

# Comparison of 0.2% Chlorhexidine Mouthwash with 1% Povidone Iodine in Preventing the Incidence of Early Ventilator Acquired Pneumonia in the Intensive Care Unit of RSUP Haji Adam Malik Medan

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## Abstract

**Background:** Intensive Care Unit (ICU) is a ward that is prone to nosocomial infections. Mechanical ventilation (MV) support is often required by 10-20% of patients admitted to the ICU, where there is always a risk of developed Ventilator-Acquired Pneumonia (VAP). Poor oral hygiene can lead to bacterial colonization of the oropharynx and aspiration of oropharyngeal secretions into the lower respiratory tract is a major factor in the occurrence of VAP. In addition, VAP is an important cause of morbidity, increased use of health resources, increased length of ICU stay and costs. Therefore, since 2003, various efforts have been made to reduce the incidence of VAP in the ICU, one of which is the use of antiseptic mouthwash which is expected to reduce the incidence of VAP.

**Objective:** Obtain the results of chlorhexidine 0,2% mouthwash compared to povidone iodine 1% mouthwash in preventing the incidence of Early VAP in RSUP Haji Adam Malik Medan.

**Methods:** The research design is randomized clinical trial with a single blind method. After obtaining approval from the Ethics Committee of the Faculty of Medicine, Universitas Sumatera Utara, Medan, 40 research samples were collected which, after fulfilling the inclusion criteria, were randomly divided into 2 groups. Group A received chlorhexidine 0,2% and group B received povidone iodine 1%. The research data obtained were tested using SPSS.

**Results:** CPIS value < 6 at 48 hours was higher in the 0.2% chlorhexidine group than the 1% povidone iodine group, but not statistically significant (p = 0.170). The most common distribution of germs found were *Acinetobacter baumannii* and *Pseudomonas aeruginosa*.

**Conclusion:** The incidence of Early VAP appeared to be less in the group receiving 0.2% chlorhexidine mouthwash compared to the 1% povidone iodine group but not statistically significant. In the 0.2% chlorhexidine group, the incidence of Early VAP was 22.5%. In the 1% povidone iodine group, the incidence of Early VAP was 32.5%. The distribution of germs obtained from the culture results shows that *Acinetobacter baumannii* and *Pseudomonas aeruginosa* are still the main causes of VAP in the ICU of Haji Adam Malik General Hospital Medan.

**Keywords:** ICU, MV support, Early VAP, chlorhexidine 0.2%, povidone iodine 1%

## I. INTRODUCTION

The Intensive Care Unit (ICU) is a treatment room where nosocomial infections and antibiotic resistance often occur. Many patients experience decreased immunity caused by acute and severe disease, which is often due to immunodeficiency or severe comorbidities and most require invasive procedures. Mechanical ventilation (MV) support is often required by 10-20% of patients treated in the ICU which is an invasive procedure. The use of MV support aims to replace the ventilation function in patients with respiratory problems or other critical illnesses. As a result, ICU patients with MV support are very susceptible to infection, where the most common infection that occurs in the ICU is Ventilator-Acquired Pneumonia (VAP).<sup>1,2</sup>

Mechanical ventilation (MV) support is often required by 10-20% of patients admitted to the ICU, which may also result from respiratory distress or other indications where there is always a risk of developing pneumonia in these patients. The use of MV support aims to replace the ventilation function in patients with respiratory problems or other critical illnesses. VAP was defined as pneumonia occurring in patients who underwent tracheostomy or endotracheal intubation within 48 hours before the onset of infection, including the weaning period. VAP itself is divided into 2 based on its onset, namely Early VAP (<5 days) and Late VAP

( $\geq 5$  days). VAP itself can be diagnosed using the Clinical Pulmonary Infection Score (CPIS) which has six parameters including fever, blood leukocytes, tracheal secretions, PaO<sub>2</sub>/FiO<sub>2</sub>, chest radiology, and tracheal aspirate culture with a score  $> 5$  associated with the incidence of VAP with 89% sensitivity and 47% specificity.<sup>3,4</sup>

Aspiration of oropharyngeal secretions into the lower respiratory tract is a major factor in the occurrence of VAP. In addition, poor oral hygiene can result in bacterial colonization of the oropharynx. Oral bacterial colonization results from the accumulation of debris in the oral cavity. Adequate salivary flow is an important factor for maintaining oral health through the use of antimicrobials and lubricants. However, in intubated patients, continuously opening the mouth and using drugs such as antihypertensives, anticholinergics, antipsychotics, and diuretics predispose to decreased salivary immune factors. In addition, the use of an endotracheal tube can hinder a thorough examination of the oral cavity and hinder access to oral care.<sup>3,5</sup>

In the United States, pneumonia nosocomial (31%) is the most common healthcare-associated infections (HAIs), followed by urinary tract infection (UTI, 23%) and primary stream infection (BSI, 14%). Of all patients with pneumonia nosocomial, 83% associated with the use of MV support. There is some data which states that the prevalence of VAP is around 9-27% with a mortality rate of 30-70%. This high number is influenced by the patient population, the causative organism, and the length of time MV support has been used. The incidence of VAP in Indonesia itself varies in various regions. Data from the National Central General Hospital dr. Cipto Mangunkusumo (RSCM) in Jakarta found an increase in the incidence of VAP, which was 21.2% in July 2014 and the lowest was in September 2014, which was 5.53%. In addition, research conducted at Margono Hospital in 2015 also found a 15% incidence of VAP.<sup>1,4</sup>

Based on the type of case, the severity of the disease, the microorganisms involved, and the appropriate management of the infection, the mortality rate for patients with VAP can exceed 50%. In addition, VAP is an important cause of morbidity, increased use of health resources, increased length of ICU stay, and increased costs. Thus, the prevention of this disease is a priority in quality improvement programs in the ICU and many efforts have been made to explain the benefits of prevention efforts implemented in the ICU.<sup>5,6</sup>

Since 2003, various efforts have been made to reduce the incidence of VAP in the ICU, one of which is the use of antiseptic mouthwash which is expected to reduce the incidence of VAP. Many investigators believe that most pneumonia occurs due to aspiration of oral microorganisms, where by reducing colonization in the oropharynx using antibiotics or antiseptics can prevent the occurrence of VAP. Both chlorhexidine and povidone iodine have been suggested as strong antiseptic drugs against oral bacteria, but studies aimed at determining which drug is more effective, optimum concentration, frequency of use, and the intended patient have not shown satisfactory results.<sup>3,7</sup>

There are various studies which show that there is a strong correlation between bacteria that colonize the oropharynx and the incidence of VAP in patients with MV support. Research by Gupta (2014) and Li (2015) in patients with MV support in the ICU who were given povidone-iodine and chlorhexidine found that oral hygiene with chlorhexidine was superior to povidone iodine but not statistically significant.<sup>7</sup>

From the results of observations in the ICU of the Central General Hospital (RSUP) Haji Adam Malik Medan, until now Listerine mouthwash is still used for oral hygiene and does not use chlorhexidine or povidone iodine. Based on these findings, we are interested in conducting a study using chlorhexidine and povidone iodine mouthwash for oral hygiene to prevent the occurrence of Early VAP in the ICU of Haji Adam Malik General Hospital Medan.

## II. METHOD

This research is a type of randomized clinical trial with a single blind method. This design is a design that groups patients into certain groups that receive different treatments based on group division. The research was conducted at the Intensive Care Unit of Haji Adam Malik General Hospital Medan after obtaining ethical clearance from the Faculty of Medicine of North Sumatra and RSUP Haji Adam Malik Medan as well as a research permit from RSUP Haji Adam Malik Medan. This research was started after the issuance of ethical clearance and research permit from the ethics committee of the USU Human Rights Hospital-FK Hospital. The population is all patients undergoing treatment with MV support in the Intensive Care Unit room at Haji Adam Malik General Hospital Medan. The sample of this study was the study population that met the inclusion and exclusion criteria. Research subjects were taken with consecutive sampling techniques until the number of research subjects was fulfilled. After obtaining approval from the ethics committee, based on the inclusion and exclusion criteria, 40 samples were obtained. The sample received an explanation of the procedure to be followed and stated their willingness in writing in the informed consent form. Data analysis was carried out using a computer program, namely SPSS 25 (Statistical Package for Social Science). Demographic data are arranged in a frequency distribution table. The data is considered significant if the p value  $< 0.05$ .

## III. RESULTS

This study was followed by 40 subjects who were divided into two groups with the same number of 20 samples each where group A received 0.2% chlorhexidine mouthwash and group B received 1% povidone iodine mouthwash.

### 3.1 Sample Characteristics

	Chlorhexidine		Povidone Iodine		p-value
	N	%	N	%	
Age					
18-30	3	7.5	2	5	0,563
31-43	5	12.5	2	5	
44-60	12	30	16	40	
Gender					
Male	11	27.5	11	27.5	0,624
Female	9	22.5	9	22.5	

\*Chi Square \*\*Fisher Exact Test

Demographic characteristics in this study include age and gender. Table 3.1 shows that there were 3 samples for chlorhexidine users in the 18-30 year age group, 5 samples in the 31-43 year age group and 12 samples in the 44-60 year age group, while for povidone iodine users there were 2 samples in the 18 age group. -30 years, 2 samples in the age group 31-43 years and 16 samples in the age group 44-60 years. The distribution of respondents according to gender in respondents using chlorhexidine and povidone iodine mouthwash showed the same data where the number of chlorhexidine users who were male was 11 samples while those who were female were 9 samples. Analysis of the relationship between age groups and use of mouthwash showed a p value of 0.563, while analysis of the relationship between gender and use of mouthwash showed a p value of 0.624. This shows that there is no significant difference in age and gender groups in the current study.

### 3.2 CPIS value at 48 hours

CPIS	Chlorhexidine		Povidone Iodine		p-value*
	N	%	N	%	
<6	11	27.5	7	17.5	0,170
≥6	9	22.5	13	32.5	
Total	20	50	20	50	

In both treatment groups, the 48-hour CPIS value was measured and the results obtained can be seen in table 3.2, namely 11 samples with CPIS <6 and 9 CPIS ≥6 in the chlorhexidine group. CPIS < 6 was 7 and CPIS ≥ 6 was 13 in the povidone iodine group. Assessment of the relationship between the 48-hour CPIS value and the use of mouthwash was carried out using the chi square test (p = 0.170). From these results it can be concluded that the CPIS value < 6 at 48 hours in the chlorhexidine group was higher than the povidone iodine group but not statistically significant.

### 3.3 Distribution of Germs

	Chlorhexidine	Povidone Iodine	Total
	n(%)	n(%)	N(%)
<i>Candida albicans</i>	1(2.5)	2 (5)	3 (7.5)
<i>Acinetobacter baumannii</i>	<b>2 (5)</b>	<b>5 (12.5)</b>	<b>7 (17.5)</b>
<i>Pseudomonas aeruginosa</i>	4 (10)	2 (5)	6 (15)
<i>Rothia mucilaginosa</i>	1 (2.5)	0 (0)	1 (2.5)
<i>Proteus mirabilis</i>	1 (2.5)	0 (0)	1 (2.5)
<i>Staphylococcus aureus</i>	2 (5)	1 (2.5)	3 (7.5)
<i>Staphylococcus epidermidis</i>	0 (0)	2 (5)	2 (5)
<i>Klebsiella sp.</i>	3 (7.5)	2 (5)	5 (12.5)
<i>Stenotrophomonas maltophilia</i>	1 (2.5)	1 (2.5)	2 (5)
<i>Candida glabrata</i>	1 (2.5)	0 (0)	1 (2.5)
<i>Escherichia coli</i>	0 (0)	3 (7.5)	3 (7.5)

<i>Citrobacter freundii</i>	0 (0)	1 (2.5)	1 (2.5)
Tidak ada pertumbuhan	4 (10)	1 (2.5)	5 (12.5)
Total	20 (50)	20 (50)	40 (100)

In table 3.3, the most germ data obtained was obtained by *Acinetobacter baumannii* as many as 7 (17.5%) overall. In the chlorhexidine group, the most germs were found, namely *Pseudomonas aeruginosa* 4 (10%) and in the povidone iodine group, the most germs were *Acinetobacter baumannii* (12.5%). The absence of bacterial growth in culture was found in 4 (10%) samples in the chlorhexidine group, whereas only 1 (2.5%) sample in the povidone iodine group.

#### IV. CONCLUSION

From this research it can be concluded that:

1. There were more CPIS values < 6 in the chlorhexidine group than in the povidone iodine group but this was not statistically significant either at T0, T1, T2, or T3.
2. Mortality on day 5 was higher in the povidone iodine group than in the chlorhexidine group but not statistically significant.
3. The distribution of germs obtained from the culture results shows that *Acinetobacter baumannii* and *Pseudomonas aeruginosa* are still the main causes of VAP in the ICU of Haji Adam Malik General Hospital Medan.

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