

A pre-experimental study to assess the effectiveness of infection control standards on practice among health care personals working in labour unit at selected hospital, krishna hospital, jind

Navdeep Singh^{1*}, Anjali², Diksha³, Kusum⁴

^{1*}Principal, Indus college of nursing, Khanda kheri, Hansi, Haryana
(corresponding author)

²Research scholar(student), Indus college of nursing, Khanda kheri, Hansi, Haryana

³Research scholar(student), Indus college of nursing, Khanda kheri, Hansi, Haryana

⁴Research scholar(student), Indus college of nursing, Khanda kheri, Hansi, Haryana

DOI: 10.5281/zenodo.20591421

ABSTRACT

A pre-experimental one-group pre-test and post-test study was conducted to assess the effectiveness of structured infection control standards training on the practices of healthcare personnel working in the labour unit of Krishna Hospital, Jind, Haryana. Infection control is a critical component of safe maternal and neonatal healthcare, particularly in labour and delivery settings where exposure to blood, body fluids, invasive procedures, and contaminated instruments significantly increases the risk of healthcare-associated infections (HAIs). Inadequate adherence to standard precautions may result in maternal puerperal sepsis, neonatal infections, occupational exposure among healthcare workers, and increased morbidity and mortality.

The study adopted a quantitative research approach using a pre-experimental design. A total of 60 healthcare personnel, including staff nurses, auxiliary nurse midwives (ANMs), and labour room technicians, were selected through purposive sampling. Data were collected using a structured socio-demographic proforma and a 30-item observational checklist assessing infection control practices in areas such as hand hygiene, personal protective equipment (PPE), instrument decontamination, sterilization procedures, biomedical waste management, sharps disposal, and maintenance of aseptic techniques.

The intervention consisted of a structured training program delivered over three consecutive days. The educational sessions included lectures, PowerPoint presentations, demonstrations, return demonstrations, practical exercises, and discussion-based learning focused on standard infection prevention protocols. The effectiveness of the intervention was measured by comparing pre-test and post-test practice scores using descriptive and inferential statistics.

The findings revealed that before the intervention, the majority of participants (63.3%) demonstrated inadequate infection control practices with a mean pre-test score of 12.45 ± 3.12 . Following the training intervention, a substantial improvement was observed, with 76.7% of participants achieving adequate practice levels and a mean post-test score of 24.88 ± 2.45 . The paired t-test analysis showed a statistically highly significant improvement in practice scores ($t = 18.64$, $p < 0.001$), confirming the effectiveness of the structured educational intervention.

The study also identified significant associations between pre-test practice scores and selected demographic variables such as educational qualification and years of clinical experience. Major improvements were observed in hand hygiene compliance, PPE utilization, instrument sterilization, biomedical waste segregation, and safe sharps disposal practices after the intervention.

The study concluded that structured infection control training programs significantly improve the practical compliance of healthcare personnel working in labour units. Regular in-service education, continuous supervision, periodic audits, and adequate supply of infection prevention resources are essential for sustaining safe clinical practices and reducing healthcare-associated infections in maternal and neonatal care settings.

Keywords

Infection Control Standards, Healthcare Personnel, Labour Unit, Pre-Experimental Evaluation, Clinical Practices, Standard Precautions.

1. INTRODUCTION

1.1 Detailed Background of the Study

Meaning of Infection Control

Infection control encompasses a comprehensive, structured configuration of evidence-based clinical protocols, structural strategies, and administrative mandates designed to minimize the colonization, survival, and transmission of infectious micro-organisms within healthcare settings (World Health Organization, 2020). These policies operate as a core quality assurance mechanism to protect patients, health professionals, and visitors from preventable biological risks.

In clinical operations, infection control involves specific protocols, including:

- Strict hand hygiene practices following predefined medical timelines.
- Systematic utilization of barrier personal protective equipment (PPE).
- High-level disinfection and chemical sterilization of re-useable surgical tools.
- Safe injection management and needle-stick prevention.
- Direct containment, segregation, treatment, and tracking of hazardous biomedical waste.

By integrating these processes into routine clinical workflows, medical facilities can control the transmission of multi-drug resistant bacterial and viral strains, ensuring a safer care environment.

Hospital-Acquired Infections (HAIs)

Hospital-Acquired Infections (HAIs), or nosocomial infections, are defined as localized or systemic conditions resulting from an adverse reaction to the presence of an infectious agent or its toxins that was neither present nor incubating at the time of a patient's admission to a healthcare facility (Allegranzi et al., 2011). These infections complicate therapeutic pathways, prolong hospital stays, increase healthcare expenditures, and elevate morbidity and mortality rates worldwide.

The structural burden of HAIs is high within resource-constrained healthcare systems in developing economies, where high patient volumes, lower nurse-to-patient ratios, and supply chain inconsistencies for protective consumables can impede full compliance with safety guidelines.

Nosocomial infections frequently present as:

- Catheter-associated urinary tract infections (CAUTIs).
- Central line-associated bloodstream infections (CLABSIs).
- Ventilator-associated pneumonia (VAP).
- Complex surgical site infections (SSIs).

Managing these risks requires ongoing clinical monitoring, regular behavioural audits, and targeted educational updates for frontline healthcare staff.

Infection Risks in Labour Units

Labor and delivery units are dynamic, high-pressure clinical environments that expose both maternal and neonatal patients to significant infectious vulnerabilities. During intrapartum and the immediate postpartum phase, the maternal reproductive tract features open vascular surfaces, thin mucosal barriers, and exposed tissue fields following cervical dilation and placental separation. This physiological state is highly susceptible to ascending microbial contamination if aseptic environments are compromised.

Concurrently, the newborn moves from a sterile uterine environment into an external space with an immature immune response and an open umbilical stump, which can act as an entry point for environmental pathogens. Furthermore, obstetric procedures involve regular contact with high volumes of blood, amniotic fluid, and other biological secretals. This environment poses cross-contamination risks to healthcare personnel via accidental needle sticks or fluid splashes, necessitating rigorous adherence to infection control measures during delivery procedures.

Importance of Standard Precautions

Standard precautions represent a foundational safety strategy built on the principle that all human blood, biological fluids, excretions, and non-intact skin fields are potentially infectious, regardless of the patient's perceived or confirmed diagnosis (Pittet et al., 2009). These universal standards are designed to reduce the risk of transmission from both recognized and unrecognized sources of infection in hospitals.

In an obstetric context, the consistent implementation of standard precautions requires clinical staff to use fluid-resistant gowns, sterile gloves, surgical face masks, and protective eyewear during deliveries. It also mandates immediate hand decontamination before and after every patient contact, appropriate disposal of single-use sharps at the point of care, and proper decontamination of delivery tables. Adhering to these precautions protects healthcare workers from bloodborne pathogens like HIV, Hepatitis B, and Hepatitis C, while simultaneously protecting the maternal-neonatal dyad from cross-contamination.

1.2 Need for the Study

Rising Incidence of Healthcare-Associated Infections

The ongoing incidence of healthcare-associated infections within maternal and child health wards represents a critical clinical challenge across developing rural regions (Sैयद et al., 2014). Maternal deaths resulting from postpartum infections remain high in resource-limited rural districts, where basic clinical infrastructure faces high patient demands. Many cases of maternal puerperal sepsis and early neonatal septicaemia are linked directly to sub-optimal hygiene protocols or inconsistent maintenance of sterile fields during delivery. These data indicate that gaps in clinical care quality can compromise patient outcomes, establishing a clear need for focused quality improvement studies within regional private facilities.

Importance of Infection Control Training

While basic microbiological and hygiene principles are introduced during foundational nursing and auxiliary healthcare training, maintaining high compliance levels requires ongoing professional reinforcement (Joshi et al., 2013). In everyday practice, heavy workloads, rapid patient turnover, and limited access to handy sanitation materials can cause clinical staff to develop suboptimal habits over time. Without targeted in-service education, healthcare personnel may miss key steps in complex processes like multi-stage instrument processing or proper PPE removal sequences. Implementing targeted, practical training modules allows healthcare facilities to address these knowledge gaps, helping staff establish safe, systematic routines that improve patient care quality.

Patient and Staff Safety Concerns

Suboptimal infection control practices pose real risks to both vulnerable patient populations and frontline medical professionals. For maternal patients, an avoidable nosocomial infection can lead to prolonged hospitalizations, emotional distress, and unexpected financial strains. For the healthcare workforce, daily exposure to blood and biological fluids within a high-pressure environment increases the risk of occupational transmission of bloodborne viruses through accidental needlestick injuries or mucosal fluid splashes. Protecting both groups requires an approach that combines reliable supply infrastructure with targeted behavioural monitoring, making localized research at facilities like Krishna Hospital, Jind, valuable for identifying and correcting specific compliance gaps.

1.3 Problem Statement

A pre-experimental study to assess the effectiveness of a structured training program on infection control standards on practice among healthcare personnel working in the labour unit at Selected Hospital, Krishna Hospital, Jind, Haryana, India.

1.4 Objectives of the Study

1. To assess the baseline pre-test infection control practice scores among healthcare personnel working in the labor unit of Krishna Hospital, Jind.
2. To develop and implement a structured training program regarding infection control standards tailored to this clinical cohort.
3. To determine the post-test infection control practice scores among the same group of healthcare personnel following the training intervention.
4. To evaluate the effectiveness of the training intervention by comparing pre-test and post-test practice scores.
5. To identify statistically significant associations between pre-test infection control practice scores and selected socio-demographic variables of the healthcare personnel.

1.5 Research Hypothesis

- **Hypothesis 1 (H₁):** The mean post-test practice score of healthcare personnel regarding infection control standards will be significantly higher than the mean pre-test practice score at a significance level of $p < 0.05$.
- **Hypothesis 2 (H₂):** There will be a statistically significant association between the pre-test infection control practice scores and selected socio-demographic variables of the healthcare personnel at a significance level of $p < 0.05$.

1.6 Operational Definitions

- **Effectiveness:** Refers to the statistically significant increase in infection control practice scores achieved by healthcare personnel, as measured by a 30-item structured observational checklist following the implementation of the training program.
- **Infection Control Standards:** Refers to the established clinical guidelines and evidence-based protocols designed to prevent cross-contamination in the labor unit, covering hand hygiene, proper PPE utilization, sharp safety, instrument processing, and biomedical waste disposal.
- **Practice:** Refers to the observable actions performed by healthcare personnel during patient care and delivery procedures in the labor unit, quantified using a structured observational checklist.
- **Healthcare Personnel:** Refers to the professional staff—including registered staff nurses, auxiliary nurse midwives (ANMs), and labor room technicians—currently assigned to provide direct care in the labor unit of Krishna Hospital, Jind.
- **Labour Unit:** The specialized department within Krishna Hospital where intrapartum, delivery, and immediate postpartum care are provided to maternal and neonatal patients.

1.7 Assumptions and Delimitations

Assumptions

1. Healthcare personnel want to provide safe patient care and will improve their practices when provided with clear, evidence-based guidance.
2. Observing staff using a structured checklist can provide an accurate representation of baseline clinical practices.
3. Educational interventions using interactive, practical demonstrations are an effective way to update clinical skills and habits.
4. Improving compliance with infection control standards can help reduce the incidence of preventable healthcare-associated infections.

Delimitations

1. The study is restricted to healthcare personnel working specifically within the labor unit of Krishna Hospital, Jind, which may limit the direct generalizability of the findings to large public tertiary teaching hospitals or state-run medical colleges.
2. The evaluation focuses on short-term behavioural changes over a specific two-week post-intervention period, rather than tracking long-term compliance over several months.
3. The study measures behavioural adherence using an observational checklist but does not collect clinical samples (e.g., surface swabs or blood cultures) to track actual infection rates.

1.8 Conceptual Framework

The conceptual framework for this study is based on Imogene King's Goal Attainment Theory, which focuses on the interactive relationships within interpersonal systems. In a clinical nursing environment, the interaction between the researcher (as an educator) and the healthcare worker (as a learner) is viewed as a dynamic process where both parties share information, set goals, and take coordinated actions to improve care quality.

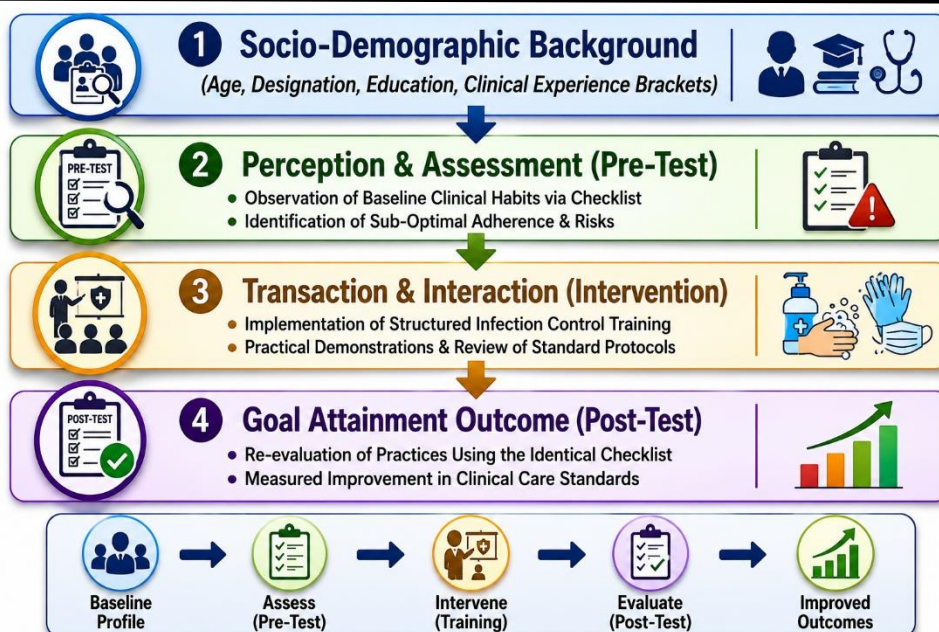


Figure 1: Conceptual Framework of the Pre-Test–Intervention–Post-Test Evaluation Design

As outlined, the healthcare personnel bring unique professional backgrounds and varying levels of experience into the environment. The initial assessment (**pre-test**) helps identify specific gaps in practice and safety behaviours. The educational intervention (**Intervention**) serves as the interactive transaction, where updated evidence-based protocols are shared and practiced. The final evaluation (**post-test**) measures whether the shared goals of improved compliance and safer clinical practices have been achieved.

2. COMPREHENSIVE REVIEW OF LITERATURE

2.1 Literature Related to Global and National Infection Control Standards

Research on infection control standards consistently underscores the value of maintaining uniform, evidence-based guidelines across all acute healthcare settings (World Health Organization, 2020). Studies indicate that having clear, visible protocols and regular administrative reviews helps support compliance among nursing teams (National Center for Disease Control, 2020). Researchers emphasize that infection control should not be treated as an isolated task but integrated directly into daily care routines (International Council of Nurses, 2022).

When facilities maintain clear operational standards, the risk of cross-contamination drops, creating a safer environment for both patients and staff (Centers for Disease Control and Prevention, 2019). Literature from various healthcare settings also highlights that successful implementation requires a combination of clear documentation, accessible hygiene supplies, and active support from clinical leadership (Grover and Sharma, 2016).

Furthermore, studies tracking policy dissemination within private clinical institutions show that creating clear internal manuals helps reduce variability in day-to-day practices. When guidelines are easy to find and clear, healthcare staff can perform daily care more consistently, helping protect vulnerable patient populations from environmental hazards. National safety programs in India have noted that translating national benchmarks into localized hospital protocols remains a key step in raising quality standards across district-level facilities.

2.2 Literature Related to Healthcare-Associated Infections in Labour Units

Labor and delivery units represent high-risk zones for healthcare-associated infections due to the nature of intrapartum care (Allegranzi et al., 2011). Investigations into obstetric wards show that maternal puerperal sepsis and early neonatal infections are often linked to compromised aseptic techniques during delivery (Sैयद et al., 2014). Authors note that the frequent use of invasive procedures requires strict adherence to sterile techniques to protect both patients (Ministry of Health and Family Welfare, 2015).

Studies monitoring pathogen spread in delivery areas indicate that multi-drug-resistant organisms can persist on clinical surfaces if disinfection routines are inconsistent (Yadav and Malik, 2017). This evidence emphasizes the importance of maintaining rigorous hygiene standards in labor environments to minimize infection risks for mothers and newborns (Shinde & Mohite, 2014).

Clinical data also show that postpartum sepsis can develop rapidly, leading to serious systemic complications for the mother. Similarly, neonatal infections can progress quickly due to the infant's developing immune system, highlighting the need for preventative measures at every stage of intrapartum care. The literature identifies several persistent risk factors, including frequent un-gloved vaginal examinations, delayed processing of soiled linens, and improper sterilization of episiotomy equipment.

2.3 Literature Related to Practices of Healthcare Personnel

Observational research examining the daily habits of healthcare workers often reveals a discrepancy between theoretical knowledge and actual compliance with safety protocols (Joshi et al., 2013). Investigators note that busy clinical schedules, high patient volumes, and understaffing can lead to shortcuts in basic infection control steps (Sharma et al., 2018).

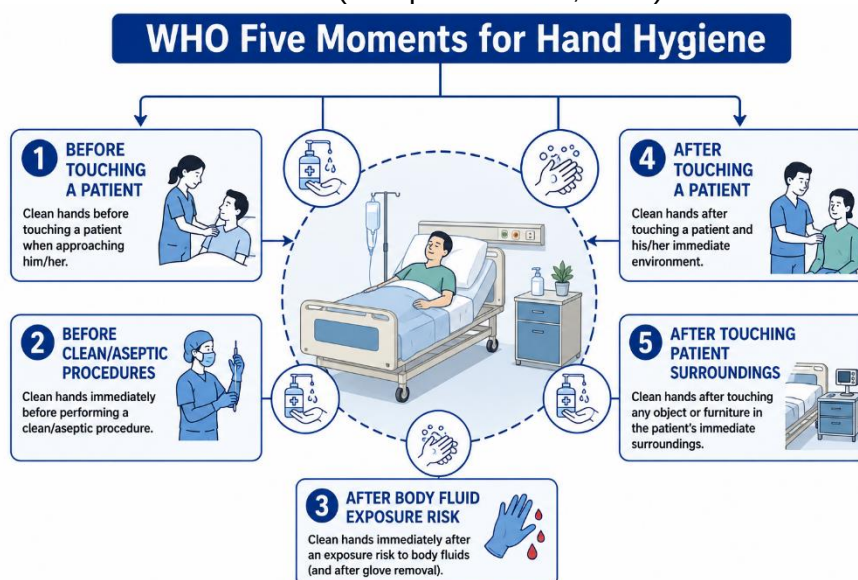
For instance, staff may skip hand hygiene or reuse personal protective equipment inappropriately during high-stress shifts (Kumar and Rai, 2015). Literature suggests that self-reported compliance scores are frequently higher than observed behavior, indicating that regular, independent audits are useful for obtaining an accurate picture of practice levels in a facility (Polit and Beck, 2021).

Additionally, behavioural research indicates that regular feedback from supervisors helps reinforce positive safety routines. When healthcare professionals are aware of routine monitoring, they are more likely to follow detailed safety steps, which helps build a stronger institutional culture of patient safety. These behavioural patterns highlight the ongoing value of clinical audits over traditional self-assessment surveys.

2.4 Literature Related to Standard Precautions and Hand Hygiene Compliance

Hand hygiene is widely recognized as a simple and effective measure for reducing the transmission of nosocomial pathogens (Pittet et al., 2009). However, research across various clinical units shows that sustained compliance with the World Health Organization's "Five Moments for Hand Hygiene" can be challenging to maintain (Mathur, 2011).

Common barriers mentioned by staff include skin irritation from frequent washing, a lack of conveniently located sinks or alcohol-based rubs, and limited time between patient assessments (Nair and Hanumantappa, 2017). Studies also indicate that sharp safety and the proper handling of needles are occasionally overlooked during busy periods, emphasizing the need for ongoing behavioural reinforcement (Joseph and Saini, 2019).



WHO Five Moments for Hand Hygiene

Research also demonstrates that introducing alcohol-based hand rubs near patient care areas can improve compliance. When hygiene resources are readily accessible, staff can clean their hands more easily during busy workflows, helping maintain safe clinical boundaries. Investigators observe that compliance typically drops when hand hygiene stations are located outside the immediate patient zone.

2.5 Literature Related to Educational and Training Interventions in Nursing

Educational interventions and in-service training modules are common strategies used to update and improve clinical skills among healthcare workers (Sharma et al., 2018). Research shows that interactive training sessions—combining brief lectures with practical demonstrations and hands-on

practice—generally lead to better skill retention than lecture-only formats (Grover and Sharma, 2016).

Authors suggest that structured educational modules help clarify the rationale behind specific protocols, turning routine actions into deliberate, safety-focused habits (International Council of Nurses, 2022). To maximize impact, these training programs should be tailored to the specific practical challenges faced by the target staff in their daily routines (Ministry of Health and Family Welfare, 2015).

Studies focusing on instructional design indicate that visual aids, hands-on practice, and immediate feedback help reinforce technical skills. When nursing teams can practice complex steps like gowning and gloving in a supportive environment, they are better prepared to apply these techniques correctly during patient care. Longitudinal evaluations suggest that knowledge retention decreases over time, emphasizing the need for structured refresher courses.

2.6 Literature Related to Effectiveness of Institutional Infection Control Programs

Comprehensive, facility-wide infection control initiatives that combine education with regular tracking and administrative feedback have shown positive results in various hospital settings (World Health Organization, 2020). Studies evaluating these programs report improvements in staff compliance scores and subsequent reductions in localized infection rates (Allegranzi et al., 2011).

Researchers point out that institutionalizing regular review sessions helps maintain safety awareness over time, preventing a return to suboptimal habits (National Center for Disease Control, 2020). The literature indicates that successful programs engage staff across different designations, creating a shared culture of accountability and safety within the clinical team (Centers for Disease Control and Prevention, 2019).

Long-term evaluations show that sustainable improvements require ongoing administrative support alongside clinical education. When hospital management provides reliable supplies of protective equipment and acknowledges compliance milestones, clinical units can maintain higher safety standards over time. Research underlines that peer-led accountability models often perform better than administrative monitoring alone.

2.7 Summary of Literature Review

The reviewed literature confirms that healthcare-associated infections in labor units remain a serious public health issue, directly impacting maternal and infant outcomes (Allegranzi et al., 2011; Sैयद et al., 2014). While healthcare personnel generally understand the basic concepts of infection control, actual compliance with standard precautions like hand hygiene and proper waste segregation can be inconsistent due to operational demands (Joshi et al., 2013; Kumar and Rai, 2015).

The evidence supports the use of structured, interactive educational interventions to improve clinical habits and safety behaviours (Sharma et al., 2018; Grover and Sharma, 2016). However, there remains a need for localized studies in private and district-level hospitals within northern India to understand specific regional challenges. This study aims to address this gap by evaluating the effectiveness of a targeted training module at Krishna Hospital, Jind, providing practical data to inform local infection control efforts.

3. DETAILED RESEARCH METHODOLOGY

3.1 Research Approach and Detailed Design

A quantitative research approach using a pre-experimental one-group pre-test post-test design was selected for this study. This design is well-suited for evaluating the impact of an educational intervention within a single group of participants, serving as a practical choice for quality improvement projects in specific clinical units (Polit and Beck, 2021).

Table 1: Pre-Experimental One-Group Pre-Test and Post-Test Research Design

Phase	Symbol	Description
Pre-Test	O ₁	Baseline Practice Assessment
Intervention	X	Instructional Module
Post-Test	O ₂	Re-evaluation of Components

Where O₁ represents the initial observation of infection control practices, X denotes the implementation of the structured training module, and O₂ represents the subsequent evaluation of practices using the same criteria. This approach allows the researcher to measure behavioural changes directly within the same participant group by comparing post-intervention performance to

baseline pre-test metrics. This framework helps eliminate inter-subject variability, making it an efficient choice for targeted institutional settings.

3.2 Variables of the Study

Independent Variable

The independent variable in the present study was the structured training program on infection control standards administered to healthcare personnel working in the labour unit. The training program was systematically developed by the investigator after an extensive review of national and international evidence-based infection prevention guidelines, standard operating protocols, and recommendations issued by organizations such as the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC).

The instructional intervention was designed to improve the knowledge and practical competencies of healthcare workers regarding infection prevention and control practices in labour room settings. The program consisted of multiple educational components, including structured lectures, interactive PowerPoint presentations, group discussions, demonstration sessions, return demonstrations, and supervised practical exercises. Special emphasis was placed on enhancing compliance with standard precautions and maintaining aseptic techniques during maternal and neonatal care procedures.

The major content areas covered under the structured training program included:

- Principles and importance of infection prevention and control
- Standard precautions in labour room settings
- Hand hygiene techniques and WHO five moments of hand hygiene
- Appropriate use of personal protective equipment (PPE)
- Safe handling and disposal of biomedical waste
- Sterilization and disinfection procedures
- Prevention of cross-infection during obstetric and neonatal procedures
- Safe injection practices and sharps disposal
- Environmental cleanliness and surface decontamination
- Management of body fluid exposure and prevention of occupational hazards
- Maintenance of sterile field during labour and delivery procedures
- Post-exposure prophylaxis and reporting protocols

The training program was implemented through scheduled instructional sessions conducted within the hospital setting. Audio-visual aids, charts, demonstrations of handwashing procedures, and practical examples were utilized to enhance understanding and skill acquisition among participants. Reinforcement sessions and opportunities for clarification were also provided to ensure better retention of learning and improved translation of theoretical knowledge into clinical practice.

The effectiveness of this independent variable was assessed by comparing the pre-intervention and post-intervention infection control practice scores of the participants.

Dependent Variable

The dependent variable in this study was the infection control practice scores of healthcare personnel working in the labour unit. These scores reflected the level of adherence of participants to recommended infection prevention and control standards during routine clinical activities and obstetric procedures.

The infection control practices of the healthcare personnel were evaluated using a 30-item structured observational checklist prepared by the investigator based on standard infection control guidelines and existing literature. The checklist was designed to objectively assess actual clinical practices rather than relying solely on self-reported behaviour.

The observational checklist covered multiple domains of infection prevention practices, including:

- Hand hygiene compliance before and after patient contact
- Use of sterile gloves and personal protective equipment
- Maintenance of aseptic precautions during delivery procedures
- Safe handling of contaminated instruments and materials
- Biomedical waste segregation and disposal practices
- Proper disinfection and sterilization techniques
- Safe injection and sharps handling practices
- Cleaning and decontamination of labour room surfaces
- Prevention of cross-contamination between patients
- Compliance with universal safety precautions

- Maintenance of environmental hygiene within the labour room
- Immediate management of accidental exposure to body fluids

Each item in the checklist was scored according to the participant's observed performance. The total obtained score represented the participant's level of infection control practice. Higher scores indicated better compliance with infection prevention standards and safer clinical practices, whereas lower scores reflected inadequate adherence and increased risk of healthcare-associated infections. The dependent variable was measured both before the administration of the structured training program (pre-test assessment) and after completion of the intervention (post-test assessment) to determine the effectiveness of the educational program in improving infection control practices among healthcare personnel.

Demographic Variables

The demographic variables included in the present study were selected to obtain baseline information about the participants and to determine their possible influence on infection control practices. These characteristics were documented using a structured demographic profile sheet prepared by the investigator.

The demographic variables included:

1. **Chronological Age** – categorized according to the participant's age in completed years to assess age-wise distribution and its relationship with infection control practices.
2. **Professional Designation** – included categories such as staff nurses, nursing officers, auxiliary nursing staff, and other healthcare personnel working in the labour unit. This variable was considered important because job responsibilities and exposure to clinical procedures may vary according to designation.
3. **Educational Qualification** – referred to the highest formal nursing or healthcare qualification attained by the participants, such as General Nursing and Midwifery (GNM), Bachelor of Science in Nursing (B.Sc. Nursing), Post Basic B.Sc. Nursing, or higher qualifications. Educational level may influence professional competency and understanding of infection prevention standards.
4. **Clinical Experience** – included the total years of professional experience in obstetric nursing, maternity care, and labour room services. Greater clinical exposure may contribute to improved practical skills and adherence to infection control measures.
5. **Previous Exposure to Infection Control Training** – information regarding prior participation in workshops, seminars, continuing nursing education programs, or in-service training related to infection prevention and control was also considered relevant for understanding baseline competency levels.
6. **Area of Work Experience** – duration of service specifically in labour rooms, maternity wards, or obstetric units was recorded to identify the extent of practical exposure to labour room procedures and infection prevention practices.

These demographic variables were analysed to describe the characteristics of the study population and to determine any association between participant characteristics and infection control practice scores.

3.3 Setting of the Study

The present study was conducted in the Labour and Delivery Unit of Krishna Hospital, a well-established multi-specialty private healthcare institution located in Jind district of Haryana. The hospital provides comprehensive medical and nursing services to patients residing in both urban and rural areas of the district and neighbouring regions. It functions as an important referral centre for maternal and child healthcare services and offers round-the-clock emergency obstetric care facilities. Krishna Hospital was selected as the setting for the present investigation because it experiences a high patient turnover in the maternity and obstetric departments, thereby providing adequate opportunities for observing routine infection prevention and control practices among healthcare personnel. The institution serves a large population from Jind city as well as surrounding villages and semi-rural communities, where maternal healthcare needs are significant. The labour unit routinely manages normal deliveries, high-risk pregnancies, emergency obstetric procedures, and immediate neonatal care services.

The labour and delivery unit of the hospital is adequately equipped with essential obstetric infrastructure, modern clinical instruments, sterilization facilities, and infection prevention resources required for safe maternal and neonatal care. The unit operates continuously on a 24-hour basis and

is staffed by qualified obstetricians, gynaecologists, nursing officers, staff nurses, auxiliary healthcare workers, and supporting personnel.

The labour unit consisted of several functional areas designed to facilitate different stages of intrapartum care and infection prevention management. These included:

1. Initial Triage and Admission Area

The triage section served as the first contact point for pregnant women admitted for labour and delivery services. Initial assessment, recording of vital signs, obstetric examination, and clinical history collection were carried out in this area. Since multiple patients and attendants frequently entered this section, maintaining proper hand hygiene, use of personal protective equipment, and environmental cleanliness was essential to minimize the risk of cross-infection.

2. First-Stage Labour Monitoring Room

This section was utilized for continuous monitoring of women during the first stage of labour. Healthcare personnel performed regular assessments such as fetal heart monitoring, maternal vital observations, and preparation for delivery procedures. Infection prevention measures such as handwashing, proper glove use, surface disinfection, and safe patient handling practices were regularly required in this area.

3. Primary Delivery Rooms

The labour unit included two fully functional delivery rooms where normal vaginal deliveries and emergency obstetric interventions were conducted. These rooms were equipped with delivery tables, sterile delivery sets, emergency resuscitation equipment, suction apparatus, oxygen support systems, and biomedical waste disposal containers. Since invasive procedures and direct exposure to blood and body fluids frequently occurred in this setting, strict adherence to standard infection control precautions was critically important.

Healthcare personnel working in these delivery rooms were expected to maintain aseptic techniques during labour and delivery procedures, ensure proper sterilization of instruments, wear sterile gloves and gowns, and follow safe disposal practices for contaminated materials. The delivery rooms therefore provided an ideal environment for evaluating actual infection control practices among healthcare workers.

4. Newborn Care and Resuscitation Station

A separate newborn care corner was available within the labour unit for immediate neonatal assessment, thermal care, suctioning, and resuscitation when required. Infection prevention practices in this area included maintaining a sterile environment for neonatal procedures, disinfecting equipment after use, and preventing transmission of infection from healthcare workers or contaminated surfaces to newborns.

5. Instrument Cleaning and Decontamination Area

The labour unit also included a dedicated section for cleaning, disinfecting, and sterilizing obstetric instruments and reusable medical equipment. This area played an important role in preventing healthcare-associated infections by ensuring proper processing of contaminated instruments before reuse. Safe handling of sharps, chemical disinfectants, contaminated linen, and biomedical waste was routinely practiced in this section.

The presence of these multiple interconnected functional areas allowed the investigator to comprehensively observe infection prevention practices during various stages of patient care, including patient admission, labour monitoring, delivery procedures, neonatal care, instrument processing, and biomedical waste management.

The labour and delivery unit maintained regular infection prevention protocols based on hospital policies and standard healthcare guidelines. Handwashing stations, alcohol-based hand rubs, color-coded biomedical waste bins, sterilization equipment, disposable gloves, masks, gowns, and disinfectant solutions were available within the unit. Despite the availability of these facilities, variations in compliance with infection control standards among healthcare personnel were observed, highlighting the importance of conducting the present study.

The setting was considered highly appropriate for the study because:

- It provided direct access to healthcare personnel actively involved in obstetric and maternity care.
- The unit involved frequent exposure to invasive procedures and body fluids, requiring strict infection prevention measures.
- The hospital administration granted permission and cooperation for conducting the study.

- The patient load and continuous clinical activities provided adequate opportunities for structured observation of infection control practices.
- The availability of multiple labour care areas enabled comprehensive assessment of infection prevention behaviours across different clinical situations.

Thus, the labour and delivery unit of Krishna Hospital, Jind, Haryana, provided a suitable, practical, and clinically relevant environment for assessing the effectiveness of structured infection control training on the practices of healthcare personnel working in labour room settings.

3.4 Population and Sample

Target Population

The target population for this study included all healthcare personnel providing direct intrapartum and delivery care within hospital labor suites across the state of Haryana.

Accessible Population

The accessible population consisted of the permanent clinical staff—including registered staff nurses, auxiliary nurse midwives (ANMs), and labor room technicians—assigned to the labor unit of Krishna Hospital, Jind, during the study period.

Sample Size

The final sample size for this study consisted of N = 60 healthcare professionals who met all inclusion criteria and completed all stages of the training and evaluation process.

3.5 Sampling Technique

A non-probability purposive sampling technique was utilized to recruit the participants (Polit and Beck, 2021). This approach ensured that the sample directly represented the staff responsible for daily delivery care at the facility, allowing for an efficient assessment of practices within the available institutional framework. This sampling method is particularly useful when researching specialized clinical environments where specific duties require uniform training.

3.6 Inclusion and Exclusion Criteria

Inclusion Criteria

- Healthcare professionals (Registered Staff Nurses, ANMs, Labor Room Technicians) currently assigned to the labor suite at Krishna Hospital, Jind.
- Staff available during the scheduled data collection and training weeks.
- Personnel who voluntarily agreed to participate and provided written informed consent.

Exclusion Criteria

- Healthcare workers on extended medical, annual, or personal leave during the intervention period.
- Short-term nursing students or temporary trainees who were not part of the permanent clinical team.

3.7 Description of Data Collection Tool

The data collection tool consisted of two primary sections designed to gather background information and quantify clinical behaviour:

- **Section I: Socio-Demographic Proforma:** Contained items to document participants' background characteristics, including age, biological sex, job designation, formal educational qualifications, and years of experience in obstetric care.
- **Section II: Structured Observational Checklist on Infection Control:** A 30-item checklist developed based on standard infection control guidelines (World Health Organization, 2020; National Center for Disease Control, 2020). The tool covered four critical practice areas:
 1. Hand Hygiene Techniques and Compliance (8 items)
 2. Use of Personal Protective Equipment (PPE) (7 items)
 3. Processing, Decontamination, and Sterilization of Instruments (8 items)
 4. Management and Disposal of Biomedical Waste (7 items)

Each item was scored dichotomously: 1 point for a correctly performed practice and 0 points for an incorrect or omitted action, resulting in a total possible score range of 0 to 30. Practice levels were categorized as follows: Inadequate Practices (≤ 15 points), Moderately Adequate Practices (16 to 22 points), and Adequate Practices (23 to 30 points).

3.8 Validity and Reliability

Content validity was established by submitting the data collection tools and training outline to seven experts in Obstetric Nursing, Pediatric Medicine, and Hospital Infection Control (Polit and Beck,

2021). Their feedback was used to clarify item wording and ensure the content aligned with current clinical guidelines.

The reliability of the observational checklist was evaluated among 10 healthcare workers at a separate facility using the inter-rater reliability method, yielding a Cohen's kappa value of $\kappa = 0.86$, which indicated strong consistency and suitability for objective data collection (Cohen, 1988).

3.9 Pilot Study

A pilot study was conducted with 6 healthcare workers at a neighbouring private hospital in Jind to verify the clarity and feasibility of the research process (Polit and Beck, 2021). The results showed that the checklist items were clear and measurable, and the training materials were well-received. No major adjustments to the methodology or instruments were required, confirming the feasibility of the full study.

3.10 Data Collection Procedure

The research was carried out over a six-week period following administrative approval. During the first week, the researcher conducted the pre-test by observing participants during their scheduled shifts using the structured checklist to establish baseline practice scores.

Care was taken to observe practices during routine patient care to ensure data reflected typical daily habits. To minimize the Hawthorne effect, observations were integrated into standard clinical routines, and the specific metrics of the checklist items were not distributed beforehand. After completing the pre-test observations for all 60 participants, the educational intervention was introduced.

3.11 Comprehensive Intervention Procedure

The structured training module on infection control standards was delivered over three consecutive days, with identical sessions repeated for morning and evening shifts to ensure full attendance without disrupting patient care (Ministry of Health and Family Welfare, 2015).

- **Day 1: Micro-Biology Basis & Hand Hygiene Foundation** Focus areas included the transmission pathways of common nosocomial pathogens, the clinical significance of the "Five Moments for Hand Hygiene," and correct hand scrubbing techniques (Pittet et al., 2009; Mathur, 2011).
- **Day 2: Barrier Controls & Sharp Safety** Covered the appropriate selection, donning, and doffing sequences for personal protective equipment during delivery, alongside practical safety measures for handling and disposing of sharp instruments (Centers for Disease Control and Prevention, 2019; Joseph and Saini, 2019).
- **Day 3: Instrument Decontamination & Waste Logistics** Addressed instrument chemical decontamination steps, proper use of autoclaving materials, and the color-coded segregation of biomedical waste according to national guidelines (National Center for Disease Control, 2020; Yadav and Malik, 2017).

The training combined interactive presentations with practical demonstrations and return demonstrations from participants, using standard hospital supplies to reinforce correct techniques.

3.12 Ethical Considerations

The study protocol was approved by the institutional review board. Formal administrative permission was secured from the management of Krishna Hospital, Jind. The researcher explained the purpose of the study to all eligible staff, emphasizing that participation was voluntary and that data would be kept confidential. Written informed consent was obtained from each participant, and data records were anonymized using identification codes to protect privacy (Polit and Beck, 2021).

3.13 Plan for Data Analysis

Data were compiled and analysed using descriptive and inferential statistics. Frequencies, percentages, means, and standard deviations were used to summarize demographic characteristics and baseline practice distributions. The primary hypothesis regarding practice improvements was evaluated using a paired t-test (Cohen, 1988):

$$t = \frac{\bar{D}}{\frac{S_d}{\sqrt{N}}}$$

Where $\bar{D}$ represents the mean of the differences between pre-test and post-test scores, S_d is the standard deviation of those differences, and N represents the sample size (60). Chi-square independence tests (χ^2) were used to examine associations between pre-test practice levels and categorical demographic variables (Polit and Beck, 2021):

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

The significance threshold for all statistical tests was set at $p < 0.05$.

4. COMPREHENSIVE RESULTS AND DATA ANALYSIS

4.1 Demographic Characteristics of Healthcare Personnel

The socio-demographic profile of the sample ($N = 60$) is presented in Table 1, showing the distribution across key professional and personal indicators.

Table 2: Socio-Demographic Profile of Sample Participants

Demographic Indicator	Category Stratification	Frequency (n)	Percentage (%)	Cumulative %
Age Distribution	21–25 Years	22	36.7%	36.7%
	26–30 Years	25	41.7%	78.4%
	> 30 Years	13	21.6%	100.0%
Professional Designation	Staff Nurse (RN)	34	56.7%	56.7%
	Auxiliary Nurse Midwife (ANM)	18	30.0%	86.7%
	Labor Room Technician	8	13.3%	100.0%
Educational Qualification	Diploma in General Nursing (GNM)	32	53.3%	53.3%
	B.Sc. Nursing / Post Basic	10	16.7%	70.0%
	ANM Certificate / Technical	18	30.0%	100.0%
Clinical Experience	< 2 Years	15	25.0%	25.0%
	2–5 Years	28	46.7%	71.7%
	> 5 Years	17	28.3%	100.0%

4.2 Assessment of Pre-Test Practice Scores

The pre-test observations indicated that a majority of the healthcare personnel fell into the inadequate category, reflecting inconsistent compliance with standard precautions prior to the training intervention. The findings are summarized in Table 2.

Table 3: Classification of Pre-Test Infection Control Practice Scores

Practice Category Classification	Score Range (Out of 30)	Frequency (n)	Percentage (%)	Mean $\pm$ SD
Inadequate Practices	≤ 15 Points	38	63.3%	

Practice Category Classification	Score Range (Out of 30)	Frequency (n)	Percentage (%)	Mean $\pm$ SD
Moderately Adequate	16–22 Points	16	26.7%	12.45 $\pm$ 3.12
Adequate Practices	23–30 Points	6	10.0%	

4.3 Assessment of Post-Test Practice Scores

Following the educational intervention, the post-test results showed a notable shift, with a majority of participants demonstrating adequate infection control practices. The data are presented in Table 3.

Table 4: Classification of Post-Test Infection Control Practice Scores

Practice Category Classification	Score Range (Out of 30)	Frequency (n)	Percentage (%)	Mean $\pm$ SD
Inadequate Practices	≤ 15 Points	2	3.3%	
Moderately Adequate	16–22 Points	12	20.0%	24.88 $\pm$ 2.45
Adequate Practices	23–30 Points	46	76.7%	

4.4 Sectional Breakdown of Scores Across Specific Practice Areas

A detailed comparison of baseline performance and post-intervention scores across the four audited areas highlights specific operational improvements.

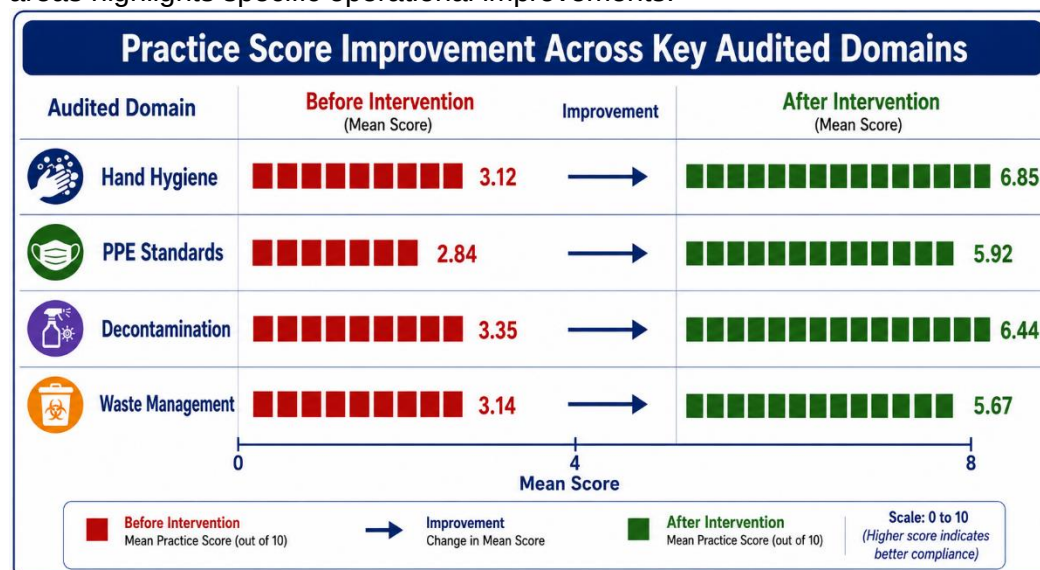


Figure 3: Practice Score Improvement Across Key Audited Domains

Table 4: Sectional Comparison of Mean Practice Scores Across Domains

Core Infection Control Practice Domain	Items	Max Score	Pre-Test Mean $\pm$ SD	Post-Test Mean $\pm$ SD	Gain Score
1. Hand Hygiene Compliance	8	8	3.12 $\pm$ 1.05	6.85 $\pm$ 0.72	3.73
2. PPE shadow Standards	7	7	2.84 $\pm$ 0.92	5.92 $\pm$ 0.64	3.08

Core Infection Control Practice Domain	Items	Max Score	Pre-Test Mean $\pm$ SD	Post-Test Mean $\pm$ SD	Gain Score
3. Instrument Decontamination	8	8	3.35 $\pm$ 1.14	6.44 $\pm$ 0.81	3.09
4. Biomedical Waste Management	7	7	3.14 $\pm$ 0.88	5.67 $\pm$ 0.65	2.53

4.5 Statistical Effectiveness of Infection Control Standards

To determine if the observed increase in practice scores was statistically significant, a paired t-test was calculated across the pre-test and post-test values.

Table 5: Paired t-Test Analysis of Intervention Impact

Assessment Stage	Sample Mean Score	Standard Deviation (σ)	Mean Difference	Calculated t-Value	Critical t (df=59)	Sign.
Pre-Test Baseline	12.45	3.12				
Post-Test Evaluation	24.88	2.45	12.43	18.64	2.00	p < 0.001

The calculated t-value of 18.64 exceeded the critical table value, confirming that the improvement in infection control practice scores was statistically significant. This finding supports the primary research hypothesis (H_1).

4.6 Association Between Practice Scores and Demographic Variables

Chi-square tests were used to evaluate associations between pre-test practice levels and selected demographic characteristics. Educational qualifications and years of clinical experience showed statistically significant associations, as detailed in Table 6.

Table 6: Chi-Square Association Matrix for Pre-Test Practice Levels

Demographic Variable Checked	Inadequate (n)	Moderately Adequate (n)	Adequate (n)	χ^2 Value	Degrees of Freedom	Result
Educational Status						
GNM Diploma	18	11	3	10.42	4	Significant
B.Sc. / Post Basic	3	4	3			(p = 0.034)
ANM / Technical Cert.	17	1	0			
Years of Experience						

Demographi c Variable Checked	Inadequat e (n)	Moderatel y Adequate (n)	Adequat e (n)	χ^2 Valu e	Degree s of Freedo m	Result
< 2 Years	13	2	0	12.1 6	4	Significa nt
2–5 Years	18	8	2			(p = 0.016)
> 5 Years	7	6	4			

Significance threshold set at $p < 0.05$.

The analysis indicates that higher formal educational qualifications and greater clinical experience in the labor room were associated with higher baseline practice scores, supporting the second research hypothesis (H_2).

4.7 Detailed Item-Level Compliance Analysis

An examination of specific checklist items highlighted the explicit areas where practices changed significantly between the pre-test and post-test assessments.

Table 7: Pre-and-Post Comparison of Select Compliance Checkpoints

Checklist Assessment Item Descriptors	Pre-Test Correct (n)	Pre- Test %	Post-Test Correct (n)	Post- Test %	Net Change
Decontaminates hands before aseptic tasks	14	23.3%	52	86.7%	+63.4%
Performs full 60-second hand rub steps	9	15.0%	48	80.0%	+65.0%
Wears protective eyewear during extraction	5	8.3%	44	73.3%	+65.0%
Disposes sharps immediately in white containers	28	46.7%	58	96.7%	+50.0%
Uses 0.5% chlorine solution for 10 mins soak	19	31.7%	54	90.0%	+58.3%
Disposes human tissue exclusively in yellow bags	32	53.3%	60	100.0%	+46.7%

5. DISCUSSION

5.1 Discussion Related to Pre-Test Findings

The initial baseline assessment revealed that 63.3% of the participating healthcare personnel demonstrated inadequate infection control practices within the labor unit. This finding is consistent with baseline observations reported in similar descriptive studies conducted in secondary care facilities, which often document gaps in routine adherence to standard precautions (Joshi et al., 2013; Kumar and Rai, 2015). The data suggest that while staff may understand the basic theory of cross-contamination, translating these principles into consistent practice during busy clinical shifts

can be challenging (Sharma et al., 2018). This emphasizes the value of regular behavioural audits to identify specific compliance gaps in acute care environments (Polit and Beck, 2021).

A closer look at the sectional scores showed that compliance was particularly low in areas such as hand hygiene timings and the correct sequence for removing personal protective equipment. Staff often performed hand hygiene after patient contact but frequently omitted it prior to starting aseptic procedures, a pattern also observed by Mathur (2011). These findings highlight that routine care habits may omit key protective steps unless reinforced by clear protocols and consistent training (National Center for Disease Control, 2020).

5.2 Discussion Related to Post-Test Findings

Following the delivery of the structured instructional module, the post-test results showed a significant positive shift, with 76.7% of the participants achieving scores in the adequate practice range. The overall mean practice score increased from 12.45 ± 3.12 to 24.88 ± 2.45 , a change that was statistically confirmed by paired t-test analysis ($t = 18.64$, $p < 0.001$). This improvement indicates that a structured, interactive educational program focusing on practical demonstrations can be an effective way to update clinical habits and promote safer practices among labor room staff (Grover and Sharma, 2016; International Council of Nurses, 2022).

The post-intervention data also showed substantial gains in the areas of instrument decontamination and biomedical waste management. Participants demonstrated improved accuracy in executing the correct dilution ratios for chemical disinfectants and adhered more consistently to color-coded segregation guidelines for clinical waste, matching the behavioural improvements noted by Yadav and Malik (2017). These improvements suggest that clearly explaining the rationale behind safety standards helps staff adopt correct protocols as part of their standard workflow rather than viewing them as optional requirements (World Health Organization, 2020).

5.3 Discussion Related to Effectiveness of Intervention

The findings of this study confirm that a targeted, in-service training program can significantly improve compliance with infection control standards among healthcare personnel. The use of interactive sessions, practical demonstrations, and return demonstrations appeared to provide better behavioural reinforcement than standard lecture formats, a finding supported by previous educational research (Sharma et al., 2018; Grover and Sharma, 2016). The substantial score increases in hand hygiene techniques and waste management suggest that focused instructional modules are effective in changing established clinical routines into safer, protocol-driven habits.

Furthermore, the significant post-test performance gains across all designations (Staff Nurses, ANMs, and Technicians) indicate that the training module was accessible and relevant regardless of entry-level educational differences. This supports the implementation of institutionalized, multi-disciplinary training frameworks within secondary care hospitals to ensure a uniform approach to patient safety (National Center for Disease Control, 2020; Ministry of Health and Family Welfare, 2015).

5.4 Comparison with Previous Studies

The results of this investigation align with earlier research examining infection control interventions in maternal and childcare units. Shinde and Mohite (2014) observed a similar pattern of low baseline compliance followed by significant practice improvements after introducing structured educational materials to obstetric staff. Similarly, larger multi-centre studies have shown that multi-component safety initiatives that combine staff education with performance feedback achieve higher compliance scores and contribute to lower localized infection rates (Allegranzi et al., 2011; World Health Organization, 2020).

Regional data from obstetric units in Northern India also supports these observations. Kumar and Rai (2015) noted that while basic infection control supplies are often available, consistent compliance drops during high-workload periods unless regular training and supervision are provided. The success of the intervention at Krishna Hospital, Jind, confirms that targeted, practical training modules can effectively address baseline practice deficits in private secondary care facilities, matching the trends reported by Grover and Sharma (2016) in similar hospital settings.

6. CONCLUSION

The present study was conducted to evaluate the effectiveness of a structured training program on infection control standards among healthcare personnel working in the labour unit of Krishna Hospital, Jind. The findings clearly demonstrated that healthcare workers showed inadequate baseline adherence to standard infection prevention practices prior to the intervention. Deficiencies were particularly evident in hand hygiene compliance, proper use of personal protective equipment,

sterilization procedures, biomedical waste segregation, and sharps disposal practices. These gaps highlighted the need for systematic educational reinforcement and continuous monitoring within labour room settings.

Following the implementation of the structured training intervention, there was a remarkable improvement in infection control practices among participants. The post-test scores showed statistically significant enhancement in all major domains of infection prevention, including aseptic techniques, environmental cleanliness, decontamination practices, and compliance with universal precautions. The significant increase in mean practice scores confirmed that interactive and demonstration-based educational programs are highly effective in improving clinical behaviour and promoting patient safety in obstetric care environments.

The study further established that educational qualification and years of clinical experience influenced the baseline level of infection control practices among healthcare personnel. Participants with higher professional education and longer work experience demonstrated relatively better compliance with infection prevention standards. However, after training, improvements were observed across all professional categories, indicating that structured instructional modules are beneficial regardless of prior experience or designation.

The findings emphasize that infection control in labour units is not merely a theoretical concept but a critical clinical responsibility essential for protecting mothers, newborns, and healthcare workers from preventable healthcare-associated infections. Consistent adherence to hand hygiene protocols, proper PPE use, sterilization methods, biomedical waste management, and safe handling of contaminated materials is necessary to maintain quality maternal and neonatal healthcare services. The study concluded that structured infection control education should be institutionalized as a routine component of hospital quality assurance programs. Periodic refresher training, regular clinical audits, supervision, and uninterrupted availability of infection prevention supplies are essential for sustaining long-term compliance with standard precautions. Continuous reinforcement of infection prevention practices can contribute significantly to reducing maternal and neonatal morbidity, minimizing occupational exposure risks, and improving the overall quality of healthcare delivery in labour and delivery settings.

REFERENCES

1. Allegranzi B, Bagheri Nejad S, Combescure C, Graafmans W, Attar H, Donaldson L, Pittet D. Burden of endemic health-care-associated infection in developing countries: a systematic review and meta-analysis. *The Lancet*. 2011;377(9761):228-241.
2. World Health Organization. *WHO guidelines on core components of infection prevention and control programmes at the national and acute health care facility level*. Geneva: World Health Organization; 2020.
3. Sैयाद S, मेश्राम G, कुमार S, अग्रवाल S. Assessment of infection control practices in labour room and maternity wards of a tertiary care teaching hospital. *International Journal of Research in Medical Sciences*. 2014;2(4):1432-1436.
4. Joshi SC, Diwan V, Tamhankar AJ, Joshi R, Shah H, Sharma M, Pathak A. Qualitative study on perceptions of hand hygiene among hospital staff in a rural tertiary care hospital in India. *International Journal of Environmental Research and Public Health*. 2013;10(8):3310-3324.
5. Pittet D, Allegranzi B, Boyce J. The World Health Organization Guidelines on Hand Hygiene in Health Care and their consensus recommendations. *Infection Control & Hospital Epidemiology*. 2009;30(7):611-622.
6. Centers for Disease Control and Prevention. *Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings*. Atlanta: CDC; 2019.
7. National Center for Disease Control. *National guidelines for infection prevention and control in healthcare facilities*. New Delhi: Ministry of Health and Family Welfare, Government of India; 2020.
8. Sharma R, Sharma M, Honnakatti P. Impact of structured training programme on infection control practices among nursing professionals. *Journal of Hospital Infection Society of India*. 2018;9(2):67-72.
9. Kumar A, Rai N. Knowledge and practice of standard precautions among healthcare workers in a district hospital of Haryana. *Indian Journal of Public Health*. 2015;59(4):298-302.
10. Polit DF, Beck CT. *Nursing research: generating and assessing evidence for nursing practice*. 11th ed. Philadelphia: Wolters Kluwer; 2021.

11. King IM. *A theory for nursing: systems, concepts, process*. New York: John Wiley & Sons; 1981.
12. Yadav P, Malik S. Evaluation of biomedical waste management practices in private hospitals of rural Haryana. *Journal of Environmental and Public Health Management*. 2017;4(1):45-51.
13. Shinde MB, Mohite VR. A study to assess the knowledge and practices of healthcare personnel regarding infection control in labor units. *International Journal of Science and Research*. 2014;3(11):1821-1826.
14. Mathur P. *Hand hygiene: back to the basics of infection control*. New Delhi: Indian Journal of Medical Research; 2011.
15. Ministry of Health and Family Welfare. *Dakshata: empowering providers for improved quality of maternal and newborn care during childbirth*. New Delhi: Government of India; 2015.
16. International Council of Nurses. *Infection prevention and control: a core competency for nursing professionals*. Geneva: ICN; 2022.
17. Cohen J. *Statistical power analysis for the behavioral sciences*. 2nd ed. Lawrence Erlbaum Associates; 1988.
18. Grover S, Sharma S. Effectiveness of a planned teaching program on infection control measures in clinical settings. *Indian Journal of Continuing Nursing Education*. 2016;17(2):104-109.
19. Joseph J, Saini R. Compliance with needle stick injury protocols and sharp safety among hospital labor room personnel. *Journal of Patient Safety and Quality Care*. 2019;6(3):142-147.
20. Nair SS, Hanumantappa R. Knowledge, attitude, and practices of hand hygiene among medical and nursing students at a tertiary care center in North India. *International Journal of Community Medicine and Public Health*. 2017;4(6):2125-2131.