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# Strategies and Challenges in Hospital Infection Control: A Qualitative Study in Iran

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## Abstract

**Background and Aim:** hospital infections (HAIs) remain a major global health concern, especially in low and middle income countries such as Iran. Despite the presence of infection prevention guidelines, there are significant gaps in their implementation. Understanding the challenges and identifying practical strategies from the perspective of infection control professionals is essential to improve hospital safety and quality of care.

**Materials and Methods:** this qualitative study was carried out in 2025. Semi-structured interviews with infection control specialists, hospital managers and frontline health care workers were conducted in various hospitals in Iran. The data were analyzed using thematic analysis with an inductive approach to identify emerging patterns and themes.

**Results:** three inclusive themes were identified: system-level barriers, including limited financial and human resources, inadequate infrastructure and inadequate policies; challenges related to the service provider, such as lack of motivation, inadequate training and resistance to adherence to protocols; and contextual and environmental factors, including busy sectors, cultural attitudes and inadequate management support. In parallel, participants emphasized effective strategies such as continuing education, leadership participation, strengthening regulatory systems, and fostering a safety-oriented culture.

**Conclusion:** infection control in Iranian hospitals faces a combination of systemic, organizational and behavioral barriers. Addressing these challenges requires a multifaceted approach that includes managerial commitment, employee empowerment, and resource allocation. Insights from the study could help policy makers and hospital administrators design more effective infection control programs tailored to the local health care field.

**Keywords:** Hospital Infections, Infection Control, Challenges, Strategies, Qualitative Study, Iran.

## Introduction

Hospital infections (HAIs) are one of the most important challenges in the world's Health Care System(1) and increase mortality, length of stay, treatment costs, and microbial resistance (1,2). These infections are a significant burden on health systems in developing countries, including Iran, and identifying the factors that affect them and how to prevent them is of vital importance (3-5). In Iran, the spread of these infections, especially in public hospitals, has raised serious concerns(6). Various studies have shown that the prevalence of hospital infections in Iran varies between 0.32% and 9.1%, which is reported lower compared to global standards.(7) several factors contribute to the incidence and prevalence of hospital infections in Iran. One of the most important factors is the wear and tear of medical and hospital equipment, especially in hospital beds(8). This condition, in addition to reducing the quality of treatment, underlies the transmission of pathogenic microorganisms(9) . In addition, failure to comply with health standards, lack of financial resources and skilled manpower, and the construction of uncontrolled facilities in hospitals are other factors that are fueling the spread of these infections. In developed

countries, prevention and control of hospital infections (HAIs) is effectively carried out using integrated systems and evidence-based strategies(10). Comprehensive infection control programs, continuous employee training and careful monitoring of health protocol implementation are among the key components of success in these countries (11). In addition, the widespread use of advanced technology and equipment such as automated environmental disinfection systems, hand washing sensors, and infection tracking software plays an effective role in reducing the prevalence of HAIs (12).

Regular monitoring and reporting of data and implementation of multilateral interventions including vaccination of staff, proper use of personal protective equipment and training of patients and companions have shown significant results in reducing hospital infections (13).

Previous studies show that adherence to health standards, continuous personnel training, proper use of personal protective equipment, regular monitoring and reporting, and proper management of antibiotic drugs can significantly reduce HAIs levels (14) in developed countries, HAIs prevention and control is carried out using comprehensive programs and evidence-based systems, advanced technologies and multilateral interventions. These include specialized infection control teams, automated environmental disinfection systems, hand washing sensors, infection tracking software and regular data monitoring.(15). In order to prevent and control hospital infections, several measures are being implemented at the national and hospital Level (16). According to the National guide to the care system of hospital infections, the observance of hygiene principles such as hand washing, the use of personal protective equipment, and environmental disinfection are among the basic measures in the Prevention of these infections (17) . However, studies show that in practice, adhering to these principles faces challenges. For example, in a study of emergency nurses, factors such as lack of equipment, high workload and lack of adequate training are listed as the main obstacles to adhering to health principles (18). studying the status of HAIs in Iran and identifying Indigenous challenges and solutions can be the basis for designing effective infection prevention strategies in the country's hospital care system. Examining the perspective of infection control specialists provides valuable information about limitations, needs and opportunities for improvement and helps develop evidence-based management and clinical models (19). so this study was conducted with the aim of identifying strategies and challenges in hospital infection control in Iran.

## Materials and Methods

The qualitative study used semi-structured interviews to examine the views of healthcare professionals on the Prevention of hospital infections (HAI) in Iran. A total of 30 participants with at least one year of experience in Infection Control were selected on a targeted basis. Each interview lasted 30-45 minutes. Participation was voluntary and individuals could leave the study at any time without any consequence. The interviews were guided by two main questions: What are the challenges of preventing hospital infections in Iran? And What strategies or recommendations do participants propose to reduce these infections and address these challenges? This approach made it possible to gather rich and in-depth data on the practical experiences and insights of specialists. Collecting and analyzing data all interviews were recorded audio with the consent of the participants and transcribed word for word immediately after each interview. The transcripts of the interviews were listened to several times to ensure accuracy and immersion in the data. The data were analyzed using conventional content analysis and with an inductive approach. Meaningful units were coded, and similar codes were grouped into the main subtopics and topics. This repetitive process made it possible to systematically extract key challenges and strategies to prevent hospital infections in Iranian health care settings. Reliability to ensure the reliability of the study, four criteria

were considered: validity: through long-term interaction with participants, review by members and peer Q & A in order to verify that the findings accurately reflect the participants ' views. Transferability: by providing detailed explanations of the study context, participants ' characteristics and data collection procedures are ensured, enabling readers to assess the applicability of the findings in other environments. Reliability: through transparent documentation of the research process, data collection and analysis procedures are maintained continuously and, if necessary, external audits. Verifiability: it is ensured by maintaining an audit path, documenting analytical decisions and peer review in order to minimize researcher bias and ensure that the findings are data-driven.

## Results

The participants in the present study were 12 women and 18 men their employment history ranged from 4 years to 37 years to an average of 83/21 years. The occupational characteristics of the participants are shown in table one. Analysis of qualitative interviews showed that the prevention and control of hospital infections in Iran faces a series of structural, human and managerial challenges. However, in addition to stating obstacles, the participants presented a set of practical strategies and strategies to improve the situation. The findings were classified into five main themes of challenges and five main themes of strategies (Table 2).

## *Challenges*

***Theme 1:*** limited human resources and finance: one of the most important obstacles to implementing infection control programs was the lack of skilled manpower and insufficient funding. Many contributors emphasized the lack of skilled staff and lack of adequate motivation among staff: "hospitals suffering from staff shortages or low morale face greater difficulties in maintaining infection prevention practices.(Participant 7). In addition, the lack of funds limited the purchase of essential equipment and supplies: "there is no specific budget for Infection Control, which limits the ability to purchase the necessary equipment and supplies.(Participant 3)

***Theme 2:*** poor infrastructure: lack of infrastructure was identified as another important obstacle. The lack of national surveillance systems and weakness in sterilization equipment had created many problems "the lack of a national surveillance system for hospital infections is the biggest challenge.(Participant 9) many hospitals still use non-standard autoclaves and inadequate disinfection methods.(Participant 5) also, poor environmental conditions such as unprincipled waste disposal and the presence of pests in the hospital environment helped increase the risk of infection."Inadequate sanitary facilities, improper disposal of waste and even the presence of pests play a role in the risks of infection.(Participant 2)

***Theme 3:*** inadequate awareness of the staff of the medical staff in some cases did not have sufficient awareness of the standard measures of infection control. "Many employees have poor knowledge of infection control procedures and require constant recall.(Participant 4) the lack of continuous and structured training had also exacerbated the problem."Training sessions are not held regularly and there is little emphasis on continuing education.(Participant 8)

***Theme 4:*** insufficient monitoring and training, weakness in monitoring the implementation of protocols and poor quality of training programs, prevented the change in behavior in employees from taking shape well.There is insufficient monitoring of infection control practices, especially in the use of antibiotics.(Participant 6) Most training sessions are brief and not functional enough to change employee behavior (Participant 10).

***Theme 5:*** problems in detecting and Reporting Limitations of laboratory facilities made it difficult to accurately and timely detect infections.Diagnosis and confirmation of hospital infections is often problematic due to limited laboratory support.(Participant 11) in addition, reporting systems were slow and inefficient and did not reflect real information about the incidence of infections.Current

reporting systems are slow and do not record reality (Participant 12).

## Strategies

Along with these challenges, the participants proposed solutions to improve the situation. These strategies were categorized into five main themes

***Theme 1:*** strengthening policy and governance solutions such as drafting national guidelines, integrating infection control indicators into hospital accreditation and forming national committees to combat microbial resistance were proposed.Integration of infection control indicators into the accreditation system can create an implementation requirement.(Participant 2) interdepartmental cooperation between the Ministry of Health, the veterinary organization and the Environmental Protection Agency was also emphasized, as well as international interactions with the WHO.

***Theme 2:*** upgrading hospital capacity and infrastructure proposals including strengthening infection control committees, allocating independent funds, providing personal protective equipment, increasing the proportion of infection control nurses and upgrading environmental management systems (such as waste disposal, ventilation and healthy water) were proposed. "For infection control measures to be effective, full-time nurses must work in this area.(Participant 5)

***Theme 3:*** training, awareness and motivation to increase postgraduate courses, holding in-service training, linking job promotion to completion of training courses, as well as creating financial and non-financial incentives for employees were proposed."When employees receive bonuses, they are more motivated to comply with protocols.(Participant 8) it also emphasized the education of patients and families and the implementation of public campaigns in the community.

***Theme 4:*** leveraging technology and innovation the use of electronic systems for timely reporting the use of artificial intelligence to analyze infection patterns and strengthen laboratory capacity with new tools such as PCR were among other proposals

***Theme 5:*** improving clinical practices and managing antibiotic use the development of evidence-based programs to reduce unnecessary prescribing of antibiotics, monitoring surgeries and improving the reporting system from clinics and the private sector was proposed. Surgeons should be given feedback to reconsider their use of antibiotics.(Participant 6).Overall, the findings showed that while there are serious obstacles in the field of resources, infrastructure, awareness and surveillance systems, applicable and diverse solutions have also been proposed to promote the prevention and control system of hospital infections in Iran.

**Table 2:** Challenges and Corresponding Strategies

| Challenge | Strategy |
|---|---|
| Governance and Policy<br>-Insufficient national guidelines<br>-Fragmented intersectoral collaboration | Develop comprehensive national IPC guidelines<br>Standardize reporting systems<br>Enhance collaboration between relevant sectors<br>Integrate IPC into hospital accreditation standards |
| Hospital Capacity and Infrastructure<br>-Weak IPC committees<br>-Staff shortages<br>-Inadequate PPE<br>-Poor facility management | Empower IPC committees with dedicated staff and budgets<br>Strengthen supply chains<br>Maintain infrastructure (ventilation, water, waste)<br>Ensure PPE availability |
| Education and Awareness<br>-Limited training<br>-Low staff motivation<br>-Poor patient/community engagement | Implement continuous IPC training programs<br>Introduce financial/non-financial incentives<br>Educate patients and caregivers |
| Technology and Innovation<br>-Lack of digital surveillance<br>-Limited laboratory capacity | Implement smart electronic systems<br>Utilize AI for real-time monitoring<br>Expand access to advanced diagnostics (PCR testing) |
| Clinical Practice<br>-Overuse/misuse of antibiotics<br>-Inconsistent infection reporting | Establish strict antibiotic stewardship programs<br>Enforce monitoring and reporting protocols<br>Encourage timely reporting from all healthcare settings |

## Discussion

the findings of this qualitative study showed that the prevention and control of hospital infections in Iran is influenced by a series of multidimensional challenges, but at the same time several solutions were proposed to overcome these obstacles by experts and clinical staff. These results are in line with international studies that emphasize the importance of combining structural, educational and managerial interventions to reduce the burden of hospital infections.(20-23) the main challenges: human resources, infrastructure and training according to our findings, lack of skilled manpower and limited financial resources are one of the main obstacles in the effective implementation of infection control programs. This result is consistent with research in other countries that have shown that insufficient ratios of nurses to beds and limited funds for equipment purchases increase the risk of infection. In addition, weak hospital infrastructure including old sterilization equipment, poor environmental conditions and lack of coherent surveillance systems make it more difficult to implement standard protocols(24-26). Similar situations have been reported in some low-and middle-income countries, where resource constraints and weak regulatory systems are the main obstacles to infection control. The role of employee awareness and education was a lack of awareness among employees and a lack of continuing education among other barriers(27).

Our findings showed that employees often need constant reminders and training, which is consistent with global evidence that intermittent and short-term training has no lasting impact on employee behavior change.(28-29) therefore, the development of structured and continuous training programs can play an important role in promoting preventive behaviors. Problems in detecting and Reporting Limitations of laboratory facilities and weak reporting systems are serious obstacles to timely detection of infections. These challenges not only reduce the accuracy of epidemiological data, but also hinder evidence-based planning. International evidence has also shown that the development of reference laboratories and electronic reporting systems can dramatically improve the quality of infection monitoring and control.(30) strategies proposed in this policy, infrastructure and innovation study in the face of these challenges, contributors presented a set of practical strategies. Among other things, strengthening national policy and integrating infection control indicators into the hospital accreditation system were proposed as binding leverage. Also, the allocation of independent funds, the employment of full-time nurses in the field of infection control and the promotion of environmental systems (such as waste disposal, ventilation and healthy water) were among other key proposals. Our findings are consistent with the results of previous studies that have shown that the presence of strong legal and financial support, appropriate infrastructure and committed human resources play a decisive role in the success of infection control programs.(30-33) the importance of technology and management of antibiotic use the use of new technologies such as electronic reporting systems and advanced diagnostic tools (such as PCR) was also mentioned as an effective solution. In addition, the participants emphasized the need for rational management of antibiotic use. This finding is of great importance given the global trend of increasing microbial resistance and shows that the deployment of antibiotic use monitoring programs and providing feedback to doctors can play an important role in reducing drug resistance(34). The policy and practical implications of the study's findings have several key messages for health policy makers and managers: infection control requires a multi-level approach that covers national policy, hospital infrastructure, employee training and technology use simultaneously. The creation of national and inter-sectoral committees, as well as the strengthening of international cooperation, can help to convey successful experiences. Attention to employee motivation, whether through financial or non-financial rewards, is

one of the prerequisites for the sustainable implementation of infection control protocols. Overall, the results of the study show that although hospitals in Iran face resource constraints, infrastructure weakness and insufficient training, there is a set of practical and feasible solutions that can help improve the situation.

## Conclusion

the study showed that effective infection prevention and control (IPC) in Iranian hospitals requires a comprehensive and multidimensional approach. The findings emphasize the importance of strengthening governance and policy-making, increasing hospital capacity and infrastructure, promoting staff training and motivation, using technology and innovation, and improving clinical practices and monitoring antibiotics. Given the challenges in controlling hospital infections in Iran, there is a need to adopt comprehensive and multilateral approaches. These approaches should include continuous staff training, improving hospital infrastructure and promoting organizational culture in order to effectively reduce hospital infections and improve the quality of health care.

## Limitation

This qualitative study investigated the causes of hospital-acquired infections in Iran through interviews with a diverse group of participants. While this diversity enriched the data, each participant spoke mainly from their own professional perspective, and the synthesis may not fully capture all potential contributing factors.

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## Conflict of Interest

The researchers declare no conflicts of interest regarding this study.

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**Table 1:** Demographic Information of Participants in Hospital-Acquired Infection Causes Interview

| Gender | Educational Qualification | Work Experience | Job Position | Organizational Status |
|---|---|---|---|---|
| Male | Infectious Disease Specialist | 37 years | Head of Infectious Diseases Department - Physician in charge of Infection Control | Faculty Member, Mazandaran University - Head of Department and Professor, Infectious Diseases Group |
| Female | Infectious Disease Specialist | 16 years | Dean of Faculty of Medicine | Faculty Member, Islamic Azad University of Sari |
| Female | Infectious Disease Specialist | 11 years | Physician in charge of Infection Control | Faculty Member, Islamic Azad University of Sari |
| Male | ICU Subspecialist | 31 years | Deputy of Treatment | Faculty Member, Mazandaran University |
| Female | Nursing Expert (B.Sc.) | 18 years | Infection Control Officer | Treatment Supervision Expert |
| Male | Nursing Expert (B.Sc.) | 21 years | Nursing Manager | Treatment Supervision Expert |
| Male | Anesthesiologist | 32 years | Deputy of Treatment | Head of ICU Department |
| Male | Epidemiologist | 11 years | Head of Non-Communicable Diseases | Faculty Member Mazandaran University |

**Table 1:** Demographic Information of Participants in Hospital-Acquired Infection Causes Interview

| Gender | Educational Qualification | Work Experience | Job Position | Organizational Status |
|---|---|---|---|---|
| | | | Research Institute and Director of Tabari Cohort | |
| Male | Infectious Disease Specialist and Infection Prevention Fellowship | 18 years | Infection Control Officer at Ministry of Health and Medical Education | Faculty Member, University of Tehran |
| Female | Infectious Disease Specialist and Infection Prevention Fellowship | 20 years | Infection Control Officer at Ministry of Health and Medical Education | Faculty Member Mazandaran University |
| Female | Pediatrician | 29 years | Head of Pediatrics Department in Hospital | Pediatrician employed in Hospital |
| Female | Infectious Disease Specialist | 20 years | Infection Control Officer | Faculty Member, Kermanshah University |
| Female | Infectious Disease Specialist | 13 years | Infection Control Officer | Faculty Member, Isfahan University |
| Male | Pediatric Infectious Diseases Subspecialist | 30 years | Infection Control Officer | Professor, Infectious Diseases |
| Male | Neonatology Subspecialist | 30 years | Head of NICU Department | Faculty Member, Mazandaran University |
| Male | Pediatrician | 35 years | Head of Pediatrics Department | Faculty Member, Mazandaran University |
| Female | Gynecologist | 16 years | Head of Gynecology Department | Faculty Member, Mazandaran University |
| Male | Pulmonology Subspecialist | 31 years | Head of Department | Faculty Member, Mazandaran University |
| Male | Anesthesiologist | 33 years | Head of Operating Room Department | Anesthesiologist employed in Hospital |
| Female | M.Sc. in Health Services Management | 20 years | Quality Improvement Officer, Mazandaran University of Medical Science | Treatment Supervision Expert |
| Male | ICU Subspecialist | 15years | Head of ICU Department | Faculty Member, Mazandaran University |
| Male | Environmental Health | 31 years | Environmental Health Quality Officer | Treatment Supervision Expert |
| Female | Health Policy | 13 years | Faculty Member | Faculty Member, Mazandaran University |
| Female | Epidemiologist | 4 years | Assistant Professor at University | Faculty Member, Shiraz University |
| Male | Internal Medicine Specialist | 31years | Assistant Professor at University | Faculty Member, Shiraz University |
| Female | General Surgeon | 10 years | Head of Surgery Department | Faculty Member, Mashhad University |
| Male | Ph.D. in Health Services Management | 17 years | University Professor | Faculty Member, Mashhad University |
| Male | Ph.D. in Health Services Management | 25 years | University Professor | Faculty Member, Shahid Beheshti University |
| Male | Pharmacologist | 20 years | Hospital | Faculty Member, Mazandaran University |
| Male | Ph.D. in Economics | 18 years | Head of University Presidency Office, Mashhad University | Faculty Member, Mashhad University |

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