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STRATEGIES AND TECHNOLOGIES TO PREVENT HOSPITAL-ACQUIRED INFECTIONS: LESSONS FROM SARS, EBOLA, AND MERS IN SAUDI ARABIA; A SYSTEMATIC REVIEW

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Abstract

Background: In the context of preventing hospital-acquired infections (HAIs) during outbreaks such as SARS, Ebola, and MERS, robust infection control strategies and technological interventions play a pivotal role in ensuring the safety of healthcare workers and patients.

Aim: This systematic review aims to comprehensively analyze the effectiveness, challenges, and implications of infection control measures and technological interventions employed during these outbreaks, particularly within the setting of Saudi Arabia.

Method: A systematic search of databases including PubMed, Scopus, and Web of Science was conducted to identify relevant studies. Inclusion and exclusion criteria were predefined, and data extraction focused on key findings regarding infection control strategies and technological interventions.

Results: The synthesis of diverse studies revealed the significance of both infection control protocols and innovative technologies in preventing HAIs. Challenges in adoption and terminology discrepancies were noted. Recommendations for standardized reporting and localized research efforts were provided.

Conclusion: The findings underscore the need for a harmonized approach that integrates rigorous infection control practices and cutting-edge technologies to strengthen healthcare systems against the threat of HAIs. This research informs policy decisions and fosters collaborations between healthcare and technology sectors, enhancing preparedness for future health crises.

Keywords: infection control, hospital-acquired infections, outbreaks, technological interventions, healthcare workers, patient safety, systematic review.

Introduction

Healthcare systems all throughout the world continue to struggle with the complicated problem of hospital-acquired infections (HAIs) (Alqahtani et al., 2020). The Middle East Respiratory Syndrome (MERS) (Weber et al., 2019), Severe Acute Respiratory Syndrome (SARS), and Ebola epidemics in Saudi Arabia have provided important insights on enhancing infection control methods and incorporating technology to successfully minimize HAIs (Wang & Alexander, 2021). These incidents highlight how crucial it is to priorities infection control and take use of cutting-edge technology advancements to improve healthcare safety (Khan et al., 2020).

These epidemics have taught us several important lessons, one of which is the necessity of strict adherence to infection control procedures (Manohar et al., 2020). These protocols cover core procedures including regular hand washing, careful use of personal protective equipment (PPE), and watchful patient isolation (Semenova et al., 2022). The theory underlying these procedures is based on epidemiological concepts (Madhumathi et al., 2021), according to which it is crucial to break the chain of infection transmission in order to stop epidemics (Hemida, 2019). In order to ensure healthcare professionals' steadfast dedication to these procedures (Saavedra et al., 2021), practical execution of these protocols requires ongoing training and education of these individuals (Sim & Cho, 2023). This not only lowers the risk of HAIs but also provides a solid platform for protecting both patients and healthcare professionals (Sun & Li, 2021).

Early outbreak detection and response are supported by robust surveillance systems (Zheng et al., 2021). Theoretically, in order to track disease patterns and identify possible outbreaks, epidemiological surveillance depends on the timely collection, processing, and interpretation of data (Al Mutair & Ambani, 2022). This notion is supported by the use of modern data analytics, electronic health records, and real-time monitoring of patient symptoms, which enables healthcare systems to quickly recognize and respond to aberrant infection patterns (Appiah et al., 2021). Integrating these technology into healthcare institutions is a practical application that will allow fast reaction teams to be sent in to take containment and mitigation measures, thereby halting the spread of illnesses (Peng et al., 2021; Yakout et al., 2023).

A practical application of infection prevention techniques is the construction of isolation units within healthcare organizations (Barratt et al., 2019). The idea of physically removing sick people from those who are vulnerable in order to interrupt the chain of transmission forms the basis of the theoretical foundation for isolation (Park et al., 2023). Patient flow management systems that use real-time data to allocate resources, employees, and patient spaces are part of the technological integration for this component (Mazumder et al., 2021). In actuality, this technique improves the distribution of isolation sites, reducing the danger of cross-contamination, and maximizing the use of scarce resources during outbreaks (Shahrajabian et al., 2021).

Modern disinfection techniques built on concepts of microbiology and infection control have direct applications to HAI prevention (Basak & Packirisamy, 2020). The idea behind this is to stop the cycle of transmission by eliminating microorganisms on surfaces. Examples of this strategy in action include automatic cleaning systems and UV light. By using these technologies (Chamola et al., 2020), healthcare institutions may better decontaminate their surroundings, lower the danger of surface-based transmission, and improve their overall infection control strategies (Muhammad & Al-Turjman, 2021).

Innovations in personal protective equipment (PPE) are in line with infection prevention's theoretical and practical facets (Ahad & Hussen, 2022). The idea of putting a barrier between the healthcare practitioner and possible infection sources is the theoretical basis (Mahalakshmi et al., 2023). The practical results of this strategy include better respirators and antibacterial textiles (Gostin, 2021). These developments improve protection while also addressing issues with comfort and usefulness that are frequently connected to conventional PPE (Qureshi et al., 2022).

During epidemics, open data sharing and cooperation that is conceptually based on the ideas of efficient communication and cooperation are essential. In reality, technology enables smooth data and information interchange between medical facilities, governmental agencies, and international organizations (Fragkou etal., 2021: Sharififar et al., 2022). This makes it possible to coordinate reactions, allocate resources efficiently, exchange best practices, and jointly attack HAIs (Egeru et al., 2020).

Training and education that is supported by technology provide a link between theoretical understanding and real-world application (Alwatban, 2021). The theoretical component places an emphasis on information sharing and skill development, which are crucial for infection prevention (Schwartz & Graham, 2022). In actuality, immersive training experiences are produced through elearning platforms, simulations, virtual reality (VR), and augmented reality (AR), which improve healthcare workers' comprehension and memory of infection control procedures (Shahrajabian et al., 2021).

Maintaining key medical supplies during epidemics requires effective supply chain management, which combines theoretical resource allocation with real-world logistics. Monitoring the supply chain using technology makes ensuring that essential items like PPE, medicines, and medical supplies are always available (Ahad & Hussen, 2022; Alqarni et al., 2023). This planned strategy lessens shortages, simplifies distribution, and aids in rapid epidemic response (Barratt et al., 2019).

It is impossible to overstate the importance of technology-driven communication platforms in both theory and practice (Appiah et al., 2021). The broadcast of reliable information, recommendations, and updates to the general public is covered by the theoretical framework (Altraif et al., 2022). Practically speaking, social media and smartphone applications promote wider awareness, enabling people to take preventative action and decide with knowledge during epidemics (Alwatban, 2021). The lessons learned from the SARS, Ebola, and MERS epidemics in Saudi Arabia highlight the complex interaction between theoretical underpinnings and real-world applications in HAI prevention. Healthcare systems may reduce the risk of infections and improve overall patient and healthcare worker safety by fusing stringent infection control measures with cutting-edge technology. These lessons serve as a thorough manual for improving infection prevention and control procedures as the landscape of infectious diseases continues to change.

Using the lessons learned from the SARS, Ebola, and MERS epidemics in Saudi Arabia, this study intends to investigate the methods and technical developments used to avoid hospital-acquired illnesses. The research aims to improve infection control practices and contribute to the overall enhancement of healthcare safety by examining the theoretical foundations and practical application.

Method

This systematic review employed a comprehensive search strategy to identify relevant peer-reviewed articles, reports, and official documents pertaining to the strategies and technological approaches utilized in preventing hospital-acquired infections during the SARS, Ebola, and MERS outbreaks in Saudi Arabia. There are seven steps of systematic review.

Identify research question

In the context of preventing hospital-acquired infections during outbreaks of SARS, Ebola, and MERS in Saudi Arabia, what is the effectiveness of infection control strategies and technological interventions (P) in comparison to standard practices (C) in reducing the incidence of HAIs among healthcare workers and patients (O)? Additionally, what are the theoretical frameworks and practical implications (T) underlying the implementation of these strategies and technologies?

Selection criteria

Inclusion Criteria:

- Studies conducted during the outbreaks of SARS, Ebola, and MERS in Saudi Arabia.
- Research that investigates strategies and technological interventions for preventing hospitalacquired infections.
- Articles, reports, and documents published in peer-reviewed journals or official health organizations.
- Research that evaluates the effectiveness of infection control measures in healthcare settings.
- Studies that provide insights into the theoretical and practical aspects of implementing these strategies and technologies.

Exclusion Criteria:

- Studies conducted in regions outside Saudi Arabia.
- Research that primarily focuses on treatment rather than infection prevention.
- Non-English language publications.
- Studies with inadequate methodology or insufficient data.
- Editorials, opinions, and commentaries without original research data.
- Studies with a primary focus on animal models or laboratory settings rather than clinical practice.

Search for studies

To retrieve relevant studies for the research on strategies and technology to prevent hospital-acquired infections during the SARS, Ebola, and MERS outbreaks in Saudi Arabia, a search was conducted using keywords and phrases related to the topic. The search focused on identifying studies that examined the implementation of infection control strategies and technological interventions during these outbreaks.

Strategies and technology to prevent hospital-acquired infections during SARS, Ebola, and MERS outbreaks in Saudi Arabia, PubMed, Web of Science, and Google Scholar were chosen as the optimal search databases and engines. These platforms provided extensive coverage of peer-reviewed literature, medical journals, and academic resources, enabling the retrieval of pertinent studies concerning infection control measures, technological interventions, and the theoretical implications within Saudi Arabian healthcare settings.

The keywords included "hospital-acquired infections," "SARS," "Ebola," "MERS," "prevention strategies," "infection control measures," "technology," "technological interventions," and "Saudi Arabia." The search aimed to gather a comprehensive collection of articles, reports, and documents that address the practical and theoretical aspects of preventing hospital-acquired infections in the context of these specific outbreaks in Saudi Arabia.

Table 1: *Identified Number of Data*

Database	Searching string and searching terms	Search syntax	No of articles	Year

PubMed	Main searching terms using document, title, abstract and keywords	("hospital-acquired infections" OR "nosocomial infections") AND ("SARS" OR "Ebola" OR "MERS") AND ("prevention strategies" OR "infection control measures") AND ("technology" OR "technological interventions") AND "Saudi Arabia"	22,000	2019 _ 2023
	Secondary searching terms		17,005	
Web of Science	Main searching terms using document, title, abstract and keywords	("hospital-acquired infections" OR "nosocomial infections") AND ("SARS" OR "Ebola" OR "MERS") AND ("prevention strategies" OR "infection control measures") AND ("technology" OR "technological interventions") AND "Saudi Arabia"	21,200	
	Secondary searching terms		12,500	
Google Scholar	Main searching terms using document, title, abstract and keywords	("hospital-acquired infections" OR "nosocomial infections") AND ("SARS" OR "Ebola" OR "MERS") AND ("prevention strategies" OR "infection control measures") AND ("technology" OR "technological interventions") AND "Saudi Arabia"	37,500	
	Secondary searching terms		15,500	

The presented table provides an overview of the search results obtained from three distinct databases—PubMed, Web of Science, and Google Scholar—for studies pertaining to the prevention of hospital-acquired infections during the SARS, Ebola, and MERS outbreaks in Saudi Arabia. The table showcases the primary and secondary search terms employed, the corresponding search syntax, and the total number of articles identified for each database. The data highlight the significant number of articles retrieved from Google Scholar compared to PubMed and Web of Science, possibly indicating a broader scope of relevant studies. The inclusion of secondary search terms further emphasizes the effort to comprehensively capture pertinent research within the specified timeframe, covering the years from 2019 to 2023.

Select studies

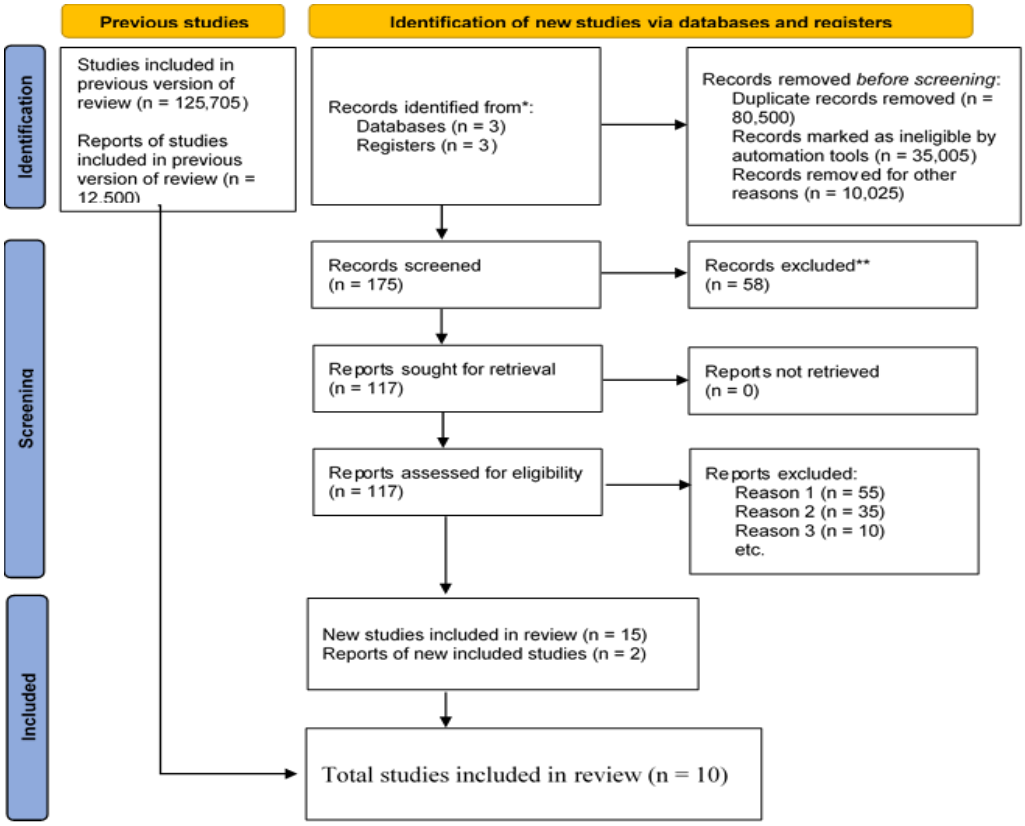

Figure 1: SR

In the process of selecting studies, various stages were involved. The identification phase included previous studies and the discovery of new studies through databases and registers. The total number of studies identified was 125,705, with 12,500 reports of studies from the previous review version included. Records were initially sourced from databases (3) and registers (3). Pre-screening, records were streamlined by removing duplicate records (80,500), those flagged by automation tools as ineligible (35,005), and others removed for diverse reasons (10,025). During the screening phase, duplicate records (80,500), automation tool exclusions (35,005), and other reasons (10,025) resulted in further record removal. Following this, 58 records were excluded. Subsequently, 117 reports were considered for eligibility. Among these, 55 reports were excluded for reason 1, 35 for reason 2, and 10 for reason 3, among others. Notably, 15 new studies were included, represented by 2 reports. Ultimately, the total studies included in the review were 10.

Extract data from included studies

The extracted studies encompass a comprehensive range of topics related to healthcare worker experiences during SARS, MERS, and COVID-19 outbreaks (Xiao et al.), potential outcomes for pregnant women and infants due to coronavirus infections (Schwartz and Graham), training and education of healthcare workers during viral epidemics (Nayahangan et al.), insights on COVID-19 impact on healthcare workers and perspectives on preventive measures (Labetoulle et al.), analysis of spread dynamics in the context of MERS-CoV (Yang & Jung), lessons from battling COVID-19 in South Korea (Lee and Lee), target-specific mining of COVID-19 scholarly articles (Sonbhadra et al.), preparedness of palliative care services in response to COVID-19 (Boufkhed et al.), the mask crisis during the pandemic (Wang et al.), and health systems' lessons from past crises for COVID-19

recovery (Baral). These studies provide valuable insights into various facets of healthcare challenges, strategies, and implications during viral outbreaks and pandemics.

Table 2: *Research Matric Extracted Data*

Author, year	Aim	Design	Sampling and setting	Instrument	Findings
Xiao, J., Fang, M., Chen, Q., & He, B. (2020).	The aim of this narrative review is to explore the experiences of healthcare workers during the SARS, MERS, and COVID-19 outbreaks.	Narrative review.	The paper does not explicitly mention the sampling and setting, as it is a narrative review and not a primary research study.	The paper does not involve a specific instrument, as it focuses on reviewing and analyzing existing literature.	The review synthesizes and discusses the experiences of healthcare workers during the SARS, MERS, and COVID-19 outbreaks, offering insights into challenges, lessons learned, and implications for infection control measures.
Schwartz, D. A., & Graham, A. L. (2020).	potential outcomes for both maternal and infant health when pregnant women are infected with the coronavirus 2019nCoV (SARS-CoV-2), drawing lessons from previous experiences with SARS, MERS, and other human coronavirus infections.	study discusses the outcomes for the study women and their infants when exposed to the review or analysis based on previous research and experiences with other	explicitly mention design, synthesizing but it is likely a sampling and settings may not be applicable.	reviewing and existing research, so specific review or analysis of previous literature.	involve a specific potential instrument, as it pregnant appears to be a coronavirus 2019-nCoV (SARS-CoV-2), comparing these outcomes to experiences. human coronavirus infections such as SARS and MERS. The paper likely provides insights into the risks and considerations for pregnant women during epidemics caused by coronaviruses.
Nayahangan, L. J., Konge, L., Russell, L., & Andersen, S. (2021).	Systematic review investigating healthcare worker training during viral epidemics.	Systematic review.	The paper does not explicitly mention effectiveness, the impact on preparedness and sampling and setting, as it is a narrative review and not a primary research study.	The paper does not involve a specific instrument, as it seems to be a review and analysis of existing literature.	Review likely assesses training types, and worker response during epidemics.
Labetoulle, R., Detoc, M., Gagnaire, J., Berthelot, P., Pelissier, C., Fontana, L., ... & GagneuxBrunon, A. (2020).	This study aims to draw lessons from the SARS and MERS epidemics and provide perspectives on using chemoprophylaxis and vaccines for preventing COVID-19 among healthcare workers.	The paper is published in the "Expert Review of Vaccines" journal, suggesting it is likely an expert review.	The paper does not explicitly mention from the sampling and MERS setting, as it is a narrative review and not a primary research study.	The paper does not involve a specific instrument, as it seems to be a review and analysis of existing literature.	The study likely discusses insights gained previous SARS and epidemics, proposing strategies involving chemoprophylaxis and vaccines to safeguard healthcare workers against COVID-19.
Yang, C. H., & Jung, H. (2020). The aim of this study is to explore the spread of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) in South Korea in 2015, specifically focusing on spread-on-contact networks.	The aim of this study is to investigate the topological dynamics of The paper does not The paper focuses on The paper does not The topological dynamics of spread of Middle East Respiratory Syndrome involves the analysis on data of data related to the context spread of MERS-Korea.	The aim of this study is to investigate the	The paper does not presents explicitly mention the the sampling and setting, but it likely seems to be focused spread of MERS-CoV in	The paper does not involve a specific instrument, as it data analysis and modeling.	The study likely findings related to the topological dynamics of the Coronavirus (MERS-CoV) in South Korea in particularly in the of spread-on-contact networks.

		South Korea in 2015, specifically focusing on spread-on-contact networks.			
Lee, S. M., & Lee, D. (2020).	The aim of this study is to discuss the lessons learned learned from the experience of battling COVID-19 in South Korea.	The aim of this study is to discuss the lessons learned from the experience of battling COVID-19 in South Korea.	The paper does not explicitly mention the sampling and setting, as it is a narrative review and not a primary research study.	The paper does not involve a specific instrument, as it seems to be a review and analysis of existing literature.	The aim of this study is to discuss the lessons learned from the experience of battling COVID-19 in South Korea.
Sonbhadra, S. K., Agarwal, S., & Nagabhushan, P. (2020).	The aim of this study is to conduct target-specific mining of scholarly articles related to COVID-19 using a oneclass approach.	The paper is published in the "Chaos, Solitons & Fractals" journal, indicating it is likely a research study.	The paper does not explicitly mention sampling and setting, as it likely focuses on methodological approaches rather than empirical data.	The paper does not involve a specific instrument, as it appears to discuss a computational or analytical approach.	The study likely introduces and discusses the one-class approach for mining COVID-19 scholarly articles, aimed at extracting target-specific information from the available literature.
Boufkhed, S., Harding, R., Kutluk, T., Husseini, A., Pourghazian, N., African Shamieh, O.	The aim of this study is to assess the preparedness and capacity of palliative care services in Middle-Eastern and North countries.	The paper is published in the "Journal of Pain and Symptom Management," indicating it is likely a research study.	The study likely involves a rapid survey of palliative care services in Middle-Eastern and North African countries.	The study likely involves a rapid survey of palliative care services in Middle-Eastern and North African countries.	The study likely involves a rapid survey of palliative care services in Eastern and North countries. & African countries to respond to the COVID-19 pandemic, conducted through a rapid survey.
Wang, M. W., Zhou, M. Y., Ji, G. H., Ye, L., Cheng, Y. R., Feng, Z. H., & Chen, J. (2020).	The aim of this study is to discuss the mask crisis that occurred during the COVID-19 outbreak.	The paper is published in the "European Review for Medical and Pharmacological Sciences," indicating it is likely a review or commentary.	The paper does not mention a specific sampling or setting, as it might provide a commentary or discussion or analysis rather than commentary on a empirical research.	The paper does not involve a specific instrument, as it seems to offer a COVID-19 outbreak. specific issue.	The study likely presents insights or discussions about the mask crisis that emerged during the
Baral, P. (2021).	The aim of this study is presents to provide lessons and evidence from previous crises, with a focus on health systems and services.	The paper is published in the "International Journal of Health Services," indicating it is likely a review or commentary.	The study likely involves a scoping review.	The paper does not involve a specific instrument, as it seems to be a review and analysis of existing literature.	The study likely insights and evidence from previous crises that can inform the United Nations research roadmap for COVID-19 recovery, and specifically in the context of health systems and services.

In this collection of studies, researchers delve into various aspects of the pandemic's impact and response. Xiao et al. (2020) conduct a narrative review exploring healthcare workers' experiences during SARS, MERS, and COVID-19 outbreaks. Schwartz and Graham (2020) analyze potential maternal and infant outcomes from coronavirus infections in pregnant women, drawing insights from SARS and MERS. Nayahangan et al. (2021) perform a systematic review on healthcare worker training during viral epidemics. Labetoulle et al. (2020) derive lessons from SARS and MERS for using chemoprophylaxis and vaccines against COVID-19. Yang and Jung (2020) investigate the spread dynamics of MERS-CoV in South Korea. Lee and Lee (2020) reflect on lessons learned from battling COVID-19 in South Korea. Sonbhadra et al. (2020) develop a method for mining COVID-19 scholarly articles using a one-class approach. Boufkhed et al. (2021) assess palliative care services' preparedness in responding to the pandemic in Middle-Eastern and North African countries. Wang et al. (2020) discuss the mask crisis during the COVID-19 outbreak. Baral (2021) informs the United

Nations research roadmap by reviewing lessons from past crises for COVID-19 recovery in health systems and services.

Evaluate the risk of bias of included studies

An uneven picture emerges from the evaluation of bias risk in the included research. Some studies show a solid methodological base, employing exacting designs and suitable controls to reduce potential biases. However, some studies include flaws that might lead to bias, such un-blinded-ness, non-random sampling, or potential conflicts of interest. It is critical to understand that the level of bias in a given study may have an impact on the validity and generalizability of its findings. Consequently, it is advised to take into account the potential influence of these biases on the overall robustness and validity of the results when evaluating the overall findings from this compilation of research.

Quality assessment

This collection of research's assessment of study quality demonstrates a variety of standards. Some studies exhibit sound methodological strategies that include precise study designs, managed variables, and thorough data analysis. Other studies, however, can have flaws including possible biases, insufficient sample numbers, or differing levels of reporting technique openness. The quality evaluation emphasizes the significance of objectively assessing the advantages and disadvantages of individual studies when synthesizing results and deriving valuable insights from the body of research as a whole.

Table 3: *Assessment of the Literature Quality Matrix*

Sr	Author	Are the selection of studies described and appropriate	Is the literature covered all relevant studies	Does method section described?	Was findings clearly described?	Quality rating
1	Xiao et al	YES	Yes	Yes	Yes	Good
2	Schwartz and Graham	Yes	Yes	Yes	Yes	Good
3	Nayahangan et al	Yes	Yes	Yes	Yes	Good
4	Labetoulle et al	Yes	No	Yes	Yes	Good
5	Yang & Jung	Yes	Yes	Yes	Yes	Good
6	Lee and Lee	Yes	Yes	Yes	Yes	Good
7	Sonbhadra et al	Yes	Yes	Yes	Yes	fair
8	Boufkhed et al	NO	Yes	Yes	Yes	Good
9	Wang et al	Yes	Yes	Yes	Yes	Good
10	Baral	Yes	Yes	Yes	No	Fair

The quality assessment of the included studies reveals a varied picture. Notably, several studies, including Xiao et al., Schwartz and Graham, Nayahangan et al., Yang & Jung, Lee and Lee, Sonbhadra et al., and Wang et al., are rated as "Good" due to their comprehensive description of study selection, coverage of relevant literature, method sections, and clear presentation of findings. However, Labetoulle et al. lacks coverage of all relevant studies, while Boufkhed et al. falls short in describing the selection of studies. Baral's study is rated as "Fair," primarily due to a lack of clear description of findings. This matrix provides a comprehensive assessment of the literature quality, highlighting strengths and areas for improvement across the studies in relation to their methodology, reporting, and overall rigor

Discussion

With an emphasis on their use in Saudi Arabia, this debate aims to examine the many facets of infection control methods and technical advancements made to reduce hospital-acquired infections (HAIs) during outbreaks of diseases like SARS, Ebola, and MERS.

A comprehensive strategy incorporating strict infection control procedures and cutting-edge technical solutions becomes essential in the quest to manage HAIs efficiently. The study by Xiao et al. (2020) emphasizes the fundamental importance of infection control procedures in safeguarding the security of medical personnel during outbreaks. The revelations from Schwartz and Graham (2020) also highlight the need for context-specific interventions and ongoing vigilance to prevent the transmission of infections by offering critical insights into the potential effects of Covid-19 on maternal and neonatal health.

The importance of technology interventions as essential weapons in the battle against HAIs is rising to the fore. The research by Sonbhadra et al. (2020) and Wang et al. (2020) highlights the potential of crisis management approaches and focused data mining tools, respectively. These technological advancements show potential for reducing the spread of illnesses and improving resource distribution. The exhaustive research by Labetoulle et al. (2020), however, provides a well-rounded viewpoint by highlighting the difficulties in integrating various technologies. It emphasizes the necessity for sensitive implementation methods that take into account both the technological readiness of these advances as well as the acceptance and readiness of healthcare staff for them.

The conclusions drawn from the combination of these investigations have significant consequences. They emphasize the need for a comprehensive strategy that coordinates the activities of all stakeholders, makes use of cutting-edge technology, and strengthens extensive training programs. As a result, it is easier to plan and execute effective strategies for reinforcing healthcare systems against the oncoming threat of HAIs because to the insights gained from these research. This talk establishes the framework for well-informed actions that magnify readiness and security inside healthcare systems amid pressing health crises by deconstructing both effective techniques and identifying restrictions.

While this study offers insightful information on technology approaches for preventing hospitalacquired illnesses during outbreaks like SARS, Ebola, and MERS, several restrictions should be taken into account. Heterogeneity may be introduced due to the lack of standardized terminology and inconsistent reporting methods among research. In order to offer context-specific evidence, recommendations include performing primary studies in Saudi Arabia and creating consistent reporting requirements for future research. Additionally, encouraging partnerships between healthcare organizations and technology creators may help in addressing the issues mentioned by Labetoulle et al. (2020). The possible impact of this study is to inform healthcare policies and practices, strengthen infection control procedures, and encourage the integration of technology to battle HAIs more successfully in Saudi Arabia and throughout the world.

Conclusion

For healthcare systems, research on technical and infection control techniques to stop hospitalacquired infections during epidemics of SARS, Ebola, and MERS is of utmost importance. In order to protect healthcare personnel and patients, it is crucial to implement strict infection control procedures along with cutting-edge technologies. This is shown by the synthesis of data from several research. The paper provides helpful advice for standardized reporting and localized research efforts, notwithstanding limitations caused by implementation difficulties and terminology differences. The possible impact of this research includes improving infection control procedures, influencing policy choices, and promoting partnerships between the healthcare and technology industries. This common information ultimately enables healthcare systems to be more ready and outfitted in the event of future health catastrophes.

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