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RESEARCH ARTICLE

Evaluation of the Role of Selective Digestive Tract Decontamination in prevention of Ventilator Associated Pneumonia in Intensive Care Unit Patients.

Dr.Mohamed Zaki Shaaban Youssef Acting consultant Anesthesia Dubai Academic Health Corporation Hatta Hospital.

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6. Antimicrobial Therapy
7. Polymyxin E
8. Tobramycin
9. Nystatin
10. Gram-Negative Bacteria
11. Fungal Infections
12. Infection Control Measures
13. Mortality Rates
14. Morbidity
15. Clinical Outcomes
16. Arterial Blood Gases (ABG)
17. Chest X-ray Opacifications
18. Leukocytic Count
19. Body Temperature
20. Heart Rate
21. Mean Arterial Blood Pressure (mABP)
22. Central Venous Pressure (CVP)
23. pH Levels
24. Weaning from Mechanical Ventilation
25. Randomized Controlled Trial (RCT)
26. Antibiotic Resistance
27. Healthcare-Associated Infections
28. Prophylactic Antibiotics
29. Clinical Diagnosis
30. Microbiologic Analysis

Abstract

Ventilator-associated pneumonia (VAP) is a significant nosocomial infection in critically ill patients, contributing to increased morbidity, mortality, and healthcare costs. The incidence of VAP in intensive care units (ICUs) ranges from 7% to 40%, with mortality rates potentially exceeding 50%[1]. Recent studies highlight that VAP affects approximately 27% of all critically ill patients, with 86% of these infections associated with mechanical ventilation. The attributable mortality of VAP varies, with some studies reporting an increase in mortality of up to 27%[3]. Pathogens such as *Pseudomonas aeruginosa*, *Acinetobacter*, and *Stenotrophomonas maltophilia* are linked to higher mortality rates[4]. Beyond mortality, VAP significantly extends ICU length of stay and increases healthcare costs[5].
The gastrointestinal tract plays a crucial role in VAP pathogenesis, as it often becomes colonized with Gram-negative bacteria during critical illness[6]. Interventions such as selective decontamination of the digestive tract (SDD), stress ulcer prophylaxis with sucralfate, and enteral feeding strategies are employed to reduce VAP incidence. While SDD has been shown to decrease VAP incidence and may positively impact mortality, it also poses a risk of promoting Gram-positive bacterial infections. SDD involves the use of non-absorbable antibiotics applied topically to the oropharynx and through a nasogastric tube, often supplemented with systemic antibiotics during the initial days of ICU admission.

Corresponding Author:- Dr.Mohamed Zaki Shaaban Youssef Acting consultant Anesthesia Dubai Academic Health Corporation Hatta Hospital.

Recent guidelines and systematic reviews continue to emphasize the importance of accurate VAP diagnosis and effective antimicrobial therapy to improve patient outcomes and reduce healthcare burdens.

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Introduction:-

Ventilator-Associated Pneumonia (VAP)

Ventilator-associated pneumonia (VAP) is defined as pneumonia occurring more than 48 hours after intubation and mechanical ventilation. Diagnosing VAP requires high clinical suspicion, bedside examination, radiographic examination, and microbiologic analysis of respiratory secretions.

Diagnosis

Clinical diagnosis of VAP involves identifying new or progressive infiltrates on chest radiographs, leukocytosis, and purulent tracheobronchial secretions. However, clinical criteria alone have limited diagnostic value. Radiologic diagnosis using portable chest radiographs is mandatory but has issues with sensitivity and specificity. Microbiologic diagnosis involves blood and pleural fluid cultures, nonquantitative or semiquantitative airway sampling, and quantitative cultures of airway specimens.

Treatment

Effective treatment of VAP involves early and appropriate antimicrobial therapy. Empirical therapy should be based on local resistance patterns and adjusted based on culture results. Antibiotic management includes de-escalation therapy, truncated courses of antibiotics, and consideration of patient-specific pharmacokinetics and pharmacodynamics.

Prevention

Preventive measures focus on reducing colonization and aspiration. Strategies include noninvasive mechanical ventilation, oral intubation, minimizing the duration of mechanical ventilation, maintaining endotracheal cuff pressure, and using selective decontamination of the digestive tract (SDD). Other measures include proper hand hygiene, avoiding unnecessary ventilator circuit changes, and using heat and moisture exchangers.

Gastrointestinal Tract and VAP

The gastrointestinal (GI) tract plays a crucial role in VAP pathogenesis. During critical illness, the stomach often becomes colonized with Gram-negative bacteria, which can lead to retrograde colonization of the oropharynx and subsequent aspiration into the lower respiratory tract. Preventive measures include stress ulcer prophylaxis with agents that do not increase gastric pH, such as sucralfate, and enteral feeding strategies that reduce the risk of aspiration.

Selective Decontamination of the Digestive Tract (SDD)

SDD involves the use of topical nonabsorbent antibiotics to decontaminate the oropharynx and GI tract, supplemented by a short course of systemic antibiotics. This approach aims to reduce the incidence of VAP and other infections by eliminating potentially pathogenic microorganisms from the digestive tract.

Pharmacological Agents

- **Nystatin**: An antifungal drug used to treat Candida infections. It is not absorbed through mucocutaneous membranes, making it safe for oral and topical use.
- **Colistin**: An antibiotic effective against Gram-negative bacilli, used as a last resort for multidrug-resistant infections. It is available in different forms, including colistin sulfate and colistimethate sodium.
- **Tobramycin**: An aminoglycoside antibiotic used to treat serious infections caused by Gram-negative bacteria. It is administered via injection, inhalation, or ophthalmic preparations.

PATIENTS AND METHODS

This prospective randomized study was conducted in the Intensive Care Unit of Ain Shams University hospitals. The study included 500 adult patients who were mechanically ventilated for more than 48 hours. Patients were randomly divided into two groups: Group A (SDD group, n=250) and Group B (control group, n=250). Standard infection control measures were applied to all patients. Group A received selective digestive decontamination (SDD) with oral polymyxin E, tobramycin, and nystatin, along with an initial course of IV antimicrobials. Group B received IV antimicrobials based on culture and sensitivity. Monitoring included vital signs, arterial blood gases, ECG, chest X-ray, and selective cultures. Data were collected on treatment efficiency, causative organisms, duration of mechanical ventilation, ICU length of stay, mortality, and complications.

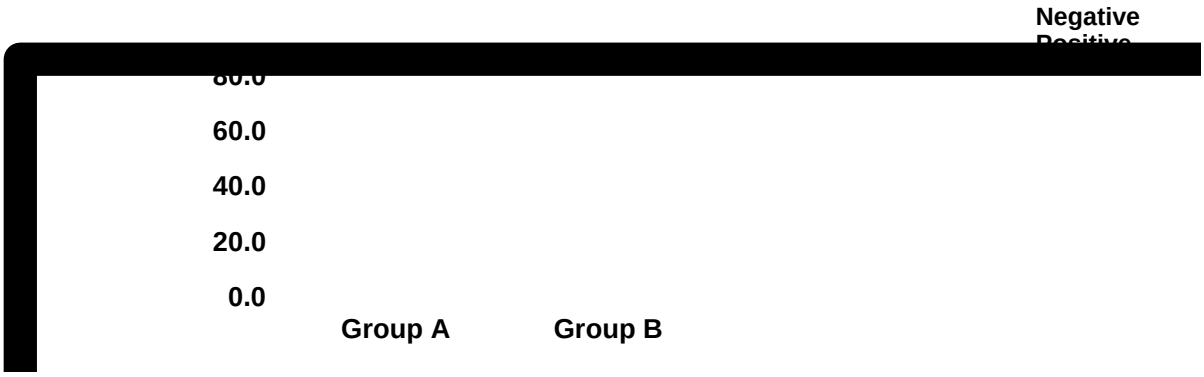
RESULTS

Main Findings:

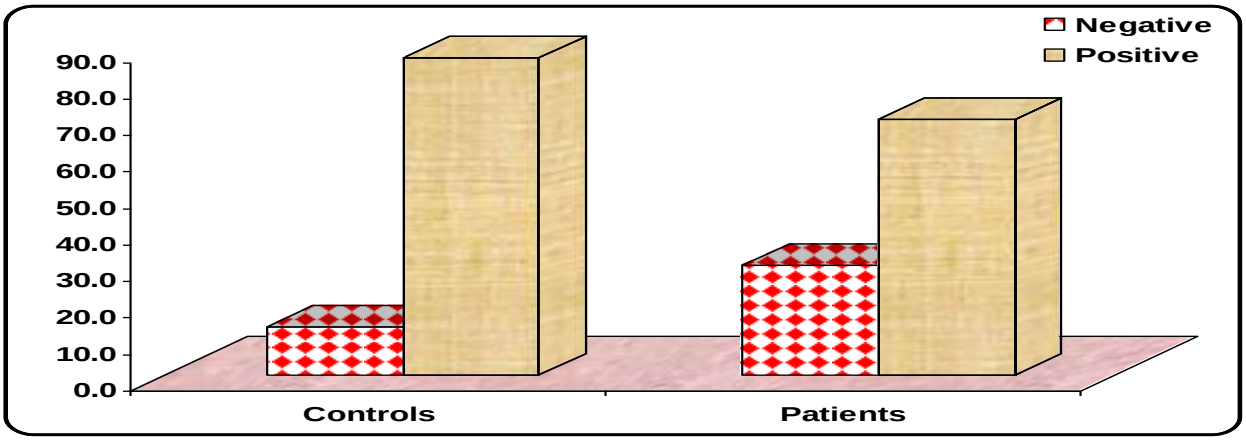
1. Infection rates were significantly lower in Group A (36%) compared to Group B (65.6%).
2. Chest X-ray opacifications were significantly lower in Group A (23.2%) compared to Group B (40%).
3. Total leukocytic count was significantly lower in Group A.
4. Elevated body temperature was significantly lower in Group A (70%) compared to Group B (86.8%).
5. Heart rate and mean arterial blood pressure were better controlled in Group A.
6. Central venous pressure was better maintained in Group A.

7. pH levels were more stable in Group A.
8. Weaning from mechanical ventilation was more successful in Group A (74%) compared to Group B (65.6%).
9. Mortality rates were not significantly different between the groups.

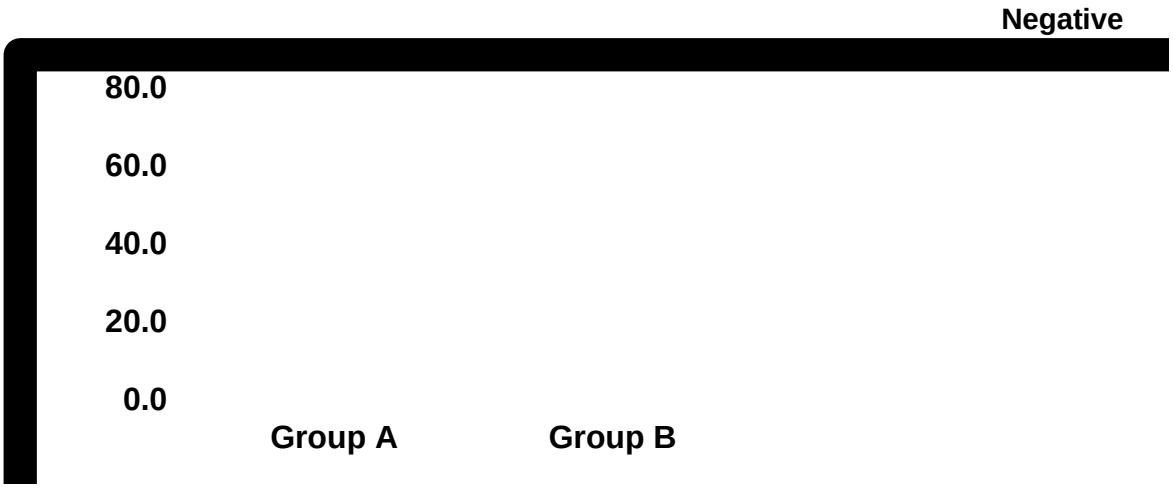
Infection rate comparison



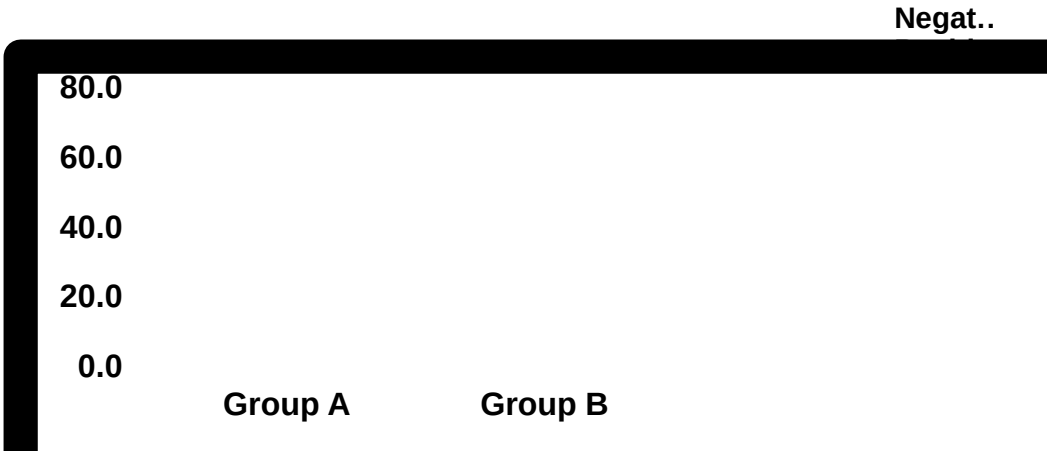
Chest X-ray opacification comparison



Elevated Body Temperature Comparison



Successful Weaning Comparison



Mortality Rate Comparison

DISCUSSION

Despite continuous infection control measures in ICUs, pneumonia incidence in mechanically ventilated patients remains high. Our study shows that selective digestive decontamination (SDD) significantly reduces infection rates and improves clinical outcomes such as chest X-ray opacifications, leukocytic count, body temperature, heart rate, mean arterial blood pressure, central venous pressure, and pH levels. However, mortality rates did not differ significantly between the groups.

The reduction in infection rates can be attributed to the effectiveness of SDD in eradicating Gram-negative bacteria and fungi while maintaining anaerobic flora. These findings align with previous studies demonstrating the benefits of SDD in reducing nosocomial infections and improving patient outcomes.

Further research is needed to explore the long-term effects of SDD and its impact on antimicrobial resistance.

CONCLUSION

Nosocomial pneumonia is a significant cause of mortality and morbidity in ICU patients. Selective digestive decontamination (SDD) effectively reduces infection rates and improves clinical outcomes in mechanically ventilated patients without significantly affecting mortality rates. Implementing SDD as part of standard ICU care can enhance patient outcomes and reduce healthcare-associated infections.

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