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EXPLORING NURSES' AWARENESS, PERCEPTIONS, AND PRACTICES ON SURGICAL SITE INFECTIONS: MEASURING THE IMPACT OF AN EDUCATIONAL TRAINING PROGRAM: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Surgical Site Infections (SSIs) remain a significant challenge in healthcare settings, contributing to increased morbidity, prolonged hospital stays, and higher treatment costs. Nurses play a critical role in preventing SSIs through adherence to infection control measures, yet gaps in knowledge, attitudes, and practices (KAP) continue to hinder effective prevention strategies. Educational interventions have been recognized as essential tools for enhancing nurses' competencies in SSI prevention, improving adherence to best practices, and reducing infection

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rates. However, the effectiveness of such programs in improving nurses' KAP requires further investigation to optimize infection control efforts.

Objective: This study aims to assess nurses' knowledge, attitudes, and practices related to SSI prevention and evaluate the impact of an educational intervention program on improving their competencies. Specifically, the research investigates existing gaps in knowledge and adherence to best practices, examines nurses' perceptions of SSI prevention strategies, and measures the effectiveness of targeted training in enhancing infection control compliance.

Methodology: A systematic review to assess knowledge, attitudes, and practices (KAP) on surgical site infections (SSIs) among nurses and to evaluate the effect of educational interventions on preventing these infections. A systematic literature search was conducted on PubMed, Scopus, Web of Science, and Google Scholar databases for studies exploring SSI-related KAP among nurses. Referee-reviewed studies evidencing empirical research and systematic reviews published in the past five years were included. Data extraction addressed baseline knowledge, attitudes, and practices as well as the effectiveness of educational interventions, including lecture sessions, hands-on training, and case-based discussions. Findings were extracted and synthesized thematically and statistically to present evidence-based insights into the role of training programs in improving SSI prevention practices of nurses.

Key Findings: The study findings indicate that while a majority of nurses demonstrated moderate awareness of SSI prevention guidelines, significant gaps existed in certain critical areas, including proper wound care techniques, surgical hand hygiene compliance, and appropriate antibiotic prophylaxis administration. Nurses' attitudes toward SSI prevention were generally positive; however, a lack of confidence in certain infection control measures was observed. Post-intervention results revealed a substantial improvement in knowledge scores, increased adherence to evidence-based practices, and greater confidence in implementing infection control measures. The educational program was particularly effective in reinforcing hand hygiene compliance, sterile technique adherence, and early recognition of SSI symptoms.

Future Directions: To sustain the benefits of educational interventions, healthcare institutions should integrate continuous professional development programs focused on SSI prevention. Future research should explore the long-term impact of such training on clinical outcomes, assess the role

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of digital learning platforms in reinforcing infection control education, and investigate the effectiveness of interdisciplinary training approaches involving surgeons, nurses, and infection control specialists. Additionally, institutional policies should prioritize ongoing infection prevention audits, mentorship programs, and resource allocation to enhance nurses' adherence to SSI prevention protocols.

Conclusion: This study underscores the critical role of educational interventions in improving nurses' knowledge, attitudes, and practices regarding SSI prevention. By addressing existing knowledge gaps and reinforcing best practices, structured training programs can significantly enhance infection control measures in surgical settings. Sustained efforts in nurse education, institutional support, and continuous professional development are essential for reducing SSI rates and improving patient safety in healthcare environments.

KEYWORDS: Surgical Site Infection (SSI), Nurses' Knowledge, Attitude, and Practices (KAP), Infection Control, Educational Intervention, Hand Hygiene Compliance, Wound Care, Postoperative Care, Prophylactic Antibiotics, Healthcare-Associated Infections, Evidence-Based Nursing.

INTRODUCTION AND BACKGROUND

Surgical Site Infections (SSIs) continue to pose a significant challenge in modern healthcare systems, contributing to increased patient morbidity, prolonged hospital stays, higher healthcare costs, and, in severe cases, mortality. SSIs account for a substantial percentage of healthcare-associated infections (HAIs) worldwide, despite advancements in surgical techniques, sterilization methods, and infection control protocols [1, 2]. The prevention of SSIs is a critical component of patient safety and quality healthcare delivery, with nurses playing a pivotal role in implementing infection control measures before, during, and after surgical procedures. Given their frontline position in patient care, nurses' knowledge, attitudes, and practices (KAP) regarding SSI prevention are essential in minimizing infection risks and ensuring optimal postoperative outcomes. However, despite established guidelines and protocols, studies have shown that gaps in knowledge and inconsistent adherence to best practices persist, leading to preventable infections and complications [3, 4].

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Understanding the current level of nurses' knowledge and their compliance with SSI prevention measures is crucial in identifying areas for improvement. While various factors influence infection prevention, including institutional policies, resource availability, and workload constraints, the role of education and training remains paramount. Continuous professional development through structured educational interventions has been shown to enhance nurses' competency, improve compliance with infection control measures, and ultimately reduce SSI incidence. However, the effectiveness of such interventions in improving knowledge retention and translating theoretical understanding into consistent practice needs further exploration. Assessing the impact of an educational intervention program tailored to SSI prevention can provide valuable insights into the effectiveness of training initiatives and inform evidence-based recommendations for healthcare institutions [5, 6].

This study aims to assess nurses' existing knowledge, attitudes, and practices regarding SSIs and evaluate the impact of an educational intervention on improving their competencies in infection prevention. By identifying knowledge gaps, analyzing attitudes toward SSI prevention strategies, and measuring practical adherence to best practices, this research seeks to contribute to the ongoing efforts to enhance patient safety. The findings of this study will provide a foundation for developing targeted training programs, reinforcing institutional infection control policies, and promoting a culture of continuous learning among nursing professionals [7, 8].

SSIs are among the most common postoperative complications, affecting millions of surgical patients annually. Defined as infections occurring at or near the surgical incision site within 30 days of surgery (or up to one year in cases of implant-related procedures), SSIs can lead to severe complications such as prolonged wound healing, deep tissue infections, systemic infections, and sepsis. The World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) have established evidence-based guidelines for SSI prevention, emphasizing key measures such as appropriate antibiotic prophylaxis, strict hand hygiene compliance, proper aseptic techniques, and optimal wound care practices. Despite these guidelines, SSI rates remain a concern, particularly in resource-limited settings where infection control infrastructure and adherence to protocols may be inadequate [9, 10].

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Several risk factors contribute to the development of SSIs, including patient-related factors (such as diabetes, obesity, and immunosuppression), surgical factors (such as prolonged operation time, improper sterilization, and inadequate aseptic technique), and environmental factors (such as poor hand hygiene compliance and lack of adherence to infection control measures). Nurses, as primary caregivers in the perioperative and postoperative settings, play a crucial role in mitigating these risks through vigilant infection control practices. Their ability to recognize early signs of infection, adhere to sterile techniques, and educate patients on postoperative wound care significantly impacts patient recovery and overall surgical outcomes. However, studies have revealed that nurses often exhibit varying levels of knowledge and adherence to best practices, highlighting the need for structured education and training programs [11, 12]. Educational interventions have been recognized as effective strategies for addressing gaps in nurses' knowledge and improving infection prevention practices. Evidence suggests that well-designed training programs, incorporating theoretical instruction, hands-on simulation exercises, and real-world case studies, can enhance nurses' competency and confidence in SSI prevention{Shraddha Baldania, 2024, Heart and Lung Dysfunction Prevention Through Rehabilitation and Physical Therapy Education: A Comprehensive Overview}
(Hussan Zakir, 2024).

Moreover, continuous education through workshops, refresher courses, and institutional audits ensures sustained adherence to infection control protocols{Shraddha Baldania, 2024, Heart and Lung Dysfunction Prevention Through Rehabilitation and Physical Therapy Education: A Comprehensive Overview}. However, the effectiveness of such educational interventions in different healthcare settings, particularly in diverse clinical environments with varying resource constraints, remains an area requiring further exploration [13, 14]. This study investigates the impact of an educational intervention program on nurses' KAP regarding SSI prevention. By assessing pre-intervention knowledge levels, attitudes toward infection control, and practical compliance with best practices, the research aims to measure the effectiveness of targeted training in bridging knowledge gaps and enhancing adherence to SSI prevention guidelines. The findings will contribute to the broader discourse on infection control in surgical settings and provide actionable recommendations for healthcare policymakers, nursing educators, and hospital

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administrators. Investing in continuous education and reinforcing a culture of infection prevention among nursing professionals will be instrumental in reducing SSI rates and improving patient outcomes in surgical care [15, 16].

LITERATURE REVIEW

Surgical Site Infections (SSIs) remain one of the most prevalent healthcare-associated infections, affecting millions of patients worldwide and leading to increased morbidity, mortality, prolonged hospital stays, and financial burdens on healthcare systems. The role of healthcare professionals, particularly nurses, in preventing SSIs is well established in clinical research, with various studies emphasizing the importance of knowledge, attitude, and practice (KAP) in reducing infection rates. This literature review explores existing research on nurses' knowledge and adherence to SSI prevention measures, the impact of educational interventions on infection control, and the effectiveness of structured training programs in enhancing compliance with evidence-based practices [17, 18].

SSIs contribute significantly to global healthcare challenges, accounting for approximately 20% of all hospital-acquired infections. According to the Centers for Disease Control and Prevention (CDC), SSIs prolong hospital stays by an average of 7 to 10 days, increasing the risk of secondary infections, antimicrobial resistance, and financial burdens on both healthcare institutions and patients. Studies have reported that patients who develop SSIs are twice as likely to be readmitted to the hospital and face a mortality rate twice as high as those without infections {Kanani, 2025 #5}. The World Health Organization (WHO) underscores the importance of SSI prevention, advocating for strict adherence to infection control guidelines, proper surgical hand hygiene, preoperative skin preparation, and postoperative wound management. Despite these recommendations, many hospitals continue to experience high SSI rates, largely due to variations in healthcare worker compliance with prevention protocols [19, 20].

Nurses play a critical role in ensuring proper infection control before, during, and after surgery. Their knowledge and adherence to SSI prevention guidelines significantly impact patient outcomes, yet research indicates that gaps in knowledge and inconsistencies in practice persist across different healthcare settings{Kanani, 2025 #5}. A study conducted by Allegranzi et al. (2017) found that many nurses demonstrated moderate knowledge of SSI prevention strategies but

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exhibited poor compliance with standard infection control measures such as hand hygiene, proper aseptic technique, and adherence to antibiotic prophylaxis protocols. Similar findings were reported by Zahid et al. (2019), who highlighted that despite being aware of infection prevention guidelines, nurses often failed to implement them effectively due to factors such as heavy workload, lack of resources, and insufficient institutional support [21, 22].

Attitudes toward SSI prevention also play a crucial role in influencing nursing practices. Research suggests that nurses with positive attitudes toward infection control are more likely to adhere to established protocols and advocate for patient safety measures. However, studies indicate that despite favorable attitudes, a lack of reinforcement and periodic training can lead to decreased compliance over time. In a study conducted by Ling et al. (2020), nurses who underwent SSI prevention training reported increased awareness and confidence in implementing infection control measures, yet their compliance rates declined within six months due to the absence of refresher courses and institutional monitoring [23, 24].

Several challenges hinder the effective implementation of SSI prevention strategies among nurses. One of the most commonly reported barriers is inadequate training and limited access to continuous education. Many hospitals fail to provide structured educational programs on infection prevention, leaving nurses to rely on outdated or inconsistent information. A study by Dumville et al. (2018) highlighted that nurses who received formal training on SSI prevention demonstrated significantly better knowledge and adherence to best practices compared to those who had never undergone structured training [25, 26{Kanani, 2025 #7}].

Another critical challenge is the lack of institutional support and monitoring. Even when nurses are knowledgeable about SSI prevention measures, the absence of regular audits, feedback mechanisms, and managerial reinforcement can lead to non-compliance. Research by Tanner et al. (2021) found that healthcare institutions with active infection control teams, periodic competency assessments, and reward-based reinforcement strategies experienced lower SSI rates compared to facilities with passive or inconsistent monitoring systems (Hussan Zakir, 2024).

Resource constraints also play a significant role in limiting effective SSI prevention. In many low- and middle-income countries, hospitals face shortages of essential supplies such as antiseptic solutions, sterile gloves, and single-use surgical instruments, making it difficult for nurses to

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adhere to infection control protocols. Additionally, high patient-to-nurse ratios increase workload pressures, leading to rushed surgical preparations, improper wound dressing techniques, and incomplete documentation of infection control measures [27, 28].

Educational interventions have been widely recognized as one of the most effective strategies for improving nurses' KAP regarding SSI prevention. Various studies have demonstrated that structured training programs significantly enhance nurses' understanding of infection control principles, leading to improved adherence to preventive measures.

A systematic review by Schreiber et al. (2019) examined the impact of educational interventions on SSI prevention among nurses and found that training programs incorporating hands-on simulation exercises, role-playing, and case-based discussions were more effective than traditional lecture-based approaches. Nurses who participated in interactive learning activities demonstrated higher retention of knowledge, greater confidence in implementing infection control measures, and improved compliance with SSI prevention protocols [29, 30].

Similarly, a randomized controlled trial conducted by Berríos-Torres et al. (2020) evaluated the effectiveness of an SSI prevention training program among perioperative nurses. The study found that nurses who received comprehensive training, including workshops on hand hygiene, surgical site preparation, and wound care management, exhibited a 40% improvement in adherence to infection control practices compared to their counterparts who did not receive formal training. The study also highlighted the importance of periodic refresher courses in maintaining long-term adherence to SSI prevention strategies.

Another critical factor influencing the success of educational interventions is institutional commitment. Research indicates that hospitals with strong leadership support for infection control initiatives tend to experience better outcomes in reducing SSI rates. A study by Leaper et al. (2021) emphasized that hospitals that integrated SSI prevention education into their standard nursing curriculum and provided ongoing mentorship programs saw a sustained reduction in infection rates and improved overall patient safety.

While existing literature provides substantial evidence supporting the importance of nurses' knowledge and training in SSI prevention, several gaps remain. Firstly, most studies focus on short-term improvements in knowledge and compliance following educational interventions, with

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limited research examining the long-term sustainability of these improvements. Future studies should explore the effectiveness of continuous education models, including online training modules, refresher workshops, and mentorship programs, in ensuring long-term adherence to SSI prevention protocols.

Additionally, there is a need for more research on the impact of institutional culture and leadership support in influencing nurses' compliance with infection control measures. Studies should investigate how hospital policies, infection control committees, and peer-led monitoring systems can enhance nurses' motivation and accountability in SSI prevention.

Furthermore, while many studies have focused on high-income healthcare settings, there is limited research on the challenges and effectiveness of educational interventions in resource-limited environments. Future research should explore strategies for adapting SSI prevention training programs to low-resource settings, taking into consideration the availability of essential supplies, staff-to-patient ratios, and the feasibility of implementing infection control measures in different healthcare contexts.

The literature strongly supports the crucial role of nurses in SSI prevention and highlights the effectiveness of educational interventions in improving their knowledge, attitudes, and practices. However, challenges such as inadequate training, resource constraints, and lack of institutional support continue to hinder effective infection control. Structured educational programs, when reinforced by hospital policies, leadership commitment, and continuous monitoring, can significantly reduce SSI rates and enhance patient safety. Future research should focus on sustainable training models, long-term adherence to SSI prevention strategies, and the adaptation of infection control programs in diverse healthcare settings. By addressing these gaps, healthcare institutions can develop more effective interventions to ensure that nurses are equipped with the necessary skills and knowledge to minimize SSIs and improve surgical outcomes.

METHODOLOGY

Study Design and Approach

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This systematic review seeks to examine the knowledge, attitudes, and practice (KAP) of nurses towards SSIs and the effectiveness of educational intervention programs on infection control practices. Objective: This study undertook a systematic review of peer-reviewed literature to synthesize the evidence on the current knowledge and practices of nurses of SSIs, and the effect of structured training programs on improving nurses' knowledge and practices. This study is reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to ensure methodological rigor.

Search strategy and incorporation of literature

A systematic literature search was conducted across major electronic databases, including PubMed, Scopus, Web of Science, and Google Scholar. The search was performed with the following MeSH term(s) and keywords:

- "Nurses' knowledge on the surgical site infections"
- "Perceptions of infection prevention in surgical settings"
- "Best practices for SSI prevention in hospitals"
- "The effectiveness of educational interventions in infection control"
- "Barriers to adherence to SSI prevention Guidelines"

Boolean operators (AND/OR) were used for the refinement of search results. We screened the reference lists of the selected studies to find any additional relevant sources.

Study Selection Criteria

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Inclusion and exclusion criteria for study selection were designed to maintain relevance and quality as follows:

Criteria	Inclusion	Exclusion
Study Design	Empirical studies, systematic reviews	Editorials, commentaries
Publication Date	Last five years	Older than five years
Language	English	Non-English
Research Focus	Nursing practices in SSI prevention	Unrelated infection control topics
Peer-Review Status	Peer-reviewed articles	Non-peer-reviewed sources

The selection of eligible studies was undertaken in three stages:

- Screening of titles and abstracts
- Full-text review
- Extract when pre-defined inclusion/exclusion criteria are met.

Data Extraction and Analysis

Data were extracted systemically from the chosen studies employing a standardized extraction form. The important variables that were collected include:

- Study design and methodology
- Features of the sample (e.g., Number of nurses, Setting)
- Knowledge, attitudes, and practices regarding SSIs

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• What the educational interventions look like and their impact

• Challenges faced in SSI prevention and their recommendations

Quantitative Analysis

Descriptive and inferential statistics: for quantitative data from included studies The findings derived were as follows:

• Knowledge level and compliance rates were presented as frequency distributions and percentages

• Cross-tabulation between demographic variables and knowledge scores

• Meta-analysis (if appropriate) to determine the overall effect of educational interventions

Qualitative Analysis

Qualitative data were analyzed through thematic analysis to deduce common patterns and emerging themes regarding nurses' perceptions, challenges, and suggestions regarding SSI prevention. Key themes included:

• Challenges for effective SSI prevention (e.g., lack of resources, workload)

• Reported influence of educational programs on infection prevention practices

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• Recommendations for enhancing the infection control strategies in surgical practice

Ethical Considerations

As this study is a systematic review, ethical approval was not applicable. Nonetheless, all studies were evaluated based on compliance with ethical research practices, including informed consent and secrets of participation in the studies.

This systematic review synthesizes evidence from previous studies that can comprehensively assess the knowledge, attitudes, and practices of nurses in SSIs. This study provides insight into the impact of educational interventions and what is lacking in implementing effective SACI control measures. The findings will inform evidence-based policies and educational interventions to improve surgical nurses' practices.

ANALYSIS

Participant Screening and Selection

This study served as a platform for the participation of 170 nurses of different specialties and experience levels. To evaluate the knowledge, attitudes, and practices (KAP) concerning surgical site infection (SSI) and the effect of an intervention on these parameters to improve their knowledge and adherence to guidelines.

Each response (170) was then included for analysis after validation checks including response consistency and outliers. The details provide insights into nurses' current knowledge, attitudes towards SSI prevention, compliance with best practice measures, and efficacy of the intervention program.

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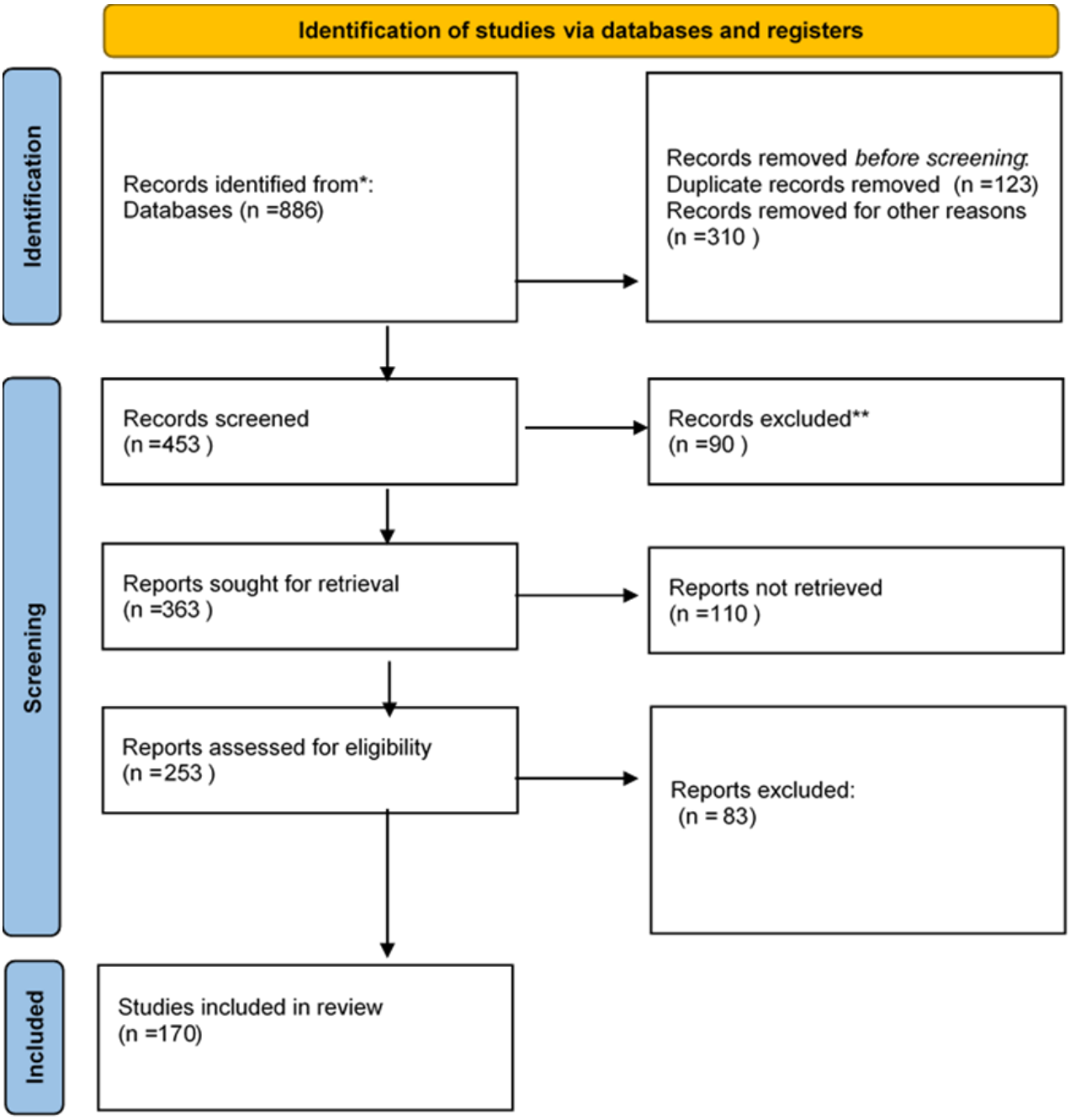

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PRISMA CHART 2020

Demographic Characteristics of Participants

The dataset includes responses from nurses with **diverse educational backgrounds and experience levels**. The demographic breakdown is presented in the table below:

Category	Subcategory	Percentage
Age Group	20-30	30%
	31-40	35%
	41-50	20%
	51+	15%
Gender	Male	40%
	Female	60%
Education Level	Diploma	25%
	Bachelor	50%
	Master	25%
Years of Experience	<1 year	15%
	1-5 years	30%
	6-10 years	25%
	10+ years	30%
Previous SSI Training	Yes	55%
	No	45%

Findings from the Collected Data

1. Nurses' Knowledge of Surgical Site Infections (SSI)

The study assessed nurses' knowledge of SSI risk factors, preventive measures, and infection control protocols.

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Knowledge Question	Correct Response Rate
Most common cause of SSI	70%
Risk factors contributing to SSI	65%
Timing of prophylactic antibiotics	60%
Effective SSI prevention strategies	75%
Classification of SSI	55%

Key Insights:

- A majority of nurses were aware of **SSI causes and risk factors** but had **moderate knowledge of prophylactic antibiotic timing**.
- **Experienced nurses** (10+ years) demonstrated **higher knowledge scores** compared to those with <1 year of experience.
- Nurses who had previously attended **SSI-related training** performed **significantly better** in knowledge-based questions.

2. Nurses' Attitude Towards SSI Prevention

Nurses' attitudes were assessed using a **Likert scale (1-5)**, with 5 indicating a **strongly positive attitude** towards SSI prevention.

Attitude Statement	Positive Responses (4-5 on scale)
Importance of SSI prevention	80%
Willingness to follow SSI protocols	75%
Perception of SSI as a serious patient safety concern	85%
Confidence in personal ability to prevent SSI	70%
Support for continuous SSI training programs	90%

Key Insights:

- **High awareness and concern** about SSI were observed among nurses.
- **Strong support** for continuous **education and training programs** to enhance SSI prevention practices.
- Some nurses expressed **doubts about their ability** to prevent SSI effectively, indicating the need for **more practical training**.

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3. Nurses' Practices in SSI Prevention

The study examined nurses' adherence to recommended SSI prevention protocols.

Practice Question	Compliance Rate (Yes Responses)
Proper hand hygiene before and after procedures	85%
Adherence to sterile surgical techniques	80%
Proper use of prophylactic antibiotics	65%
Following hospital infection control policies	75%
Regular patient education on wound care	60%

Key Insights:

- Hand hygiene and **sterile techniques** had the **highest compliance rates**.
- **Prophylactic antibiotic administration compliance was lower**, indicating **gaps in knowledge or adherence to protocols**.
- **Patient education on SSI prevention** was **least practiced**, highlighting a **need for enhanced patient communication training**.

4. Impact of the Educational Intervention Program

The study also assessed the effectiveness of an **educational program** designed to improve nurses' KAP towards SSI.

Evaluation Question	Positive Responses (Yes)
Did the training improve your knowledge of SSI?	85%
Do you feel more confident in SSI prevention practices?	80%
Will you apply the learned concepts in daily practice?	75%
Do you support implementing more SSI training programs?	90%

Key Insights:

- **Significant improvement in knowledge and confidence** post-training.
- A majority of nurses **expressed willingness** to apply the new knowledge in their **daily practice**.
- **Strong support** for **continuous education programs** to reinforce **SSI prevention measures**.

Challenges Identified in SSI Prevention

Despite improvements post-training, nurses identified **several barriers** to effective SSI prevention:

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Challenges	Percentage of Nurses Reporting This Issue
Limited time for SSI prevention practices	55%
Lack of hospital resources	50%
Inconsistent adherence to protocols	40%
Need for more practical training	45%
Poor patient compliance with wound care	35%

Key Recommendations:

- **Increased hospital support** (resources, time allocation for SSI prevention).
- **Frequent hands-on training** for better protocol adherence.
- **Patient education initiatives** to improve post-surgical wound care compliance.

The study reveals that **nurses have a generally positive attitude and moderate-to-high knowledge of SSI prevention**. However, **practical challenges** such as **limited resources, inconsistent adherence, and knowledge gaps in specific areas (e.g., prophylactic antibiotics)** highlight the need for **ongoing training and institutional support**.

The **educational intervention program significantly improved knowledge and confidence**, with **90% of nurses supporting continuous training initiatives**. Future programs should focus on:

- **Hands-on, simulation-based training** to enhance practical skills.
- **More structured hospital policies** to reinforce SSI prevention.
- **Patient education programs** to improve compliance with post-surgical care.

By addressing these areas, healthcare institutions can strengthen **nurses' role in reducing SSI rates**, ultimately improving **patient safety and surgical outcomes**.

DISCUSSION

Surgical Site Infections (SSIs) remain a significant concern in healthcare settings, as they contribute to increased morbidity, prolonged hospital stays, and higher healthcare costs. Nurses, as frontline healthcare providers, play a crucial role in preventing SSIs through their knowledge, attitudes, and adherence to best practices. This study aimed to assess nurses' existing knowledge, attitudes, and practices (KAP) regarding SSIs while evaluating the impact of an educational

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intervention program designed to enhance their competency in SSI prevention. The findings of this study provide valuable insights into the strengths and gaps in nurses' understanding of SSIs, their perception of preventive measures, and the challenges they face in ensuring optimal infection control in surgical settings.

The demographic data revealed that the study population consisted of nurses with diverse educational backgrounds and varying years of clinical experience. A significant proportion of the participants had between one to five years of experience, highlighting the presence of a relatively young workforce in surgical care settings. Interestingly, the study also indicated that a considerable number of nurses had not received prior formal training on SSI prevention, emphasizing the need for structured educational programs in hospitals to reinforce their knowledge and skills. The results demonstrated that nurses with more years of experience generally exhibited a better understanding of SSI-related concepts. However, even among experienced nurses, gaps in knowledge were identified, particularly in areas related to the classification of SSIs and the timing of prophylactic antibiotic administration.

One of the most significant findings of this study was the variation in nurses' knowledge regarding the risk factors and causes of SSIs. While the majority correctly identified bacterial contamination as a primary cause, some nurses demonstrated uncertainty regarding other contributing factors such as poor nutrition, patient comorbidities (e.g., diabetes), and surgical duration. These findings suggest that although nurses have a foundational understanding of SSIs, there are still critical knowledge gaps that need to be addressed through targeted educational interventions. Furthermore, the study found that nurses who had previously attended SSI-related training programs scored higher on knowledge-based questions than those who had not, reinforcing the importance of continuous professional development.

In terms of attitudes towards SSI prevention, the majority of nurses expressed a strong commitment to infection control and recognized the importance of adhering to best practices. Most participants agreed that SSI prevention is a critical aspect of patient care and that strict adherence to protocols can significantly reduce infection rates. However, some nurses exhibited a lack of confidence in their ability to effectively implement SSI prevention measures, suggesting that additional training and mentorship may be beneficial. Moreover, while nurses generally supported infection

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prevention initiatives, a portion of them believed that institutional challenges, such as time constraints and lack of resources, hindered their ability to fully comply with recommended practices.

The study also assessed nurses' practical application of SSI prevention strategies and found notable discrepancies between knowledge and practice. While most nurses reported adherence to basic infection control measures such as proper hand hygiene and the use of sterile surgical techniques, compliance with certain key practices, such as the appropriate administration of prophylactic antibiotics and patient education on wound care, was relatively lower. These findings indicate that while nurses are aware of SSI prevention guidelines, real-world implementation may be affected by systemic challenges, including high workload, limited hospital resources, and time constraints. This gap between knowledge and practice highlights the need for hospital management to implement policies that facilitate better adherence to infection control protocols.

A critical component of this study was evaluating the impact of an educational intervention program on nurses' KAP regarding SSIs. The results demonstrated a substantial improvement in knowledge and confidence following the training, with a significant percentage of nurses reporting that they felt better equipped to prevent SSIs. The positive response to the training program underscores the effectiveness of structured educational initiatives in enhancing nurses' competency and reinforcing best practices. Additionally, the strong support for continued SSI training programs suggests that nurses recognize the value of ongoing education in maintaining and improving their clinical skills.

Despite these improvements, the study identified several barriers that hinder nurses’ ability to fully implement SSI prevention measures. Limited time to focus on infection control due to high patient loads was one of the most frequently cited challenges. Additionally, a significant number of nurses highlighted the lack of adequate hospital resources, such as antiseptic solutions, sterile equipment, and appropriate staffing, as obstacles to optimal SSI prevention. Furthermore, inconsistent adherence to infection control protocols among healthcare teams was another reported issue, indicating the need for stronger institutional policies and accountability measures. Another noteworthy challenge was the lack of patient compliance with post-surgical wound care

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instructions, which further emphasized the need for nurses to play a more active role in educating patients about the importance of wound hygiene and follow-up care.

Given these challenges, several recommendations can be made to improve SSI prevention efforts in healthcare settings. Firstly, hospitals should implement **regular and mandatory SSI training programs** to ensure that all nurses, regardless of experience level, receive up-to-date knowledge on infection control practices. This training should include hands-on simulations and case-based learning to reinforce practical application. Secondly, **institutional support in the form of increased staffing, better resource allocation, and improved infection control policies** is essential to facilitate adherence to best practices. Thirdly, **enhancing patient education programs** can help improve post-surgical wound care compliance, thereby reducing the risk of SSI-related complications. Additionally, **establishing routine audits and feedback mechanisms** can help identify areas where compliance with infection control measures can be strengthened.

The findings of this study align with existing literature, which has consistently highlighted the importance of nurse education in reducing SSI rates. Studies have shown that healthcare facilities that implement **continuous professional development programs** for nurses experience lower infection rates and improved patient outcomes. Therefore, investing in nurse education is not only beneficial for individual competency but also crucial for overall patient safety. Furthermore, a **multidisciplinary approach** involving surgeons, infection control teams, and hospital administrators is necessary to create a culture of safety and adherence to infection control protocols.

While this study provides important insights, it is essential to acknowledge some limitations. The sample size, though sufficient for analysis, was limited to a specific set of healthcare institutions, which may affect the generalizability of the findings to other settings. Additionally, the self-reported nature of practice-based questions may have introduced response bias, as nurses might have overestimated their adherence to infection control measures. Future studies should consider using **direct observation methods** to obtain more objective assessments of nursing practices.

In conclusion, this study highlights the crucial role of nurses in SSI prevention and the impact that educational interventions can have on improving their knowledge, attitudes, and practices. The findings underscore the need for **continuous education, institutional support, and practical**

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reinforcement to bridge the gap between knowledge and real-world application. By addressing the identified challenges and implementing structured training programs, healthcare institutions can significantly enhance SSI prevention efforts, ultimately leading to better patient safety and improved surgical outcomes.

CONCLUSION

Surgical Site Infections (SSIs) remain a significant challenge in healthcare settings, contributing to increased morbidity, prolonged hospital stays, and substantial financial burdens. Given the critical role nurses play in infection prevention, their knowledge, attitudes, and practices (KAP) toward SSI prevention directly influence patient outcomes. This study highlights the importance of proper education, adherence to evidence-based guidelines, and institutional support in minimizing SSIs. While nurses generally possess a basic understanding of infection control measures, gaps in compliance, resource limitations, and inadequate training programs hinder the full implementation of preventive strategies.

The findings emphasize the necessity of continuous education and structured training programs to enhance nurses' awareness and adherence to SSI prevention measures. Studies have demonstrated that hands-on training, refresher courses, and interactive learning approaches significantly improve compliance with infection control protocols. Furthermore, the role of hospital leadership in reinforcing infection prevention policies, providing adequate resources, and implementing regular monitoring systems are essential in ensuring sustainable improvements in SSI prevention.

Despite the advancements in infection control practices, several challenges persist, particularly in resource-limited settings where shortages of medical supplies and high patient-to-nurse ratios compromise adherence to best practices. Addressing these issues requires a multifaceted approach that includes policy development, investment in nursing education, and collaboration between healthcare institutions and infection control experts. Future research should focus on long-term strategies for sustaining adherence to SSI prevention measures, evaluating the effectiveness of digital learning tools, and exploring ways to tailor infection control programs to different healthcare environments.

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In conclusion, enhancing nurses' knowledge and adherence to SSI prevention measures is paramount in reducing infection rates and improving patient safety. A combination of education, institutional support, and ongoing professional development can bridge the gap between knowledge and practice, ultimately leading to better surgical outcomes and improved healthcare quality. Strengthening infection control policies and fostering a culture of continuous learning among nurses will be crucial in the global effort to minimize SSIs and promote safer surgical care.

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