence to operational procedures, and continuous supervision.

2.2 Chemical Management in Housekeeping Operations

Cleaning chemicals are essential resources in hotel housekeeping because they remove dirt, stains, microorganisms, and other contaminants from guest rooms and public areas ([Putri, Putra, Wajdi, & Mazher, 2025](#)). Effective chemical management includes selecting appropriate cleaning agents, preparing standardized dilution ratios, applying chemicals according to the manufacturers' recommendations, storing chemicals safely, and disposing of chemical waste responsibly ([Boyce, 2016](#)). Improper chemical dilution or inappropriate application may reduce cleaning effectiveness, increase operational costs, damage hotel facilities, and create occupational health risks for employees ([Kramer, Arvand, Christiansen, Dancer, Eggers, Exner, Müller, Mutters, Schwebke, & Pittet, 2022](#)). Standardized chemical management also contributes to environmental hygiene while minimizing unnecessary chemical consumption. [Kotsiou, Gouta, Natsaridis, Papageorgiou, Daniil, and Gourgoulidis \(2026\)](#) further argued that standardized chemical management enhances environmental hygiene while reducing unnecessary chemical consumption.

2.3 Compliance with Standard Operating Procedures (SOPs)

Standard Operating Procedures (SOPs) provide standardized guidelines that ensure consistency, effectiveness, and safety throughout housekeeping operations. These procedures regulate the selection of cleaning chemicals, dilution ratios, contact time, application techniques, storage procedures, and the use of Personal Protective Equipment (PPE). From an organizational behavior perspective, employee compliance with SOPs reflects their willingness to perform tasks in accordance with the organization's standards. [Belinda et al. \(2025\)](#) reported that employee compliance with organizational procedures improves operational consistency and quality of service. [Similarly, Bensonch et al. \(2022\)](#) explained that these procedures regulate chemical selection, dilution ratios, contact time, application methods, storage practices, and the use of Personal Protective Equipment (PPE) during room cleaning operations. [Fatema \(2026\)](#) found that organizations with strong safety cultures demonstrate higher procedural compliance because employees perceive safety procedures as integral components of their daily work rather than merely as administrative requirements.

2.4 Occupational Safety in Chemical Handling

Cleaning chemicals may expose housekeeping employees to occupational hazards, including skin irritation, respiratory disorders, eye irritation, and other long-term health effects, when chemicals are handled improperly ([Oyaigbevwen, 2026](#)). Consequently, occupational safety has become a fundamental component of the management of housekeeping. Safe chemical handling involves proper dilution procedures, adequate ventilation, appropriate storage, and consistent use of Personal Protective Equipment (PPE), such as gloves, masks, and protective clothing.

According to [Oluwaniyi \(2025\)](#), The International Labour Organization emphasizes that organizations should integrate occupational safety into daily operational activities through employee training, hazard communication, risk assessment and continuous supervision. [Permana et al. \(2025\)](#) found that management commitment to workplace safety positively influences employee safety behavior and procedural compliance. Therefore, occupational safety should not be considered separately from chemical management strategies. Instead, both aspects should be integrated into housekeeping operations because effective chemical management improves cleaning quality, employee health, operational efficiency, and overall hotel service quality.

2.5 Theoretical Relationship Between Chemical Management, SOP Compliance, and Occupational Safety

This study is based on the premise that effective chemical management depends largely on employee compliance with Standard Operating Procedures (SOPs). Proper chemical selection, standardized dilution, appropriate contact time, and consistent PPE use are interconnected operational practices that collectively determine cleaning effectiveness and workplace safety. Employees who consistently comply with SOPs are more likely to use cleaning chemicals appropriately, minimize unnecessary chemical consumption, reduce occupational health risks, and maintain hygiene standards. Conversely, poor compliance may increase operational costs, reduce cleaning quality, and expose workers to

chemical hazards ([Kramer et al., 2022](#)). Accordingly, this study proposes that chemical management, employee compliance behavior, SOP implementation, and occupational safety are interrelated constructs that collectively influence housekeeping performance and service quality.

2.6 Conceptual Framework

This study proposes that the effectiveness of chemical use in room-cleaning operations is determined by four interrelated dimensions: chemical management practices by room attendants, compliance with Standard Operating Procedures (SOPs), occupational safety through the consistent use of Personal Protective Equipment (PPE), and optimization strategies involving employee training, supervision, and standardized dilution practices. These dimensions collectively influence housekeeping performance, operational efficiency, service quality, employee safety, and guest satisfaction in hotel housekeeping operations.

3. Research Methodology

3.1 Research Design

This study employed a descriptive qualitative approach to examine the implementation of chemical usage practices in room cleaning operations conducted by Room Attendants at Lion Hotel & Plaza Manado. A qualitative approach was considered appropriate because the study aimed to explore actual operational practices, employee experiences, and compliance with Standard Operating Procedures (SOPs) in the use of cleaning chemicals. According to [Chand \(2025\)](#), qualitative research enables researchers to obtain comprehensive insights into organizational phenomena through direct interaction with participants in their natural settings.

3.2 Research Site and Period

The research was conducted at the Lion Hotel & Plaza Manado, located on Jl. Piere Tendean No. 19 Boulevard Area, Manado, North Sulawesi, Indonesia. The hotel was selected because its housekeeping department routinely uses various cleaning chemicals during guest room maintenance. Data collection was conducted from February to April 2026, including field observations, interviews, and document analyses related to housekeeping operations.

3.3 Data Sources

This study used both primary and secondary data sources. Primary data were obtained through direct observation and semi-structured interviews with housekeeping personnel involved in room-cleaning activities. These data provide information on chemical usage practices, SOP implementation, operational challenges, and optimization efforts. Secondary data were collected from housekeeping SOP documents, operational reports, chemical usage records, training materials and relevant scientific literature. These documents were used to support the data interpretation and strengthen the theoretical foundation of the study.

3.4 Research Participants

Participants were selected using purposive sampling because they possessed direct knowledge and practical experience related to the use of chemicals in housekeeping operations. The study involved nine informants, consisting of seven Room Attendants and two Housekeeping Supervisors. Room Attendants served as the primary informants because they were directly responsible for room cleaning and chemical handling.

Housekeeping Supervisors acted as supporting informants by providing information regarding operational procedures, supervisory practices, and SOP implementation. Participant recruitment continued until data saturation was achieved, which meant that no substantially new information or themes emerged from the additional interviews. Data saturation indicated that the collected information was sufficient to comprehensively address the research objectives.

3.5 Data Collection Techniques

Data were collected using three complementary techniques:

3.5.1 Observation

Direct non-participant observation was conducted during routine room-cleaning activities. The researcher observed chemical selection, dilution procedures, application techniques, contact time implementation, PPE use, storage practices, and compliance with housekeeping SOPs. Observation notes were systematically recorded using an observation checklist.

3.5.2 Semi-Structured Interviews

Semi-structured interviews were conducted individually with each participant using a predetermined interview guide, while allowing flexibility for further probing. Each interview lasted approximately 30–45 minutes and was conducted in a quiet location within the housekeeping department to ensure that the participants could respond comfortably. With the participants' consent, the interviews were audio-recorded and supplemented with field notes. The interview questions focused on chemical usage procedures, SOP compliance, operational challenges, supervisory practices, occupational safety, and opportunities for improving chemical management.

3.5.3 Documentation

Documentation was collected to support and verify the findings obtained through observations and interviews. The documents included housekeeping SOPs, operational reports, chemical handling guidelines, training materials, internal records, and photographs of housekeeping activities.

3.6 Data Analysis

Data were analyzed using the interactive model proposed by [Bhuiyan et al. \(2019\)](#), which consists of three stages.

3.6.1 Data Reduction

Data reduction involved selecting, organizing, simplifying, and categorizing the information obtained from observations, interviews, and documentation. Relevant information was grouped into themes, including chemical management, SOP compliance, occupational safety, operational challenges, and optimization strategies.

3.6.2 Data Display

The reduced data were organized into descriptive narratives, tables, and interview summaries to facilitate interpretation and identify relationships among the research findings. The data presentation emphasized the similarities and differences between the observational findings and the participants' perspectives.

3.6.3 Conclusion Drawing and Verification

The final stage involved interpreting the findings and drawing conclusions based on the recurring patterns identified throughout the analysis. Verification was conducted continuously during the research process to ensure consistency between the collected data and the conclusions drawn.

3.7 Trustworthiness of the Study

Several validation techniques were employed to enhance the credibility and trustworthiness of the findings. Source triangulation was conducted by comparing information obtained from Room Attendants, Housekeeping Supervisors, direct observations, and documentary evidence. This process enabled the researcher to verify the consistency of the information across different data sources.

Method triangulation was applied by integrating observations, interviews, and document analysis to obtain a comprehensive understanding of chemical management practices. To further improve credibility, member checking was conducted by presenting the interview summaries to selected participants for confirmation. The participants verified that the summarized findings accurately reflected their experiences and opinions. This process minimized researcher bias and enhanced the accuracy and trustworthiness of the qualitative findings.

4. Result and Discussions

4.1 Chemical Usage Practices in Room Cleaning Operations

Table 1. Observation results of chemical use practices in room cleaning

No.	Observation Aspect	Observation Findings	SOP Compliance	
			Yes	No
1	Housekeeping trolley preparation	Room Attendants prepared housekeeping trolleys containing linen, guest amenities, cleaning equipment, and cleaning chemicals before entering guest rooms.	✓	
2	Availability and selection of cleaning chemicals	The cleaning chemicals used included bathroom cleaner, glass cleaner, multipurpose cleaner, disinfectant, and air freshener, according to the cleaning area and operational needs.	✓	
3	Use of glass cleaner	A glass cleaner was applied to the mirrors and glass surfaces to effectively remove stains and fingerprints.	✓	
4	Use of bathroom cleaner	Bathroom cleaner was used for toilets, washbasins, shower areas, and bathroom floors, according to housekeeping procedures.	✓	
5	Use of multipurpose cleaner	Multipurpose cleaner was applied to the furniture, tables, cabinets, and other room surfaces.	✓	
6	Chemical dilution	Chemical dilution is generally performed based on employees' estimations rather than standardized measuring tools.		✗
7	Chemical application technique	Cleaning chemicals were sprayed directly onto the surfaces before being wiped with a cleaning cloth.	✓	
8	Contact time implementation	Cleaning chemicals were not consistently left on surfaces for the recommended contact time prior to wiping.		✗
9	Use of Personal Protective Equipment (PPE)	Protective gloves were used only in certain situations and were not consistently worn during all chemical-handling activities.		✗
10	Use of cleaning cloths	Separate cleaning cloths were used for the bathroom and bedroom areas to prevent cross-contamination.	✓	
11	Chemical storage	The cleaning chemicals were stored in the housekeeping storage room and labeled according to their respective types.	✓	
12	Supervision of chemical use	Supervisors conducted routine briefings and periodic inspections, although monitoring was not performed during every room-cleaning activity.	✓	
13	Final room inspection	Room Attendants conduct a final inspection after completing room cleaning to ensure that rooms meet operational standards before guest occupancy.	✓	

Based on Table 1, the observation results indicate that most room cleaning procedures performed by Room Attendants at Lion Hotel & Plaza Manado complied with the housekeeping Standard Operating Procedures (SOPs). Compliance was observed in housekeeping trolley preparation, chemical selection according to cleaning areas, application of glass cleaner, bathroom cleaner, and multipurpose cleaner, use of separate cleaning cloths to prevent cross-contamination, proper chemical storage, routine supervisory activities, and final room inspections before guest occupancy

However, three operational practices were identified as being not fully compliant with the established SOPs. These included chemical dilution based on estimation without standardized measuring tools, inconsistent implementation of the recommended contact time, and irregular use of Personal Protective Equipment (PPE) during chemical handling. These findings indicate that although the overall housekeeping workflow has been implemented effectively, improvements are still required to strengthen SOP compliance, enhance occupational safety, and optimize the effectiveness of chemicals used in room-cleaning operations.

One of the primary objectives of this study was to evaluate the level of compliance between actual chemical usage practices and housekeeping Standard Operating Procedures (SOPs). The findings indicate that chemical usage generally follows established operational procedures. Room Attendants apply chemicals according to the designated cleaning areas and demonstrate an understanding of product functions. However, several deviations from the SOP requirements were identified. Continuous monitoring of environmental cleaning practices is necessary to ensure that cleaning procedures are consistently implemented according to the established standards ([Anderson et al., 2026](#)).

4.2 Interview Findings

Table 2. Summary of interview findings

No.	Research Focus	Key Interview Findings	Main Interpretation
1	Types of cleaning chemicals	All Room Attendants and Housekeeping Supervisors stated that the chemicals used include bathroom cleaner, glass cleaner, multipurpose cleaner, disinfectant, and air freshener in accordance with housekeeping operational needs.	Employees understand the functions of cleaning chemicals and generally follow hotel housekeeping procedures.
2	Chemical selection	Informants explained that chemical selection is adjusted to the cleaning area and surface characteristics to achieve effective cleaning and prevent damage to the hotel facilities.	Chemical selection is generally consistent with the housekeeping Standard Operating Procedures (SOPs).
3	Chemical dilution	Most Room Attendants reported that chemical dilution is usually based on work experience and estimation rather than standardized measuring equipment, although dilution standards are specified in the SOP.	Chemical dilution remains a major area of noncompliance with SOPs.
4	Use of measuring tools	Measuring tools are rarely used because employees rely on practical experience, and the supervision of dilution practices is still limited.	Standardized dilution practices have not yet been fully established.
5	Use of Personal Protective Equipment (PPE)	Informants indicated that PPE is available; however, gloves and other protective equipment are only used in certain situations and not during every chemical handling activity.	Employee compliance with occupational safety procedures is inconsistent.
6	Contact time implementation	Room Attendants explained that the recommended contact time is often shortened because room cleaning must be completed within a limited operational time.	Operational workload influences the compliance with cleaning procedures.
7	Challenges in chemical use	High room occupancy, limited cleaning time, established work habits, and operational pressure were identified as the primary challenges affecting the use of chemicals.	Operational conditions contribute to deviations from the housekeeping SOPs.

No.	Research Focus	Key Interview Findings	Main Interpretation
8	Supervision	Housekeeping Supervisors conduct daily briefings, room inspections, and periodic performance evaluations; however, continuous supervision during every cleaning activity is difficult.	Supervisory practices have been implemented but require strengthening to improve procedural compliance.
9	Training	Employees have participated in internal training programs, although refresher training is conducted on an irregular basis. The informants recommended more frequent training activities.	Continuous training is required to improve employee competence and SOP compliance.
10	Optimization strategies	Informants recommended providing standardized measuring equipment, strengthening supervision, conducting regular refresher training, and improving employee commitment to SOP implementation and occupational safety.	Continuous improvement programs are necessary to optimize chemical management in the Housekeeping Department.

Table 2 summarizes the interview findings obtained from seven Room Attendants and two Housekeeping Supervisors regarding chemical use practices in room cleaning operations. Overall, the participants demonstrated adequate knowledge of the types and functions of cleaning chemicals used in housekeeping activities. Nevertheless, several operational practices deviated from the established Standard Operating Procedures (SOPs), particularly regarding chemical dilution, use of standardized measuring equipment, implementation of the recommended contact time, and consistent use of Personal Protective Equipment (PPE). The interviews further revealed that operational workload, time constraints, and long-established work habits were the primary factors influencing employees' compliance with chemical handling procedures. Both Room Attendants and Housekeeping Supervisors emphasized the importance of regular training, stronger supervision, and the provision of standardized measuring tools to improve the effectiveness, efficiency, and safety of chemical use in housekeeping operations.

4.3 Compliance with Standard Operating Procedures (SOP)

The observation and interview findings indicate that the implementation of Standard Operating Procedures (SOPs) for chemical use at Lion Hotel & Plaza Manado has been carried out appropriately. Room Attendants consistently prepared housekeeping trolleys, selected cleaning chemicals according to their functions, applied appropriate cleaning techniques, and completed final room inspections in accordance with housekeeping procedures. [Boyce \(2016\)](#) and [Chen et al. \(2022\)](#) emphasized that adherence to housekeeping procedures supports operational efficiency and service quality.

However, several practices were found to be inconsistent with SOPs. Chemical dilution was often performed based on estimation rather than standardized measuring tools, the recommended contact time was not consistently applied, and the use of Personal Protective Equipment (PPE) remained inconsistent. The interview results showed that these deviations were mainly influenced by work habits, operational workload, and limited cleaning time. Similar findings were reported by [Kramer et al. \(2022\)](#) and [Cruz et al. \(2026\)](#), who emphasized the importance of standardized chemical dilution, appropriate contact time, and consistent PPE use to improve cleaning effectiveness and occupational safety.

Overall, the findings suggest that although SOP implementation has generally been achieved, improvements are still required in chemical dilution practices, PPE compliance and supervisory control. Regular training, stronger supervision, and the provision of standardized measuring equipment are recommended to improve operational performance and ensure the consistent implementation of housekeeping SOPs.

4.4 Analysis of Observation and Interview Findings

The observation and interview findings indicate that the use of cleaning chemicals at Lion Hotel & Plaza Manado generally follows the operational procedures established by the hotel's Housekeeping Department. Room Attendants consistently prepared housekeeping trolleys, selected cleaning chemicals according to their functions, applied appropriate cleaning techniques, and completed final room inspections. These findings suggest that employees have a good understanding of housekeeping procedures, which is consistent with, This finding is consistent with [Boyce \(2016\)](#) and [Cruz et al. \(2026\)](#), who stated that standard housekeeping procedures improve cleaning quality and operational effectiveness.

However, several aspects of chemical handling were inconsistent with the Standard Operating Procedures (SOPs). The observations and interviews revealed that chemical dilution was often performed based on employee estimations rather than standardized measuring tools. In addition, the recommended contact time was not consistently applied because employees were required to complete room cleaning within a limited operational time. The use of Personal Protective Equipment (PPE) was inconsistent, as gloves were generally worn only in certain situations. These findings support [Kotsiou et al. \(2026\)](#) and the International Labour Organization (2023), who emphasized that proper dilution, adequate contact time, and consistent PPE use are essential for effective cleaning and ensuring occupational safety.

The interviews further identified several factors contributing to these deviations, including high workload, limited cleaning time, established work habits, and limited supervision. To improve compliance with housekeeping SOPs, both Room Attendants and Housekeeping Supervisors recommended providing standardized measuring tools, conducting regular refresher training, strengthening supervision, and reinforcing employee awareness of occupational safety. Previous hospitality studies have examined employee compliance with operational procedures [El-Said et al. \(2026\)](#) and housekeeping operational performance ([El Madja et al., 2026](#)). Overall, the findings indicate that chemical use practices generally meet housekeeping operational standards; however, improvements in SOP implementation are still required to optimize cleaning effectiveness, chemical management, and workplace safety.

4.5 Discussion

The findings of this study indicate that the overall implementation of chemical use in room cleaning at Lion Hotel & Plaza Manado complied with the housekeeping operational procedures. Room Attendants demonstrated a good understanding of selecting cleaning chemicals according to their intended functions and cleaning areas. This finding is consistent with [Boyce \(2016\)](#), who reported that proper housekeeping procedures contribute significantly to cleanliness, operational efficiency, and guest satisfaction.

However, this study also identified several gaps between operational practices and the established Standard Operating Procedures (SOPs). The most common deviations involved chemical dilution without standardized measuring tools, inconsistent implementation of the recommended contact time, and irregular use of Personal Protective Equipment (PPE). These practices may reduce cleaning effectiveness, increase chemical consumption, and expose workers to occupational health risks. Similar findings were reported by [Kotsiou et al. \(2026\)](#). Proper environmental cleaning procedures and appropriate chemical applications are fundamental for maintaining hygiene standards and improving cleaning effectiveness ([Boyce, 2016](#)). who emphasized that correct chemical dilution is essential for achieving optimal cleaning performance, whereas [Kramer et al. \(2022\)](#) highlighted that adequate contact time is necessary to maximize the effectiveness of cleaning and disinfectant agents.

The findings further suggest that employee compliance with SOPs is influenced by operational conditions, including high workload, limited cleaning time, and long-established work habits. These factors make it difficult for Room Attendants to consistently implement all housekeeping procedures. This supports the findings of [Liu et al. \(2022\)](#), who concluded that organizational and operational pressures significantly influence employee compliance with workplace procedures.

To improve housekeeping performance, this study recommends providing standardized measuring tools, conducting regular refresher training, strengthening supervisory practices, and promoting consistent use of PPE. Continuous exposure to cleaning chemicals without appropriate PPE may increase the risk of respiratory irritation and occupational diseases among housekeeping employees ([Oyaigbevwen, 2026](#)). Likewise, [Rani et al. \(2025\)](#) recommended the consistent use of PPE and proper chemical handling procedures to minimize workplace hazards. This finding is consistent with [Fitri and Wijayanti \(2026\)](#) and [Shidiq and Noekent \(2026\)](#), who reported that continuous supervision, organizational commitment, and employee training are key determinants of procedural compliance in service organizations, and that continuous training and effective supervision are key factors in improving employee performance and procedural compliance.

Employee education and continuous training are effective strategies for improving safe chemical handling practices and reducing the inappropriate use of cleaning products ([Ayeni & Olagoke-Komolafe, 2024](#)). Therefore, strengthening SOP implementation is expected to improve cleaning quality, optimize chemical use, and enhance occupational safety in the Housekeeping Department. The findings also support previous studies conducted by [Kotsiou et al. \(2026\)](#), who reported that noncompliance with chemical handling procedures is commonly associated with work habits, operational workload, and limited supervision.

5. Conclusions

5.1 Conclusion

This study concluded that the use of cleaning chemicals in room cleaning operations at Lion Hotel & Plaza Manado generally complies with the housekeeping Standard Operating Procedures (SOPs), particularly in terms of chemical selection, cleaning techniques, and final room inspections. However, several operational practices, including non-standardized chemical dilution, inconsistent implementation of the recommended contact time, and irregular use of Personal Protective Equipment (PPE), deviated from established procedures due to operational workload, limited cleaning time, and long-established work habits. These findings indicate that strengthening employee competence through regular training, providing standardized measuring equipment, enhancing supervisory practices, and consistently enforcing occupational safety measures are essential for improving housekeeping performance and chemical management.

This study contributes to the hospitality management literature by demonstrating that effective chemical management, SOP compliance, and occupational safety are interrelated factors that support service quality and operational effectiveness in hotel housekeeping. Nevertheless, the findings are limited to a single hotel and a qualitative case-study design. Therefore, future research should involve different hotel classifications and apply quantitative or mixed-method approaches to examine the relationships between chemical management, operational performance, employee productivity, and guest satisfaction more comprehensively.

5.2 Research Limitations

This study had several limitations. First, the research was conducted in only one hotel, namely, Lion Hotel & Plaza Manado, which limits the generalizability of the findings to other hospitality organizations with different operational characteristics. Second, the study involved a relatively limited number of participants, consisting of Room Attendants and Housekeeping Supervisors. Third, this study adopted a qualitative approach that focused on describing operational practices rather than quantitatively measuring the effectiveness or financial efficiency of chemical usage. Therefore, the findings should be interpreted in the specific context of the case study.

5.3 Suggestions and Directions for Future Research

The findings of this study provide practical implications for hotel management, particularly the Housekeeping Department, by highlighting the importance of strengthening SOP implementation in chemical-handling activities. Regular training programs, standardized dilution procedures, routine supervision, and consistent use of Personal Protective Equipment (PPE) should be prioritized to improve housekeeping performance, operational efficiency, and employee safety.

Future studies should expand the scope of research by involving hotels with different classifications and geographical locations to enable broader comparisons of chemical management practices. Quantitative or mixed-method approaches may also be employed to measure the relationship between SOP compliance, chemical consumption, operational costs, employee productivity and guest satisfaction. Furthermore, future research could investigate the implementation of automated chemical dilution systems, environmentally friendly cleaning chemicals, and sustainable housekeeping practices that support green hotel initiatives.

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Author Contributions

Mohd Supriadi, Jongky Wuner Alfius Kamagi, Hendry Moudy Estefanus Kumaat, was responsible for the study conceptualization, data collection, data analysis, manuscript writing, and final approval of the published version.

References

- Anderson, D. M., Sadler, C., Tantum, L. K., & Cronk, R. (2026). Global capacity for implementing the eight practical steps to achieve universal access to water, sanitation, and hygiene in healthcare facilities: A qualitative study using implementation science. <https://doi.org/10.1016/j.ssmhs.2026.100182>
- Ayeni, O., & Olagoke-Komolafe, O. E. (2024). Advancing chemical safety protocols in small and medium enterprises: A comprehensive guide. *CRR Journals*, 2(1), 47-60. <https://doi.org/10.57219/crrms.2024.2.1.0040>
- Belinda, J., Lukito, P. M., & Hidayat, M. A. (2025). Impact of SOP implementation, training, and employee satisfaction on service quality. *Jurnal Administrare: Jurnal Pemikiran Ilmiah dan Pendidikan Administrasi Perkantoran*, 12(1), 9-17. <https://doi.org/10.71309/administrare.v12i1.7380>
- Bensonch, C., Argyropoulos, C. D., Dimopoulos, C., Mikellidou, C. V., & Boustras, G. (2022). Analysis of safety climate factors and safety compliance relationships in the oil and gas industry. *Safety Science*, 151(1). <https://doi.org/10.1016/j.ssci.2022.105744>
- Bhuiyan, M. A. R., Ullah, M. R., & Das, A. K. (2019). IHealthcare: Predictive model analysis concerning big data applications for interactive healthcare systems. *Applied Sciences*, 9(16), 3365. <https://doi.org/10.3390/app9163365>
- Boyce, J. M. (2016). Modern technologies for improving cleaning and disinfection of environmental surfaces in hospitals. *Antimicrobial Resistance & Infection Control*, 5(1), 10. <https://doi.org/10.1186/s13756-016-0111-x>
- Chand, S. P. (2025). Methods of data collection in qualitative research: Interviews, focus groups, observations, and document analysis. *Advances in Educational Research and Evaluation*, 6(1), 303-317. <https://doi.org/10.25082/AERE.2025.01.001>
- Chen, X. A., Wang, R., & Zhang, J. (2022). Divide and conquer: A hygienic, efficient, and reliable assembly line for housekeeping. *Manufacturing & Service Operations Management*, 24(2), 938-955. <https://doi.org/10.1287/msom.2021.0984>
- Cruz, P., Kyle, J. L., Gold, D., Armour, P., & Durrani, T. S. (2026). Evaluation and management of exposure to infectious agents. <https://doi.org/10.1002/9781394319947.ch7Digital>
- Dasgupta, A., & Islam, M. M. (2024). Engineering management perspectives on safety culture in chemical and petrochemical plants: A systematic review. *Academic Journal On Science, Technology, Engineering & Mathematics Education*, 1(01), 10.69593. <https://doi.org/10.69593/AJTEET.V1I01.121>

- Deban, Z., Salehi, N., & Brunetto, Y. (2026). The role of psychosocial safety climate in engineers' well-being: Examining the mediating effects of leader-member exchange and psychological capital. <https://doi.org/10.1016/j.emj.2026.01.001>
- El Madja, N. M., Rumawak, I., & Usulu, R. A. P. (2026). *Belajar pariwisata dan perhotelan dari dunia nyata*. Dawarmiyata Press LPPM STIE Al-Anwar.
- El-Said, O. A., Kattara, H., Smith, M., & Youssif, M. (2026). Fostering healthy outcomes in hotels: The effects of healthy organizational resources on employees' stress reduction, resilience, and task performance. *Tourism and Hospitality Research*, 26(1), 99-117. <https://doi.org/10.1177/14673584241276171>
- Fatema, M. K. (2026). Food safety compliance and nutritional management protocols in institutional healthcare food services: Evidence-based framework for US long-term care facilities. *American Journal of Health and Medical Sciences*, 7(01), 87-127. <https://doi.org/10.63125/rvvzz976>
- Fitri, S. A., & Wijayanti, W. (2026). The effect of principal's academic supervision, work environment and work commitment on teacher performance at public middle schools in Jekan Raya District. *Journal of Educational Sciences*, 10(2), 2742-2754. <https://doi.org/10.31258/jes.10.2.p.2742-2754>
- Hussien, H. M., & Ayad, H. A. (2025). The impact of housekeeping employee technical skills on job performance in hotels. *Minia Journal of Tourism and Hospitality Research MJTHR*, 19(3), 155-179. <https://doi.org/10.21608/mjthr.2025.401649.1212>
- Kadir, A., Dhesi, S. K., Amalinda, V. D., Yuantoko, T. D., Satrya, B. A., & Fitriadi, F. (2026). Occupational health and safety in educational settings: Barriers, strategies, and compliance using a mixed-methods approach. *Safety*, 12(1), 11. <https://doi.org/10.3390/safety12010011>
- Kotsiou, O. S., Gouta, E., Natsaridis, N., Papageorgiou, G., Daniil, Z., & Gourgoulialis, K. I. (2026). The role of ATP bioluminescence in monitoring surface hygiene in hospital settings: A comprehensive review. *Antimicrobial Resistance & Infection Control*, 15(1), 44. <https://doi.org/10.1186/s13756-026-01698-8>
- Kramer, A., Arvand, M., Christiansen, B., Dancer, S., Eggers, M., Exner, M., Müller, D., Mutters, N. T., Schwebke, I., & Pittet, D. (2022). *Ethanol is indispensable for virucidal hand antisepsis: Memorandum from the Alcohol-Based Hand Rub (ABHR) task force, WHO Collaborating Centre on Patient Safety, and the Commission for Hospital Hygiene and Infection Prevention (KRINKO)* (Report No. 11). Berlin, Germany: Robert Koch Institute.
- Liu, J., Wang, Y., & Wang, Z. (2022). Effect of pressure on construction company compliance attitudes: Moderating role of organizational ethical climate. *Journal of Construction Engineering and Management*, 148(11), 04022125. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0002400](https://doi.org/10.1061/(ASCE)CO.1943-7862.0002400)
- Maczugin, J., Yazıcıoğlu, A., & Ciesielski, S. (2026). The future of portable sanitation: From harmful chemicals to sustainable green cleaning technologies. *Sustainability*, 18(6), 2828. <https://doi.org/10.3390/su18062828>
- Nadila, I. A., Swasti, I. K., & Rosyanti, D. M. (2026). The effect of workload and motivation on organizational commitment towards non government official. *JHSS (Journal Of Humanities And Social Studies)*, 9(2). <https://doi.org/10.33751/jhss.v9i2.12054>
- Oluwaniyi, O. I. (2025). Integrating occupational safety management into Enterprise Risk Management (ERM) frameworks. *International Journal of Scientific Research in Science and Technology*, 12(6), 811-834. <https://doi.org/10.32628/IJSRST25126505>
- Oyaigbevwen, I. O. (2026). *A systematic review on the impact of pesticides on the health of farmers in Nigeria* (Report No. 2).
- Permana, M. R., Islami, M. C. P. A., & Tranggono, T. (2025). Analysis of the effect of management commitment, safety compliance and safety awareness on safety culture. *Journal La Sociale*, 6(4), 1267-1279. <https://doi.org/10.37899/journal-la-sociale.v6i4.1962>
- Putri, N. M. K. E., Putra, I. K. M., Wajdi, M., & Mazher, M. A. (2025). An operational assessment of housekeeping services in fulfilling guest requests: A case study of Rby Bali. *Kajian Pendidikan, Seni, Budaya, Sosial dan Lingkungan*, 2(2), 88-101. <https://doi.org/10.58881/KPSBSL.V2I2.119>

- Putri, N. S., Adiatma, D., & Dhamayanty, S. (2026). Standard operating procedures as a strategic tool for service quality management: A case study of housekeeping operations in an international five-star hotel. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 11(01), 212-221. <https://doi.org/10.23969/jp.v11i01.43533>
- Rani, H. A., Ismail, A., Jaa'far, M. H., & Ahmad, N. (2025). Risks, incidents, guidelines, and strategies pertaining to chemical storage and handling in primary healthcare: A narrative review. *International Journal of Public Health Research*, 15(2).
- Shidiq, R. F., & Noekent, V. (2026). Creating quality of work life and organizational commitment: The mediating role of job satisfaction on staff performance. *Journal of Comprehensive Business Administration Research*, 3(2), 92-102. <https://doi.org/10.47852/bonviewJCBAR52024069>