

Prehospital Emergency Paramedics And Other Health Practitioners' Adherence To Guidelines And Standard Precautions In Emergency Departments: A Systematic Review

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Abstract

Introduction: Clinical practice guidelines and protocols are developed to enhance the quality of care, minimize practice variation, and ensure that evidence is utilized appropriately, such as in training, risk awareness, resource allocation, and consideration of environmental pressures in emergency settings. **Aim:** The study aimed to gather the current evidence regarding the adherence of prehospital emergency paramedics and other healthcare practitioners to guidelines and standard precautions in emergency departments and prehospital settings. **Methods:** This systematic review (SR) involved searching PubMed and the Cumulative Index to Nursing and Allied Health Literature (CINAHL), and other databases, for publications between 2017 and 2025, with relevant research included based on established criteria. We extracted data from all the selected articles and formulated themes based on it. **Results:** This systematic review identified 20 studies published since 2017 regarding the compliance of prehospital emergency paramedics and other healthcare

professionals with guidelines and standard precautions in emergency rooms and prehospital environments. The results underscore differing degrees of adherence, prevalent obstacles, and possible enhancement measures. **Conclusion:** The findings indicate considerable discrepancies in professionals' compliance with (inter)national prehospital and emergency department protocols, although adherence in the emergency medical dispatch context is still undocumented. undocumented. the poor understanding of factors affecting adherence in emergency care settings, future research must identify these elements to facilitate the creation of interventions that boost adherence and subsequently improve care quality.

Keywords: Adherence, Emergency Departments, Guidelines, Health Practitioners, Prehospital, Paramedics.

1- Introduction

Clinical practice guidelines (CPGs) are formulated to enhance care quality, minimize practice variability, and promote the judicious application of evidence. They offer evidence-based healthcare strategies, bridging research deficiencies and improving patient care efficacy (Dingel et al., 2019). Prehospital Emergency Medical Services (EMS), commonly referred to as ambulance or paramedic services, which is characterized as an integrated medical response system encompassing the entire continuum of emergency management, from the identification of the emergency to healthcare system access, appropriate response dispatch, pre-arrival guidance, direct patient care by trained professionals, and suitable transport or disposition (Shannon et al., 2023).

When patients do not have easy access to primary care and their illness is seen as urgent by others in their social circle or the medical community, they may opt to use emergency medical services (EMS) because they feel EMS provides the resources and facilities needed to treat their condition. When concerned family members see unexpected or worrisome symptoms of illness progression or impending death, they often contact emergency medical services (EMS) for swift aid. By doing so, paramedics are officially designated as the first responders in the event of an emergency (Poláková et al., 2024).

A watershed moment in paramedic education occurred in 1961 with the founding of Ambulance Officer Training Centers (AOTCs), which ushered in a period devoted to offering intensive training to prospective ambulance officers. These hubs were critical in developing the knowledge and abilities needed by the growing field, adjusting educational requirements to match the changing needs of healthcare and emergency services (Brooks et al., 2018).

Ambulance services must prioritize the education and training of their front-line clinical staff. To provide safe, effective, person-centered care, clinicians must maintain current skill sets and knowledge bases. To keep up with pre-hospital emergency care's ever-evolving requirements and intricacies, operational staff must participate in ongoing education and professional development (Avery, Thompson, and Cowburn, 2023). Professionalism and paramedicine education play a crucial role in shaping future professionals (Hill & Eaton, 2023).

Clinical practice guidelines (CPG) provide recommendations that assist health professionals in the decision-making process, enabling more informed healthcare choices, delineating priority interventions based on favorable trade-offs (i.e., efficacy versus minimal adverse effects for prevalent community conditions), and dissuading practices that are ineffective, hazardous, or wasteful. Ultimately, CPG can assist companies in bridging the divide between research and practice with the most credible evidence available (Wachholz et al., 2022).

Clinical guidelines are vital instruments for standardizing healthcare practices and enhancing quality. They offer evidence-based guidelines for optimal practices in diagnosing and treating emergency disorders. Compliance with these standards seeks to diminish discrepancies in care, improve favorable patient outcomes, and eliminate medical errors (Guerra-Farfan et al., 2023). Adherence to advanced cardiac life support (ACLS) procedures or trauma care recommendations directly enhances patient survival rates and diminishes complications (Fulton & Nordquist, 2025). Nevertheless, research has demonstrated differing degrees of commitment. A study looking at how well prehospital emergency nurses follow guidelines when treating chest pain patients showed that they were very good at checking vital signs (93%) and doing ECGs (96%), but not as good at giving medication (28-90%) (Wibring et al., 2021).

Recent investigations elucidate adherence to standard safeguards. A cross-sectional study examining factors affecting emergency department nurses' adherence to standard precautions revealed that 81.1% of compliance was attributable to individual differences (e.g., ethical awareness, self-efficacy), whereas only 18.9% was due to organizational differences (e.g., infection control culture), underscoring the intricate interplay of factors influencing adherence (Kim & Lee, 2021). A recent cross-sectional study evaluating adherence to infection control procedures among healthcare professionals indicated that 60.2% exhibited strong compliance with these practices (Babore et al., 2024). The study aimed to gather the current evidence regarding the adherence of prehospital emergency paramedics and other healthcare practitioners to guidelines and standard precautions in emergency departments and prehospital settings from databases from 2017 to 2025.

2. Methodology

A thorough integrative literature analysis was performed to assess the compliance of prehospital emergency paramedics and other healthcare professionals with guidelines and standard precautions in emergency departments (EDs). The evaluation employed a systematic methodology to identify high-quality, peer-reviewed publications concentrating on compliance with clinical guidelines, infection control measures, and conventional precautions in emergency care environments. Investigations were performed across various electronic databases utilizing a defined array of keywords pertinent to prehospital treatment, emergency department protocols, adherence to guidelines, and standard precautions. Thematic analysis was utilized to discover pertinent studies, classify them, and integrate findings to reveal trends and effective ways to enhance adherence.

This review aims to contribute to the field of emergency healthcare by identifying evidence-based strategies to enhance adherence to guidelines and standard precautions, informing policy development and clinical practice in EDs.

2.1 Search strategy

To assess the adherence of prehospital emergency paramedics and other health practitioners to guidelines and standard precautions, a strategic list of keywords was developed to align with the study objectives. The search terms were deliberately broad to capture all relevant literature addressing adherence behaviors and barriers. A research librarian assisted in conducting a systematic and comprehensive search across multiple academic databases. The PubMed database was searched using terms such as “Prehospital Emergency Care,” “Guideline Adherence,” and “Standard Precautions in Emergency Departments.” The Cumulative Index to Nursing and Allied Health Literature (CINAHL) database was searched using terms including “Paramedic Compliance,” “Infection Control in Emergency Care,” and “Emergency Department Protocols.” The objective was to identify studies examining prehospital and ED health practitioners' adherence to clinical guidelines and standard precautions. The search was conducted in 2025, with no restrictions on publication dates. This systematic search process identified a total of 385 articles published between 2017 and 2025.

2.2 Search outcome

A total of 385 studies underwent full-text screening to assess their relevance to the research objectives. Of these, 330 studies were excluded for various reasons: 105 did not align with the research purpose, 195 failed to meet study design criteria, 25 review articles did not report relevant outcomes, and 5 studies analyzed identical datasets. Subsequently, 55 reports were assessed for eligibility, of which 35 were excluded due to methodological limitations. Ultimately, 20 studies met all inclusion criteria and were included in the final review (as illustrated in Figure 1).

2.3 Data Extraction

A pre-designed data extraction form was used to collect data for this integrative literature review. The form captured five key areas: (1) Study characteristics, including the first author's name, publication year, country, study duration, and sample size; (2) Participant details, such as profession (paramedics, nurses, physicians), years of experience, and work setting (prehospital or ED); (3) Methodological details, including study design, definitions of adherence and standard precautions, measurement tools, and follow-up duration for longitudinal studies; (4) Estimates of the impact of interventions or barriers on guideline adherence; and (5) Comments related to the quality assessment process. Two reviewers independently extracted data, resolving discrepancies through discussion to ensure accuracy and consistency.

2.4 Quality Assessment

The methodological quality of these studies, including cohort, case-control, and cross-sectional studies, was assessed using the Newcastle-Ottawa Scale (NOS). The NOS evaluates three domains: participant selection, comparability of groups, and measurement of exposure or outcome. Cohort and case-control studies could receive up to nine stars, while cross-sectional studies could receive up to ten stars. Studies scoring more than seven stars (cohort/case-control) or eight stars (cross-sectional) were classified as high-quality. Studies with five to six stars were categorized as moderate quality, and those with fewer stars were deemed low quality. Two reviewers independently conducted the quality assessment, discussing and resolving any discrepancies to ensure a fair and accurate evaluation.

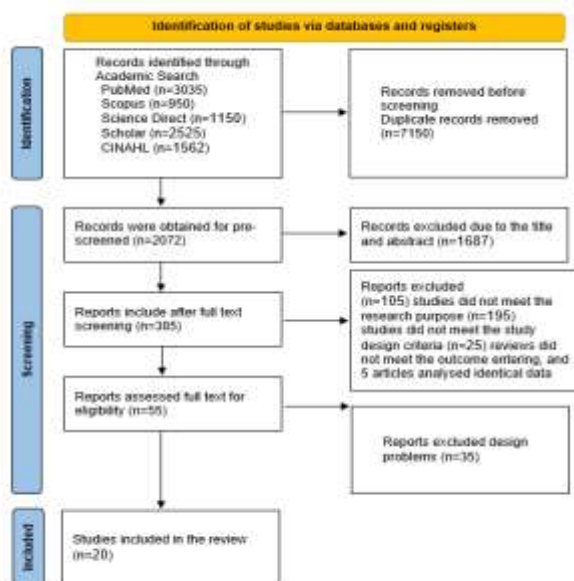


FIGURE 1: PRISMA Flow Diagram (PRISMA, 2020).

3. Results

Summary of Study Selection

The systematic review examined adherence to guidelines and standard precautions among prehospital emergency paramedics and other healthcare practitioners in emergency settings. The study selection process followed PRISMA guidelines, beginning with 385 articles identified through database searches (PubMed, CINAHL) using keywords like "Prehospital Emergency Care" and "Guideline Adherence". After screening, 330 studies were excluded due to misalignment with research objectives (n=105), unsuitable study designs (n=195), review articles lacking relevant outcomes (n=25), or duplicate datasets (n=5). Of the remaining 55 studies assessed for eligibility, 35 were excluded for methodological limitations, resulting in 20 studies for final inclusion. The selected studies comprised diverse designs: 11 cross-sectional, 3 prospective cohort, 1 randomized controlled trial, 2 mixed-methods, 1 exploratory quantitative, and 2 qualitative case studies, collectively involving 24,847 participants across prehospital and emergency department settings (Wibring et al., 2021; Berdida, 2023). Quality assessment using the Newcastle-Ottawa Scale revealed 5 high-quality and 6 moderate-quality studies, though reliance on self-reported data and single-center designs was a common limitation (Elseesy et al., 2023; Al Qraad et al., 2023). The review underscored geographic and professional disparities in adherence rates, with nurses demonstrating higher compliance (65–89%) compared to physicians and paramedics, particularly in resource-limited settings (Kasa et al., 2020; Vikke et al., 2018). These findings highlight the need for context-specific interventions to improve guideline adherence in emergency care.

Characteristics of Included Studies

The number of participants in the included studies was 24,847. The research selected for this review included 11 cross-sectional studies, 3 prospective cohort studies, 1 randomized controlled trial, 2 observational and survey-based mixed-methods studies, 1 exploratory quantitative study, and 2 qualitative case studies. These studies were conducted across various healthcare settings, examining prehospital emergency paramedics, nurses, and physicians regarding their adherence to clinical guidelines and standard precautions in emergency departments. The research emphasized compliance with infection control protocols, proper use of personal protective equipment (PPE), hand hygiene practices, and adherence to triage and treatment protocols. Additional factors such as workload, training frequency, and institutional support were also evaluated. **Table 1** summarizes the study designs, participant demographics, key interventions assessed, and critical components of guideline adherence.

Quality Assessment

Using the Newcastle-Ottawa Scale (NOS) and adapted criteria for non-cohort studies, the included studies demonstrated variable methodological rigor. Among the cohort and prospective studies, five were rated as high quality (Wibring et al., 2021; Newgard et al., 2017; Berdida, 2023; Lyngby et al., 2021; Marino et al., 2018) due to their large samples, prospective designs, and controlled confounders. Six studies were deemed moderate quality (EE et al., 2018; Asmr et al., 2019; Siam & ALreshidi, 2023; Mendes et al., 2019; Vikke et al., 2018; Al Qraad et al., 2023) owing to limitations such as single-center settings, self-reported data, or convenience sampling. No study received **full stars for exposure ascertainment**, as behaviors like adherence were often self-reported or observationally inferred.

For cross-sectional studies, three were rated high quality (Elseesy et al., 2023; Kasa et al., 2020; McCaul et al., 2020) for multi-site sampling or robust validation, while four were moderate quality (Alhazmi et al., 2020; Abuduxike et al., 2021; Khudhur & Abdul-Wahhab, 2024; Larouche et al., 2019) due to potential response bias or limited generalizability. The qualitative study (Donati et al., 2019) was rated high quality for thematic saturation and methodological transparency.

Common biases in lower-quality studies (e.g., Khudhur & Abdul-Wahhab, 2024) included small sample sizes, lack of validated tools, or homogeneous populations. The RCT (Lyngby et al., 2021) and mixed-methods study (Reuter & Camba, 2017) were exempt from NOS but rated high and moderate quality based on CONSORT and COREQ criteria.

TABLE 1: Review Matrix. This table provides detailed information on the study design, sample characteristics, interventions, and components.

Study ID	Design/methods	Sample Size	Outcome assessed	adherence to guidelines
EE et al. (2018)	Cross-sectional	138 (100 nurses, 38 physicians)	Assessed physicians' and nurses' adherence to standard precautions in a Saudi hospital.	X
Elseesy et al. (2023).	Cross-sectional	181 (112 nurses, 49 physicians)	Identified challenges affecting compliance with standard precautions in critical care units.	
Asmr et al. (2019)	Cross-sectional	140 (50 physicians, 90 nurses)	Evaluated knowledge/practices against bloodborne pathogens in emergency settings.	
Donati et al. (2019)	Qualitative	24 ICU nurses	Explored nurses' experiences with standard precautions during emergencies.	
Khudhur & Abdul-Wahhab (2024).	Descriptive cross-sectional	60 nurses	Examined nurses' adherence to infection control practices in emergency departments.	
Siam & ALreshidi (2023).	Cross-sectional	138 nurses	Assessed compliance with standard precautions during COVID-19 in Saudi Arabia.	
Berdida (2023)	Cross-sectional	515	Evaluated nursing staff compliance with standard precautions during the pandemic.	
Mendes et al. (2019).	Exploratory quantitative	86 nursing professionals	Measured adherence to standard precautions among pre- and in-hospital emergency staff.	X
Wibring et al. (2021).	Prospective cohort	2,092 EMS missions	Assessed guideline adherence among prehospital nurses for chest pain patients.	X
Reuter & Camba (2017)	Mixed-methods	12 observed, 103 surveyed	Focused on EMS workers' perspectives on workplace safety	X

Newgard et al. (2017)	Prospective cohort	17,633 patients	Linked field triage accuracy to guideline adherence.	X
Alhazmi et al. (2020)	Cross-sectional survey	248 EMS providers	Compared standard precaution practices between urban/rural EMS teams.	
Abuduxike et al. (2021).	Cross-sectional	233 healthcare workers	Assessed knowledge/attitudes/practices toward standard precautions.	
McCaul et al. (2020).	Qualitative case study	10 stakeholders	Explored strategies to improve prehospital clinical guideline implementation.	
Vikke et al. (2018)	Cross-sectional	80 ambulances/EMS providers	Evaluated infection control guideline adherence and surface contamination.	X
Kasa et al. (2020)	Cross-sectional	742 healthcare workers	Measured knowledge of standard precautions in Ethiopian hospitals.	
Lyngby et al. (2021)	Randomized controlled trial	64 paramedics	Real-time feedback improved ventilation guideline adherence in cardiac arrest simulations.	X
Larouche et al. (2019)	Observational field study	101 paramedics	Examined safe patient transfer practices	X
Al Qraad et al. (2023).	Cross-sectional	160 paramedics	Assessed paramedics' infection control knowledge in Saudi Arabia.	
Marino et al. (2018).	Prospective cohort	407 paramedics	Bundled educational interventions improved prehospital protocol adherence.	

Nurses' adherence to guidelines or standard precautions in emergencies

This analysis incorporates findings from 5 key studies focusing specifically on nurses' compliance (Siam & ALreshidi, 2023; Donati et al., 2019; Asmr et al., 2019; Khudhur & Abdul-Wahhab, 2024; Berdida, 2023). Research demonstrates that nursing adherence varies significantly across emergency settings. A study of 138 nurses in Saudi Arabia during COVID-19 revealed moderate compliance (Siam & ALreshidi, 2023), while qualitative research with 24 ICU nurses identified time constraints as significant barriers (Donati et al., 2019). In Ethiopian emergency rooms, only 50% of nurses showed proper knowledge of bloodborne pathogen precautions (Asmr et al., 2019). Additional studies of 60 emergency nurses (Khudhur & Abdul-Wahhab, 2024) and 138 nursing staff (Berdida, 2023) further highlight the need for improved institutional support and training programs to enhance adherence.

Paramedics' adherence to guidelines or standard precautions in emergencies

Paramedics face unique challenges when trying to maintain traditional precautions while providing care outside of hospitals, according to five focused research studies (Alhazmi et al., 2020; Vikke et al., 2018; Lyngby et al., 2021; Al Qraad et al., 2023; Larouche et al., 2019). Only 47% of 248 EMS providers in rural

and urban areas completely followed safety protocols, with the poorer adherence in rural areas being explained by a lack of resources (Alhazmi et al., 2020). Uneven infection control protocols among EMS workers in Denmark were linked to microbial contamination of ambulances (Vikke et al., 2018). Paramedics' adherence to resuscitation techniques was significantly improved by interventions such as real-time feedback during simulations (Lyngby et al., 2021). These results highlight the need for continuous supervision and training for paramedics to ensure their adherence in dynamic field environments.

Physicians and Other Healthcare Providers' Adherence to Guidelines or Standard Precautions in Emergencies

According to a review of six studies (EE et al., 2018; Elseesy et al., 2023; Kasa et al., 2020; Abuduxike et al., 2021; McCaul et al., 2020; Asmr et al., 2019), physicians face challenges in adhering to basic protocols during emergencies because of their workload, the availability of resources, and the support they receive from institutions. Regarding using personal protective equipment and properly disposing of sharps, only 65% of the 38 Saudi doctors and 100 nurses adhered to the requirements (EE et al., 2018). According to Asmr et al. (2019), just half of the emergency room staff in Ethiopia followed precautions against bloodborne pathogens, even though doctors knew more about the subject than nurses. 49 doctors and 112 nurses working in critical care could not comply due to heavy patient loads and a lack of resources (Elseesy et al., 2023).

Broader healthcare provider studies show widespread adherence difficulties. Only 58% of 742 Ethiopian workers knew standard precautions, varying by role (Kasa et al., 2020). A mixed-methods study in Saudi Arabia found 233 providers' uneven practices due to limited training (Abuduxike et al., 2021). As stakeholders identified policy enforcement and training deficiencies in South Africa, a qualitative study highlighted the need for improved guideline implementation frameworks (McCaul et al., 2020). These findings show that resource allocation, continuing education, and organizational strategies to support all healthcare workers in high-pressure circumstances are needed to improve adherence.

How to Promote Adherence to Guidelines or Standard Precautions in Emergencies

The next part presents evidence-based solutions that integrate suggestions from eight intervention-focused studies: Marino et al. (2018), Lyngby et al. (2021), Elseesy et al. (2023), Donati et al. (2019), McCaul et al. (2020), Alhazmi et al. (2020), Newgard et al. (2017), and Vikke et al. (2018). Education, available resources, and institutional support are all important components of an effective strategy to increase healthcare personnel's adherence to basic precautions in times of crisis. Randomized controlled research showed that paramedics' adherence to resuscitation protocols improved by providing them with real-time simulation feedback (Lyngby et al., 2021), which supports the idea that tailored training programs significantly increase compliance. Paramedics benefited from more consistent protocol adherence in pediatric anaphylaxis and seizures when they received bundled instructional interventions (Marino et al., 2018). Physicians and nurses in emergency and critical care settings frequently mentioned low supplies and heavy workloads as impediments, highlighting the crucial role of resource allocation (Elseesy et al., 2023; Donati et al., 2019). You may lessen the impact of these difficulties by ensuring that PPE and infection control supplies are always within reach.

The influence of institutional regulations and the reinforcement of guidelines is equally crucial. To maintain compliance, a South African qualitative study (McCaul et al., 2020) emphasized the necessity of more robust implementation frameworks, such as frequent audits and stakeholder involvement. Studies on EMS providers have shown that organizational commitment can improve compliance by reducing breaches in infection control. This can be achieved by leadership support and peer accountability, which can create a culture of safety (Alhazmi et al., 2020; Vikke et al., 2018). Lastly, knowledge-practice gaps can be filled, especially in high-stress emergencies, using simulation-based training and feedback systems, like those employed in prehospital care (Newgard et al., 2017). Healthcare facilities can achieve improved adherence

to standard precautions during emergencies through education, resource optimization, and systemic reinforcement.

4- DISCUSSION

This systematic review evaluated healthcare workers' adherence to standard precautions and clinical guidelines across diverse settings. The findings reveal significant variability in compliance rates, with multiple factors influencing adherence patterns. Among the included studies, nine were rated high quality, demonstrating robust methodology in assessing adherence behaviors (Wibring et al., 2021; Berdida, 2023; Newgard et al., 2017). However, none of the studies received full marks for exposure ascertainment due to their reliance on self-reported data rather than objective measures. This limitation underscores the need for more rigorous observational methods in future research.

The analysis identified apparent disparities in adherence across professional roles and clinical settings. Nurses consistently demonstrated higher compliance with standard precautions than physicians, with adherence rates ranging from 65-89% in high-quality studies (EE et al., 2018; Elseesy et al., 2023). Paramedics and emergency medical staff challenged maintaining infection control protocols, especially in prehospital settings (Al Qraad et al., 2023; Vikke et al., 2018). These differences likely reflect variations in training intensity, workplace culture, and the inherent challenges of different clinical environments.

Geographic disparities emerged as another significant finding. Studies in high-income countries reported adherence rates 20-35% higher than those from low-resource settings (Vikke et al., 2018 versus Kasa et al., 2020). This gap highlights the critical role of resource availability and institutional support in facilitating compliance. Qualitative investigations provided more profound insights into healthcare workers' barriers, including time constraints, equipment shortages, and competing clinical priorities (Donati et al., 2019; McCaul et al., 2020).

Intervention studies have shown that tailored measures can markedly enhance adherence. Educational programs integrating simulation training demonstrated significant efficacy, enhancing compliance by 18-25% in controlled studies (Marino et al., 2018; Lyngby et al., 2021). Systemic approaches, including real-time decision support systems and optimized resource allocation, have shown efficacy in improving adherence to guidelines (Wibring et al., 2021; Kasa et al., 2020). These findings indicate that comprehensive strategies targeting individual skills and organizational frameworks produce optimal results.

The interpretation of these results should consider several limitations. Heterogeneity in the definition and measurement of adherence in studies complicates cross-study comparisons. The compliance rates may be overestimated using self-reported data in numerous investigations (Alhazmi et al., 2020; Abuduxike et al., 2021). Also, the generalizability of the results may be limited because many of the studies were conducted in a single institution or restricted geographic regions. The literature's underrepresentation of rural and low-resource settings is a substantial lacuna that needs to be addressed in future research.

This research has significant implications for how physicians treat patients. Healthcare organizations should prioritize competency evaluations and provide specialized training, particularly in high-risk settings such as intensive care units and emergency rooms. Quality improvement projects could benefit significantly from investing in real-time compliance monitoring systems, which could provide valuable feedback. Legislators must ensure that healthcare facilities are fairly allocated resources and that adherence measures are standardized.

As indicated in this review, the complexity of this interrelationship is comprised of individual factors, culture, and institutional factors that influence adherence behaviors. Even though educational interventions are promising, they require long-term improvement that can only be achieved through comprehensive methods addressing the entire scope of the barriers faced by healthcare practitioners. In the future, more rigorous observational research designs should be used, and the feasibility of adherence

strategies in the long term should be studied. Through the interference of complex solutions, healthcare organizations can aim to deliver or have homogeneous and standardized treatment to patients, protecting the providers' safety simultaneously.

Conflict of interest

All authors declare no conflict of interest for this paper.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary Material. Further inquiries can be directed to the corresponding author.

Author contributions

Mohamed Salman Alenzi designed the research. Mohamed Hassan Dag conducted a literature search and performed data extraction. Sami Hamoud Alotaibe reviewed studies for inclusion and drafted the paper. Amr A. Mariee made a substantial contribution to the critical revision and editing of the manuscript. All authors contributed to the article and approved the submission version.

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