# Growth Changes of Mouth Germs after Implementation of Oral Hygiene Actions

Hamzah, Arie Utariani, Kohar Hari Santoso, Christrijogo Sumartono, Soni Sunarso, Sulistiawan, Alsep Dolfi Luntungan
*Department of Anesthesiology and Reanimation, Faculty of Medicine, Universitas Airlangga, Indonesia*

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Abstract: Implementation of the oral hygiene according to procedures can reduce the growth of oral germs. The aim of this study was to determine the growth changes of oral germ after the implementation of oral hygiene. The subjects were all severe head injury patients who performed oral hygiene action in Intensive Observation Room of Dr. Soetomo General Hospital Surabaya from June 1st to July 31st 2014. Samples were taken before and after the action of oral hygiene and then the culture of bacteria were examined against 13 patients during the period. Furthermore, a statistical analysis was performed with paired t-test to determine the amount of germs and McNemar test was used to determine the germs, before and after the oral hygiene action. In 13 patients, the amount of germs were decreased and no amount of germs after the implementation of oral hygiene action. The result of data analysis with paired sample t-test showed a significant result ($p = 0.001$). The conclusion of this study was decreased of the germ's number and no amount of germs after the implementation of oral hygiene action.

## 1 INTRODUCTION

Oral hygiene is defined as those measures that are necessary to attain and maintain oral health including practices required to cleanse teeth, the periodontal tissues and the mouth in general, and contribute to a state of cleanliness in the oral cavity (Stallard et al, 1982). Poor maintenance of oral and dental hygiene were associated with some dissease including caries and respiratory dissease (Azarpazhooh et al, 2006; Marsh, 2009). There are various microorganisms in the oral cavity although it is commensal, it can be pathogenic when the host response is disrupted (Casadevall et al, 2000). Controlling homeostasis of microbe that formed in dental plaque is very important to prevent infection. Preservation of dental plaque pH to normal level can be achieved by the suppression of sugar catabolism and acid production by the use of metabolic inhibitors in oral care products, the consumption of non-fermentable sweeteners in snacks, the stimulation of saliva flow, therefore maintaining microbial homeostasis (Marsh, 2009). Use of chlorhexidine as oral rinse solution was recommended among other solution, because it has potent antimicrobial activity including gram-negative bacteria (Berry et al, 2007).

Traumatic brain injury (TBI) is a major cause of death and disability in the United States, which contribute to about 30% of all injury deaths. TBI is caused by a bump, blow, or jolt to the head that disrupts the normal function of the brain, with severity range from mild to severe (Taylor et al, 2017). Based on medical record in Dr. Soetomo General Hospital Surabaya, there were 1,588 to 2,005 people with head injury every year, 195 to 467 patients among themwere severe brain injury (Glasgow Coma Scale $\leq$8). The mortality rate for all severity of brain injury varies from 6.17% to 11.22%. It was found that the percentage of head injury patients ranged from 10-20% in the resuscitation room. This means almost have one patient with head injury every 5 patients in the resuscitation room, as well as in intensive observation room (IOR) (Wahyuhadi et al, 2007). Patients with head injury may experience various nursing problems including impaired consciousness, impaired physical mobility, and swallowing disorders. Patients with severe head injury will experience a decrease in consciousness which the patient will cause food swallowing disorders through the mouth, and this could cause the inflammation of the mucous membranes (Maas et al, 2008; AANS, 2016).



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Based on the facts and data mentioned above, the researchers aimed to conduct a research on the growth changes of oral germ after the implementation of oral hygiene action in patients with severe head injury in IOR unit of Dr. Soetomo General Hospital Surabaya.

## 2 METHODS

The study was a prospective observational longitudinal study to analyze changes in oral germgrowth before and after oral hygiene action in 13 patients with severe head injury. Sampling was conducted at IOR of Dr. Soetomo General Hospital Surabaya during June 1st to July 31st, 2014. The inclusion criteria were patients with severe head injury (GCS $\leq$8) treated for 1-2 days, aged 14-70 years, and patients were examined before and after oral hygiene action. Data collecting process were done after consent given to family of the patient. Samples of germs collected, using swab, for culture from the mouth of patients with a severe head injury before and after oral hygiene action with intervals of 12 hours. Specimen then diluted, followed by inoculation into isolation medium then incubation of aerobic & anaerobic (37 ° C, for 18-24 hours) was conducted. After the growth of germ found, then we counted the colony and continued with the identification of the germ.Furthermore, a statistical analysis was performed using paired t-test to determine the number of germs and Mc Nemar test to determine the types of germs, before and after the oral hygiene action.

## 3 RESULTS

Table 1: Characteristic of sample.

| Characteristics | Result (n=13) |
|---|---|
| Sex | |
| male | 9 (69.2%) |
| female | 4 (30.8%) |
| Age | |
| range | max= 62y.o; min= 14y.o |
| mean (SD) | 35.00 ($\pm$ 17.176) |
| Glasgow Coma Scale | |
| 1X1 | 3 (23.1%) |
| 1X3 | 2 (15.4%) |
| 1X4 | 1 (7.7%) |
| 2X3 | 4 (30.8%) |
| 2X4 | 3 (23.1%) |

(reference: internal data research)

Most of the sample in this study were male (69.2%), with age varies from 14 to 62 y.o. Degree of consciousness of the sample, based on Glasgow Coma Scale, were mostly 2X3 (n=4). Verbal aspect of consciousness could not be evaluate because all of sample were using endotracheal intubation.

Table 2 showed the result of data analyze with paired sample t test which obtained a significant result (p = 0.001). Thus, there were significant differences in the number of germs before and after the implementation of oral hygiene action. After those germ identified, *Klebsiella pneumonia* were found in 6 patients (46.2%). This ammount then reduced to 1 patient, after intervention of oral hygiene were done. Other species that found before oral hygiene were *Proteus mirabilis, Pseudomonas aeruginosa, Staphylococcus aureus, Streptococcus viridans*. After taking oral hygiene procedure, no germ were found in 11 patients. Germ still found on 2 patients after oral hygiene, which identified as *Proteus mirabilis* and *Klebsiella pneumoniae.*

Table 2: The number and types of germ before and after Oral Hygiene.

| | Mean | N | SD | P |
|---|---|---|---|---|
| Pre Oral Hygiene | 11.6154 | 13 | 9.41221 | 0.001 |
| Post Oral Hygiene | 2308 | 13 | 59914 | |

*significant (p<0.05)

| Types of germs | Before OH | After OH |
|---|---|---|
| | Frequency (%) | Frequency (%) |
| *Klebsiella pneumoniae* (Rod gram -) | 6 (46.2 %) | 1 (7.7%) |
| *Proteus mirabilis* (Rod gram -) | 1 (7.7%) | 1 (7.7%) |
| *Pseudomonas aeruginosa* (Rod gram -) | 2 (15.4%) | - |
| *Staphylococcus aureus* (Coccus gram +) | 2 (15.4%) | - |
| *Streptococcus viridans* (Coccus gram +) | 1 (7.7%) | - |
| Nothing | 1 (7.7%) | 11 (84.6%) |
| Total | 13 (100%) | 13 (100%) |

(reference: internal data research)

# 4 DISCUSSION

Dental plaque is an example of a biofilm which naturally presents and supports the host in its defense against invading microbes. The microbial composition of dental plaque is diverse and remains relatively stable over time (microbial homeostasis). But under some circumstance, this microbial homeostasis is disrupted, which leads to development of unfavorable microorganism (Marsh, 2009). Severe head injury cause decreased consciousness thus also decrease swallowing reflex. It may leads to excessive saliva and increases plaque formation of germs in the oral cavity, which can be source of infection if it left untreated (Wahyuhadi et al, 2017; Maas et al, 2008; AANS, 2016). Thus oral hygiene is needed to control microbialcolonization.

As shown in Table 2, there was a significant change in oral germ growth ($p = 0.001$), prior to the oral hygiene action and after the oral hygiene. Implementation of oral hygiene action used chlorhexidine 0.2%, which was a bisbiguanide-class antiseptic. Chlorhexidine has bactericidal and bacteriostatic effect on gram(+)bacteria and gram(-) bacteria. It induce death of bacteria by causing cell leakage and coagulation of intracellular compound. It also can eliminate protozoa and virus in the oral cavity. Positive charge or cation of Chlorhexidine permeates to the tooth tissue, the acidic protein covering the teeth, the oral mucosa, and the salivary protein. The antiseptic absorbed by the tooth surface has an anti-bacterial effect. Chlorhexidine can significantly reduce the amount of plaque that formed on tooth surfaces and reduced the number of bacteria present in saliva (Sekino et al, 2004).

Other studies showed that patients with susceptible age from 35 to 67 years who usedchlorhexidine on the implementation of oral hygiene action could decrease the amount of colonization of oral bacteria and decreased the incidence of nosocomial infection (Fourrier et al, 2010). The provision of chlorhexidine 0.2% as an antiseptic on the implementation of oral hygiene action every 12 hours can prevent the formation of biofilms from bacteria thus it decreases the incidence of infection (Panchabhai et al, 2009). The use of chlorhexidine 0.2% also found to significantly reduces ventilator-associated pneumonia incidence (Tantipong et al, 2008).

# 5 CONCLUSION

There was a change in the number of germs before and after the oral hygiene action. Statistical test results (paired sample t-test) showed significant differences ($p = 0.001$) between the number of germs before and after the implementation of oral hygiene action. In addition to decrease of number of germs growth, most patients show no identifiable germs on culture media, after taking oral hygiene procedure

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