

Research Article

The Integration of Individual and Behavioral Factors in Needle Stick Injuries Among Nurses in Hospitals: A Literature Review

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Abstract: Needle stick injury (NSI) is one of the most common occupational hazards among nurses and poses a significant risk of transmitting infectious diseases. The occurrence of NSI is influenced by multiple interacting factors, requiring a comprehensive approach to understand these determinants in an integrated manner. This study aimed to analyze the integration of individual and behavioral factors associated with NSI among nurses. The findings indicate that individual factors such as age, education level, and years of service contribute to the basic capacity of nurses in understanding occupational risks. Behavioral factors, including unsafe practices, needle recapping, and non-compliance with standard operating procedures, are the direct causes of NSI. Work environment factors, such as safety training, occupational safety systems, and workload, influence the development of such behaviors. The study concludes that NSI is the result of an interaction between individual, behavioral, and work environment factors, with behavioral factors being the most dominant determinant. Therefore, prevention efforts should be carried out comprehensively by promoting safe behavior supported by a conducive work environment and safety system.

Keywords: Behavior, Individual Factors, Needle Stick Injury, Nurses, Occupational Safety.

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1. Introduction

Needle stick injury (NSI) is one of the most common occupational hazards experienced by healthcare workers, particularly nurses, in the delivery of clinical services within healthcare facilities. NSI carries a significant risk of transmitting serious infectious diseases such as hepatitis B, hepatitis C, and human immunodeficiency virus (HIV), which may have long-term consequences for the health of healthcare personnel (Hassanipour et al., 2021). This incident affects not only physical health but also may lead to psychological distress, anxiety, and economic burden due to the need for follow-up examinations and medical treatment (Bouya et al., 2020).

NSI remains a significant global issue in the field of occupational safety and health. Studies indicate that the prevalence of NSI among healthcare workers is relatively high across various countries, with variations influenced by differences in healthcare systems and the implementation of occupational safety policies (Sahebi et al., 2025). Nurses represent the most vulnerable group due to their frequent contact with patients and direct involvement in invasive procedures such as injections and blood sampling (Vitello et al., 2024).

The occurrence of NSI is not incidental but is influenced by multiple interacting factors that form a complex risk mechanism. Literature suggests that individual factors such as age, level of education, and length of work experience are associated with NSI incidence. Healthcare workers with less experience tend to exhibit lower levels of vigilance in dealing with occupational risks (Motaarefi et al., 2016). Furthermore, differences in educational level may affect the ability to understand safety procedures and implement safe clinical practices (Raisa Amieni & Suhermi, 2025).

Behavioral factors play a crucial role in the occurrence of NSI, as they are directly related to the actions of healthcare workers during clinical practice. Unsafe behaviors, such as recapping needles, failure to use personal protective equipment, and non-compliance with standard operating procedures (SOPs), are major contributors to needle stick injuries (Chen et al., 2020). Low awareness of occupational risks and lack of discipline in adhering to safety procedures further increase the likelihood of NSI incidents (Saparwati et al., 2025).

Organizational factors also contribute significantly to NSI incidence through the development of the work environment and safety culture. Occupational safety training provided to healthcare workers can enhance knowledge and skills in preventing work-related injuries when conducted systematically and continuously (Andriyani et al., 2024). The implementation of occupational health and safety management systems (OHSMS) and the availability of clear and structured policies can support the establishment of safe work behaviors among healthcare personnel (Almutawakkil & Budiono, 2025).

However, research findings indicate that occupational safety training does not always significantly reduce NSI incidence if it is not followed by consistent implementation in daily work practices (Putranto et al., 2019). The effectiveness of training is strongly influenced by delivery methods, frequency, and active participant engagement in the learning process (Aziz, 2018). This suggests that training alone cannot serve as the primary solution but must be supported by other factors such as supervision and a strong safety culture.

High workload and unfavorable working conditions may also influence healthcare workers' behavior in implementing safety practices. Excessive workload can lead to physical and mental fatigue, thereby reducing concentration and increasing the likelihood of errors in clinical procedures (Li et al., 2024). This condition reinforces that behavioral factors are shaped not only by individual characteristics but also by the surrounding work environment.

Most previous studies have examined individual, behavioral, and organizational factors separately, thus failing to provide a comprehensive understanding of the interrelationships among these factors in NSI occurrence. Such fragmented approaches limit the ability to fully understand the underlying mechanisms of NSI (Vitello et al., 2024). Therefore, an integrated approach is needed to synthesize these factors in order to achieve a more comprehensive and in-depth understanding.

Based on the above considerations, this study aims to analyze and synthesize scientific evidence regarding the integration of individual and behavioral factors in the occurrence of needle stick injury among nurses through a systematic literature review approach.

2. Literature Review

The Role of Individual Factors in Needle Stick Injury Incidence

Individual factors are important determinants in the occurrence of needle stick injury (NSI) among nurses, as they are directly related to personal characteristics that influence the ability to recognize and manage occupational risks. The literature indicates that variables such as age, educational level, and length of work experience are significantly associated with NSI incidence. Younger nurses and those with limited work experience tend to have a higher risk of experiencing NSI due to limited clinical skills and a lower ability to optimally identify workplace hazards (Motaarefi et al., 2016; Raisa Amieni & Suhermi, 2025).

In addition, educational level contributes to shaping understanding of occupational safety procedures, although findings remain inconsistent. Higher education may enhance cognitive abilities and clinical decision-making; however, it does not necessarily translate into safe work behavior without adequate experience and training (Putranto et al., 2019). This indicates that individual factors are not limited to demographic characteristics but also include cognitive and psychological aspects that influence nurses' readiness to manage occupational risks (Motaarefi et al., 2016).

The Dominant Role of Behavioral Factors in Needle Stick Injury

Behavioral factors represent the most dominant determinants in the occurrence of NSI, as they are directly related to nurses' actions during clinical procedures. Unsafe work behaviors, such as needle recapping, failure to use personal protective equipment, and non-compliance with standard operating procedures (SOPs), are the primary causes of needle stick injuries (Chen et al., 2020). These behaviors are often influenced by habitual work practices, low risk awareness, and a lack of discipline in adhering to occupational safety principles (Saparwati et al., 2025).

Furthermore, knowledge and attitudes play a crucial role in shaping work behavior. Nurses with inadequate knowledge of occupational safety are more likely to engage in risky practices, while negative attitudes toward safety may lead to non-compliance with established procedures. High workload further exacerbates this issue by causing physical and mental fatigue, reducing concentration, and increasing the likelihood of errors during clinical procedures (Li et al., 2024). Therefore, behavioral modification is a key component in preventing NSI.

Integration of Individual, Behavioral, and Work Environment Factors

The occurrence of NSI among nurses cannot be explained by a single factor but is the result of the interaction between individual, behavioral, and work environment factors. Individual factors contribute to forming the basic capacity of nurses; however, they do not directly cause NSI without being manifested through behavior. Behavioral factors represent the practical expression of individual characteristics in daily clinical practice, where less experienced nurses are more prone to unsafe actions (Putranto et al., 2019; Saparwati et al., 2025).

The work environment acts as a mediator that can strengthen or weaken the relationship between individual and behavioral factors. The implementation of occupational safety systems, the availability of clear SOPs, and continuous training programs can promote safe behavior among nurses (Almutawakkil & Budiono, 2025). Conversely, unfavorable working conditions, such as high workload and lack of supervision, may lead nurses to disregard safety procedures despite having adequate knowledge (Li et al., 2024). Therefore, NSI should be understood as the result of an integrated interaction among these factors, highlighting the need for comprehensive and integrated prevention strategies (Vitello et al., 2024).

3. Proposed Method

This study employed a systematic literature review design aimed at identifying and synthesizing research findings related to the integration of individual and behavioral factors in the occurrence of needle stick injury (NSI) among nurses. The article search process was conducted systematically across several electronic databases using keywords relevant to the research topic.

The articles included in this study were scientific journals published between 2016 and 2026 and were selected based on topic relevance and data completeness. A total of 14 relevant scientific articles were included for analysis. The selection process followed several stages, including identification, screening, and eligibility assessment, to ensure alignment with the research objectives.

Data from the selected articles were subsequently extracted and analyzed descriptively by categorizing findings into individual and behavioral factors. The results of the analysis were then presented in a narrative form to illustrate the relationships and integration among factors contributing to the occurrence of NSI among nurses.

4. Results and Discussion

Individual Factors in Needle Stick Injury Among Nurses

Individual factors constitute important determinants in the occurrence of needle stick injury (NSI) among nurses, as they are directly related to personal characteristics that influence the ability to recognize and manage occupational risks. The most frequently examined individual factors in the literature include age, level of education, and length of work experience, each of which contributes to the incidence of NSI (Motaarefi et al., 2016).

Age is one of the factors associated with NSI incidence, as it reflects the level of maturity and experience in handling workplace situations. Younger healthcare workers tend to have a higher risk of experiencing NSI compared to older workers. This condition occurs because younger nurses generally have more limited clinical experience and are not yet fully skilled in

performing invasive procedures safely. In addition, their ability to identify potential occupational hazards has not yet developed optimally (Raisa Amieni & Suhermi, 2025).

Length of work experience is also significantly associated with NSI incidence, as it reflects the level of professional exposure possessed by nurses. Studies indicate that nurses with shorter work experience are at a higher risk of experiencing NSI compared to those with longer tenure. Greater work experience enables nurses to become more accustomed to clinical procedures, better understand potential risks, and implement preventive measures more effectively. Thus, work experience may serve as a protective factor against NSI (Putranto et al., 2019).

Educational level is another individual factor that influences NSI incidence, although findings remain inconsistent. Some studies suggest that higher educational attainment is associated with a reduced risk of NSI due to improved understanding of occupational safety procedures (Raisa Amieni & Suhermi, 2025). However, other studies report no significant relationship between educational level and NSI incidence (Putranto et al., 2019). These discrepancies indicate that formal education alone is insufficient to ensure safe work behavior without adequate experience and training.

Furthermore, individual factors are also related to cognitive abilities and readiness to manage occupational risks, including knowledge, risk perception, and decision-making skills during clinical procedures. Nurses with a strong understanding of safety procedures are more likely to avoid high-risk actions that may lead to NSI. This highlights that individual factors are not limited to demographic aspects but also encompass psychological and cognitive dimensions that influence work behavior (Motaarefi et al., 2016).

Based on the synthesis of various studies, individual factors cannot independently determine NSI occurrence but interact with other factors such as behavior and the work environment. Nurses with favorable individual characteristics may still experience NSI if they are not supported by safe work practices and adequate safety systems (Vitello et al., 2024).

Behavioral Factors in Needle Stick Injury Among Nurses

Behavioral factors represent the most dominant determinants in the occurrence of needle stick injury (NSI), as they are directly related to the actions performed by nurses during clinical procedures. Unsafe work behaviors, such as recapping needles, failure to use personal protective equipment, and non-compliance with standard operating procedures (SOPs), are the primary causes of needle stick injuries (Chen et al., 2020).

The practice of recapping needles is one of the most common unsafe behaviors in healthcare settings. This action increases the risk of injury due to direct contact with used and potentially contaminated needles. Nurses who continue this practice are often influenced by habitual work patterns and a lack of awareness regarding associated risks. This condition suggests that behavioral change requires not only educational interventions but also sustained and continuous efforts (Saparwati et al., 2025).

Compliance with SOPs is a critical aspect of preventing NSI, as these procedures are designed to minimize risks in every clinical activity. Nurses who fail to comply with SOPs are more likely to experience NSI compared to those who adhere to established procedures. Non-compliance may be influenced by factors such as lack of supervision, high workload, and low awareness of occupational safety importance (Raisa Amieni & Suhermi, 2025).

Knowledge and attitudes are also integral components of behavioral factors influencing NSI incidence. Nurses with inadequate knowledge of occupational safety are more likely to engage in risky actions, while those with unfavorable attitudes toward safety may disregard established procedures. This indicates that behavior is shaped not only by technical competence but also by cognitive and affective dimensions (Saparwati et al., 2025).

High workload can significantly influence nurses' behavior in performing their duties. Excessive work pressure may lead to physical and mental fatigue, reducing concentration and increasing the likelihood of errors in clinical procedures. Such conditions may encourage nurses to take shortcuts, thereby increasing the risk of NSI (Li et al., 2024).

The synthesis of various studies indicates that behavioral factors have a more direct relationship with NSI occurrence compared to other factors. While individual and organizational factors influence behavior, it is behavior itself that directly leads to injury. Therefore, NSI prevention efforts should focus on behavioral change through increased awareness, adherence to SOPs, and the development of a strong safety culture (Chen et al., 2020).

Work Environment Factors in Supporting Safe Behavior

Work environment factors play a crucial role in shaping and influencing nurses' behavior in implementing occupational safety practices. These factors include safety management systems, the availability of standard operating procedures (SOPs), safety training, and working conditions that support safe practices. An inadequate work environment may increase the risk of NSI even when healthcare workers possess favorable individual characteristics (Almutawakkil & Budiono, 2025).

The implementation of occupational health and safety management systems (OHSMS) is a key component in creating a safe work environment. These systems regulate policies, procedures, and supervision in preventing workplace accidents. Nurses working in environments with well-implemented OHSMS tend to exhibit more positive attitudes toward safety and higher compliance with established procedures. This demonstrates that effective systems can indirectly foster safe work behavior (Aziz, 2018).

The availability and implementation of SOPs are also essential elements of the work environment influencing NSI incidence. Incomplete or outdated SOPs that do not align with current safety standards may increase the risk of errors in clinical practice. Nurses working without clear procedural guidance are more likely to rely on habitual practices, which may lead to unsafe behaviors (Alisha et al., 2023).

Occupational safety training is another effort aimed at enhancing healthcare workers' competence in preventing NSI. Structured and continuous training can improve nurses' knowledge and skills in applying safety procedures (Andriyani et al., 2024). However, the effectiveness of training largely depends on the quality of implementation and the consistency of its application in daily practice (Putranto et al., 2019).

Additionally, high workload and unfavorable working conditions can influence nurses' behavior. Excessive workload may cause fatigue and reduce concentration, thereby increasing the risk of errors in clinical procedures. This situation may lead nurses to neglect safety procedures in favor of efficiency, ultimately increasing the likelihood of NSI (Li et al., 2024).

Based on the synthesis, work environment factors function as elements that shape and reinforce healthcare workers' behavior in implementing safety practices. A supportive work environment not only provides facilities and procedures but also fosters a safety culture that promotes safe behavior. Therefore, NSI prevention efforts should not only focus on individual factors but also involve comprehensive improvements in systems and work environments.

Integration of Individual and Behavioral Factors in Needle Stick Injury Among Nurses

The occurrence of needle stick injury (NSI) among nurses cannot be explained by a single factor in isolation but rather results from the interaction between individual factors, behavior, and the work environment. Individual factors such as age, educational level, and work experience contribute to forming the basic capacity of nurses to understand risks and safe practices; however, these factors do not directly cause NSI without being manifested in behavior (Motaarefi et al., 2016).

Behavioral factors represent the practical manifestation of individual influences in daily work activities. Nurses with limited experience tend to have suboptimal skills, increasing the likelihood of unsafe actions such as recapping or failure to follow established procedures (Putranto et al., 2019). Conversely, nurses with good knowledge do not necessarily demonstrate safe behavior if they lack awareness and positive attitudes toward occupational safety (Saparwati et al., 2025).

The interaction between individual and behavioral factors indicates that improving individual capacity alone is insufficient to prevent NSI. Individual attributes must be translated into safe work behavior through learning processes, experience, and the development of good work habits. This explains why some studies find no significant relationship between educational level and NSI incidence, as formal education does not automatically ensure safe behavior (Raisa Amieni & Suhermi, 2025).

Work environment factors act as mediators that strengthen or weaken the relationship between individual factors and behavior. A work environment with robust safety systems, clear SOPs, and continuous training can promote the development of safe behavior among nurses (Almutawakkil & Budiono, 2025). Conversely, an unsupportive work environment may lead nurses to disregard safety procedures despite having adequate knowledge (Li et al., 2024).

The integration of these three factors demonstrates that behavior is the most proximal determinant of NSI, while individual and environmental factors influence the formation of such behavior. Therefore, NSI can be understood as the final outcome of a process that begins with individual characteristics, is shaped by the work environment, and is ultimately manifested in daily work behavior (Vitello et al., 2024).

This integrative approach implies that NSI prevention efforts must be comprehensive and involve multiple aspects simultaneously. Interventions focusing solely on knowledge improvement without accompanying behavioral change and system enhancement are unlikely to yield optimal results. Therefore, NSI prevention strategies should prioritize the development of safe behavior through strengthening individual capacity and supporting it with a conducive work environment.

5. Conclusions

Based on the findings of this literature review, it can be concluded that the occurrence of needle stick injury (NSI) among nurses is influenced by the interaction of multiple multifactorial determinants, namely individual, behavioral, and work environment factors. Individual factors such as age, educational level, and length of work experience contribute to shaping nurses' fundamental capacity to understand occupational risks; however, they do not directly determine the occurrence of NSI unless manifested through work behavior.

Behavioral factors represent the most dominant determinants, as they are directly related to actions performed during clinical procedures, including compliance with standard operating procedures (SOPs), recapping practices, and the use of personal protective equipment. Meanwhile, work environment factors play a critical role in shaping and reinforcing behavior through the implementation of safety systems, training programs, and policies that support safe work practices.

Therefore, NSI can be understood as the result of the integration of individual characteristics, work environment conditions, and healthcare workers' behavior. Consequently, prevention efforts should be conducted in a comprehensive and integrated manner.

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