



## IMPACT OF ORAL HYGIENE INTERVENTIONS ON STROKE PATIENTS: RAPID REVIEW

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## ABSTRACT

**Background:** Stroke can occur when there is an obstruction to the blood supply to the brain or when there is bleeding in a blood vessel in the brain. Stroke results in decreased neurological function, with clinical consequences depending on the degree of neurological damage. Post-stroke health problems may be exacerbated by poor oral hygiene. Poor oral hygiene results in the accumulation of bacteria in the oral cavity which allows these bacteria to enter the trachea. **The purpose** of this study was to determine the various oral hygiene interventions that can be carried out and their impact on the health status of stroke patients. **Methods:** This study uses a rapid review system where after obtaining articles from four databases, articles will be selected and assessed based on inclusion criteria, then a feasibility evaluation is carried out using The Joanna Briggs Institute (JBI) Critical Appraisal Tools. **Results:** After searching and analyzing, there were 6 articles that were judged to meet the criteria. From these 6 articles, there are 6 oral hygiene interventions that can be performed on stroke patients. **Conclusion:** The six interventions can have an effect on oral health status such as decreasing PI, GI, Candida colonization, oral hygiene, bleeding gums and preventing the occurrence of SAP (Stroke-Associated Pneumonia).

**Keywords:** stroke patient, oral hygiene, intervention, impact

## INTRODUCTION

Stroke is the third leading cause of disability in the world and the second leading cause of death with an annual mortality rate of around 5.5 million cases. The burden of stroke lies not only in high mortality but high morbidity also results in up to 50% of sufferers becoming chronically disabled (Donkor, 2018). The incidence of stroke continues to increase every year. In Indonesia there was an increase in the prevalence of stroke cases from the results of Riskesdas 2013 by 7% to 10.9% (2,120,036 cases) in Riskesdas 2018 (Info DATIN, 2018).

Stroke can occur when there is an obstruction of blood supply to the brain or when bleeding occurs in the blood vessels in the brain (Kumar et al., 2016). Both will result in prolonged brain damage, long-term disability or even death (CDC, 2021).

Stroke results in decreased neurological function, with clinical consequences depending on the extent of neurological damage. In the context of oral health, stroke can cause hemiparesis and hemiplegia in the muscles of the pharynx, tongue, palate and masticatory muscles (Ajwani et al., 2017). This leads to impaired ability to chew and grind food, dysphagia and reduced oral cleaning (Shilpi Ajwani, 2016). Post-stroke health problems may be exacerbated by poor oral hygiene (Kwok, McIntyre, Janzen, Mays, & Teasell, 2015).

Poor oral hygiene results in the accumulation of bacteria in the oral cavity that allows these bacteria to enter the trachea (Shilpi Ajwani, 2016). During the acute phase, respiratory infections caused by decreased swallowing and coughing function may lead to aspiration pneumonia (Obana, et al., 2019). The results of the study found that stroke patients with a greater number of bacteria and plaque will result in worse periodontal conditions. Therefore it is important for stroke patients to improve oral health status to prevent aspiration pneumonia and for patient health status (Shilpi Ajwani, 2016).

The purpose of this study was to determine the various oral hygiene interventions that can be done and their impact on the health status of stroke patients.

## METHOD

### Research Design

The research design on making this literature is a rapid review. Rapid review is a type of knowledge

synthesis that has components of a simplified systematic review process (Tricco et al., 2015; Arevalo-Rodriguez et al., 2019). This synthesis process is carried out with a short time and is set between 1 to 6 months (Williams et al., 2018).

### **Search Strategy**

Researchers conducted several search strategies in order to get articles that are relevant to the research topic sought, namely the impact of oral hygiene interventions on stroke patients. During the search process, researchers use several keywords, such as; (stroke OR hemorrhagic stroke OR acute stroke OR ischemic stroke) AND (oral hygiene OR dental hygiene OR toothbrushing OR oral health) AND (intervention OR method OR program OR procedure) AND (impact OR effect OR impacted OR impacting) in English and (stroke OR hemorrhagic stroke OR acute stroke OR ischemic stroke) AND (oral hygiene OR dental hygiene OR brushing) AND (intervention OR method OR program OR procedure) AND (impact OR effect OR impact) in Indonesian. The study used four databases including Pubmed, CINAHL, SAGE Journals, and Google Scholar.

### **Article Criteria**

The inclusion criteria for this study are the availability of full text articles, randomized control trial and quasi-experiment research designs, published in the last 10 years from 2012-2021 and have a research focus on the impact of oral hygiene interventions on stroke patients.

### **Article Selection Process**

The article selection process carried out by researchers is depicted in the PRISMA flowchart (Stovold et al., 2014). Journal selection results are obtained based on suitability with keywords, validation of inclusion criteria and titles, evaluation of article feasibility using The Joanna Briggs Institute (JBI) Critical Appraisal Tools and at the final stage determining the appropriate journal for analysis (Porritt et al., 2014).

The PRISMA flowchart in Fig.1 illustrates the process of selecting articles based on the title and content of the article as well as the inclusion criteria that have been set by the researcher so that 6 articles are obtained according to which are then analyzed by the researcher.

The notability of the article was evaluated using JBI Critical Appraisal Tools by the researcher. A total of 13 assessment items were tested for articles with Randomized Controlled Trials research design and 9 items for quasi-experimental research. The results of the feasibility evaluation through JBI Critical Appraisal Tools are contained in Table 1. Articles with JBI rating results of >60% are the articles used in this rapid review

### **Data Extraction and Analysis**

Data extraction is done manually on the entire article obtained (Langensiepen et al., 2013). The core data of the article is used by researchers in the analysis process, which includes components of the author's name, year of publication, research design, research location, sample size and characteristics, research objectives and results.

## **RESULT**

The amount of literature obtained from several data bases (PubMed, CINAHL, Google Scholar, and SAGE Journals) by entering keywords is 172,737 literature. The literature was then checked for duplication using the Mendeley application and filtered again using the inclusion criteria set so that 6 literature was obtained in accordance with the research topic and was considered worthy of analysis in this study. Of the 6 literatures, 3 literature was published in the same country, South Korea, and 3 other literature was published in China, Hong Kong, and Taiwan. In the literature, two of them were

published in 2014, and 4 others were published in 2015, 2019, and 2020. The type of research used in 5 literatures was Randomized Controlled Trial and 1 other literature used quasi-experiment (Non-equivalent Control Group) with a total number of respondents as many as 363 respondents.

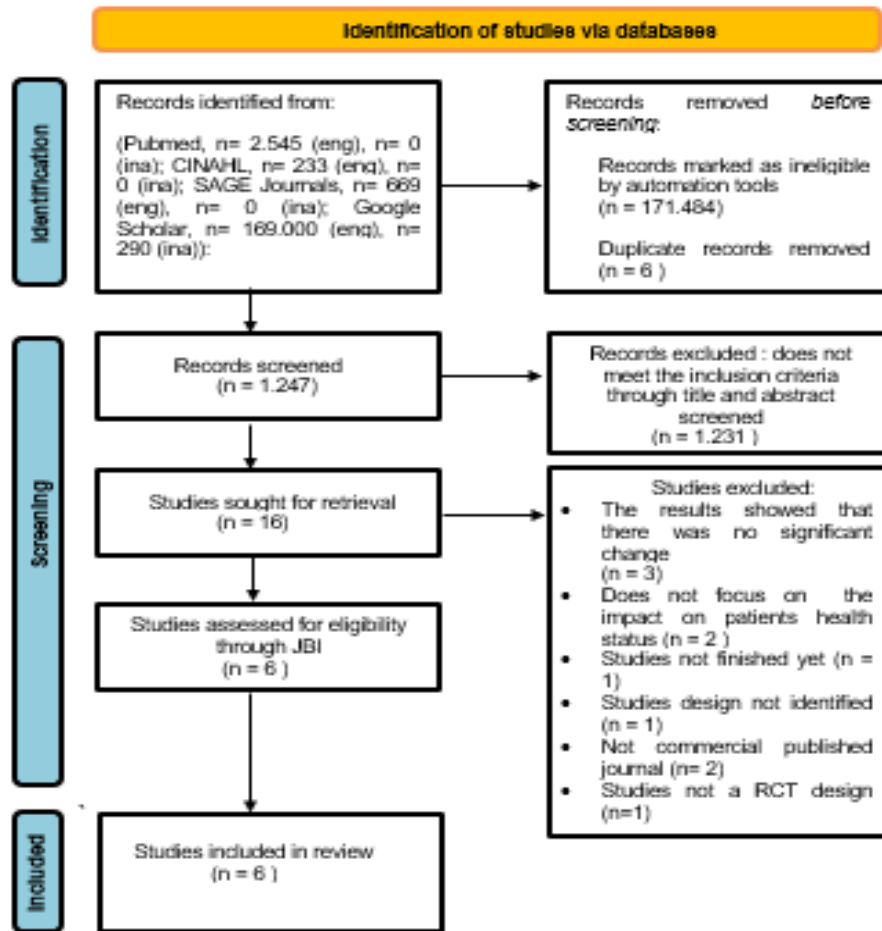


Figure 1. Article Search Process

Researcher, Year	JBI Critical Appraisal Checklist	Literature Quality Assessment
Kim et al. (2014)	84% (11/13)	Strong
Lee & Park 2015)	89% (8/13)	Strong
Dai et al. (2019)	77% (10/13)	Keep
Chen et al. (2019)	84% (11/13)	Strong
Yuan et al. (2020)	84% (11/13)	Strong
Fan et al. (2014)	69% (9/30)	Keep

Table. 1 Article Quality Assessment

All literature obtained discusses the impact of oral hygiene on the health status of stroke patients.

1. *Effect of an Oral Hygienic Care Program for Stroke Patients in The Intensive Care Unit*  
After the Oral Hygiene Care Programme (OHCP), plaque index, gingival index, and degree of colonization of candida albicans in saliva showed significant reductions in the intervention group compared to the control group ( $P < 0.05$ ). However, no significant differences were observed in clinical attachment loss and colonization rates of candida albicans on the tongue ( $P > 0.05$ ).
2. *Effect Of Oral Programmes On Oral Opportunistic Pathogens During Stroke Rehabilitation*  
COHCP Group and AOHCP Group, both of these programs have had significant results in improving oral hygiene and reducing bleeding in the gums.

3. *Effect of an Oral Health Programme on Oral Health, Oral Intake, and Nutrition in Patients with Stroke and Dysphagia in Taiwan: A Randomised Controlled Trial*  
Oral health program with several steps such as suction of the oral cavity, brushing teeth with the Bass method, then coating teeth with fluoride toothpaste can significantly improve the oral health of stroke patients compared to the group of stroke patients who are only given standard oral care unit treatment, namely brushing teeth only ( $p < 0.001$ ).
4. *The Effect of Oral Hygiene Care Program in Stroke Patients*  
The intervention group's oral hygiene and health status improved compared to the control group that only received an oral condition survey conducted the day before discharge, a meeting explaining instructions on how to brush their teeth properly and oral health education.
5. *Effects of Special Mouth Care with an Aroma Solution on Oral Status and Oral Cavity Microorganism Growth in Elderly Stroke Patients*  
There were significant differences between the experimental group and the control group, which was supported by the fact that the intervention group reduced the number of bacteria in the oral cavity compared to the control group using physiological saline. The use of aroma solutions is proven to objectively improve the condition of the mouth, and reduce bacterial colonies in the mouth.
6. *Intensified Oral Hygiene Care in Stroke-Associated Pneumonia: A Pilot Single Blind Randomized Controlled Trial*  
IOHC has succeeded in reducing the incidence of SAP in male stroke patients, higher stroke severity, poorer level of consciousness, poor swallowing function, and poor oral hygiene. This study showed that IOHC was associated with a significantly lower prevalence of oral SAP pathogens, compared to routine oral hygiene care.

No.	Title, Author and Year	Study Design	Sample	Purpose	Result
1.	Title: Effect Of Oral Hygiene Programmes On Oral Opportunistic Pathogens During Stroke Rehabilitation Penulis: (Dai et al., 2019°) Tahun: 2019 Location: Hongkong	<i>Randomized Controlled Trial</i>	94 stroke patients at Tung Wah Hospital (TWH) were randomized into 47 oral hygiene care programme (AOHCP) groups and 47 conventional oral hygiene care programme (COHCP) groups.	To assess the effectiveness of conventional oral hygiene care programs (COHCP) and advanced oral hygiene care programs (AOHCP) on the prevalence and number of viable oral opportunistic pathogens among patients undergoing stroke rehabilitation.	Both oral hygiene programs significantly improved oral hygiene and reduced gingival (gum) bleeding, but no significant differences were observed in the prevalence of oral opportunistic pathogens in each group during the clinical trial period. A significant decrease in viable amounts of <i>S. aureus</i> was found during the clinical trial process in the AOHCP group ( $p < 0.05$ ), while the number of yeast and AGNB remained stable in each group. Regression analysis failed to detect an association between the intervention and the feasible prevalence/number of oral opportunistic pathogens.
2.	Title: Effect of an Oral Health Programme on Oral Health, Oral	<i>Randomized Controlled Trial</i>	33 stroke patients as oral care group (oral cavity suction, brushing	Looking at the effectiveness of oral health programs by	The oral care group had significantly improved oral health conditions compared to the control group (95% CI

	Intake, and Nutrition in Patients with Stroke and Dysphagia in Taiwan: A Randomised Controlled Trial Penulis: (H. J. Chen et al., 2019) Tahun: 2019 Location: Taiwan		teeth with bass method, saliva suction and manual instructions for eating) and 33 patients as control group (standard oral care unit and manual instructions)	assessing variables of oral health outcomes, oral function, intake, nutritional status, and nasogastric tube release rates among stroke patients with dysphagia	= 2.69 to 1.25, Wald 2 = 29.02, p < 0.001).
3.	Title: Effect of an Oral Hygienic Care Program for Stroke Patients in The Intensive Care Unit Penulis: (E. K. Kim et al., 2014b) Tahun: 2014 Location: Korea Selatan	<i>Randomized Controlled Trial</i>	The 56 stroke patients who were in the ICU were randomized into two groups: an intervention group (26 patients) and a control group (29 patients).	Impact of the Oral Hygiene Care Program (OHCP) on the oral health status of stroke patients in the ICU.	After OHCP, plaque index, gingival index, and degree of colonization of candida albicans in saliva showed significant reductions in the intervention group compared to the control group (P<0,05). However, no significant differences were observed in clinical attachment loss and colonization rates of candida albicans on the tongue (P >0,05).
4.	Title: Intensified Oral Hygiene Care in Stroke-Associated Pneumonia: A Pilot Single-Blind Randomized Controlled Trial Penulis: (Yuan et al., 2020b) Tahun: 2020 Location: China	Pilot Single-Blind Randomized Controlled Trial	113 acute stroke patients who were in the neurological intensive care unit, randomized into two groups: the Intensified Oral Hygiene Care group (56 patients) and routine oral hygiene care group (57 patients).	conduct a single-blind, randomized controlled trial to investigate whether IOHC can decrease the incidence of SAP, as well as lead to a reduction in detection rates of suspected oral SAP pathogens	The results of this study suggest that IOHC can successfully fully decrease the incidence of SAP among acute stroke patients who are male, or who have greater stroke severity, poorer awareness, poorer swallowing function, or poorer oral hygiene. Furthermore, IOHC significantly decreased the prevalence of suspected oral SAP pathogens
5.	Title: Effects of Special Mouth Care with an Aroma Solution on Oral Status and Oral Cavity Microorganism Growth in Elderly Stroke Patients Penulis: (Lee & Park, 2015a) Tahun: 2015 Location: Korea	Non-equivalent control group	61 stroke patients from 4 hospitals were divided into intervention group (n = 30) and control group (n = 31)	To determine the effect of oral care using aroma solution on improving the condition of the oral cavity and reducing oral bacterial colonies in elderly stroke patients.	Objective oral status was significantly lower in the experimental group than in the control group (t = -1.24, p = 0.109). The growth of oral microorganisms was significantly lower in the experimental group than in the control group (t = -7.39, p<.001)
6.	Title: The Effect of Oral Hygiene Care	<i>Randomized Controlled Trial</i>	66 stroke patients are in the rehabilitation	To determine the effect of oral hygiene care	The intervention group that received instructions on how to brush their teeth properly

Program in Stroke Patients Penulis: (Fan et al., 2014a) Tahun: 2014 Location: Korea Selatan	department at Daegu Youngnam University Hospital. 35 patients belonged to the intervention group and 31 patients belonged to the control group.	programs on stroke patients.	and oral health education at 5 meetings had significantly improved oral condition in the intervention group at the 3rd meeting. This proved that the oral hygiene and health status of the intervention group improved compared to the control group who only received an oral condition survey conducted the day before discharge, A meeting that explained instructions on how to brush your teeth properly and oral health education.
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Table. 2. Result of article

## DISCUSSION

Stroke patients are known to be prone to dental and oral health problems due to limited activities of daily living, this problem can be exacerbated when patients experience low consciousness, barriers in mobility, difficulty eating from the mouth and the use of nasogastric tubes that cause reduced saliva production, and result in dry mouth (E.-K. Kim et al., 2014). This results in reduced independence in early care including oral hygiene, poor oral health can cause serious conflicts such as; pneumonia and other infections (Dai et al., 2019b). Therefore, here are some interventions to overcome oral hygiene problems in stroke patients:

The intervention most often discussed in journals is the Oral Hygiene Care Program (OHCP) which is very diverse in form, one of which is a journal according to E.-K. Kim et al. (2014) which took 56 randomized ICU patients and divided into two groups, namely the intervention group of 29 patients and the control group of 27 patients.

In the intervention group, oral hygiene management was given to patients 1 time daily for an average of 2.2 weeks. To remove plaque on teeth and tongue, researchers used children's toothbrushes, interdental toothbrushes, and tongue cleaners. Then, gauze with 0.5% chlorohexidine is used to clean the oral mucosa and tooth surface. Researchers found that the intervention group showed reductions in terms of PI, GI, and Candida colonization rates in saliva, compared to the control group. PI and GI findings show that daily brushing removes plaque on teeth also improves dental and oral health.

The degree of colonization of Candida on the tongue showed a greater decrease in the intervention group than in the control group. These results suggest that OHCP researchers, in which plaque control using children's toothbrushes and interdental toothbrushes was administered along with the use of chlorohexidine, had an effect on decreasing Candida colonization in tongue and saliva (Siskaningrum, 2018; Marinda, 2018).

Journal by Dai et al. (2019) Using 94 inpatient stroke patients (duration 3 months, single-blind) as randomized respondents and divided into two groups, namely; conventional oral care group (manual brushing) and advanced oral hygiene group (brushing with a powered toothbrush, gargling with 0.2% chlorhexidine gluconate) after receiving oral hygiene instructions.

Results in two groups showed significant improvement of oral hygiene and reduced bleeding in the gums. There was a significant decrease in the advanced oral hygiene care group in decent numbers of *S. aureus* ( $p < 0,05$ ), while the amount of yeast yield and anaerobic negative salt bacilli (AGNB) remained stable in both groups (Ab Malik et al., 2018).

Journal Chen et al. (2019) Using 66 stroke patients with dysphagia complaints as respondents who were randomized and divided into two groups, namely; The intervention group was 33 patients and the control group was 33 patients. The control group was given a standard oral care intervention, brushing their teeth. In contrast to the intervention group, patients were given oral suction intervention, brushing their teeth with the Bass method, then coating their teeth with fluoride toothpaste for 3 weeks with a frequency of 3 times a week (Latuconsina & Maelissa, 2019).

The results of the study after evaluation in week 3 stroke patients who received oral health program treatment had a significantly improved oral health status compared to the control group. The intervention is given by the caregiver who has been trained on how to perform oral health procedures by the researcher until the caregiver is confident in performing the procedure independently (Sahmad, 2015).

Journal by Yuan et al. (2020) Using 113 acute stroke patients who were in the neurological intensive care unit, randomized into two groups: Intensified Oral Hygiene Care Group (56 patients) and Routine Oral Hygiene Care Group (57 patients).

Intervention group: in the intervention group other than oral care alone (or in lieu of routine saline swabbing), all teeth and soft tissues of the mouth (including gingiva, vestibule, buccal mucosa, floor of the mouth, dorsum of the tongue, and oral pharynx), swabbed with mouthwash chlorhexidine digluconate 0.12% (duration 5 minutes, 3 times daily). This study showed that IOHC was associated with a significantly lower prevalence of oral SAP pathogens, compared to routine oral hygiene care (Pariati & Angki, 2019).

Jurnal Lee & Park (2015) Using 61 inpatients divided into two groups, namely the intervention group of 30 patients and the control group of 31 patients. In the intervention group, oral care was carried out for 5 minutes and twice a day for 7 days. Each session, the intervention group performed an oral treatment with 20 ml of solution dipped in sterile gauze then squeezed to wipe the inside of the oral cavity. In the control group, the treatment was carried out with a 0.9% saline solution with the same treatment, dose, and time as the intervention group.

The results of the study found that there was a significant difference between the intervention group and the control group, which was supported by data that the number of bacteria in the mouth in the intervention group decreased compared to the control group using physiological saline. The use of aroma solutions is proven to improve the condition of the mouth objectively, and reduce bacterial colonies in the mouth, this is because the ingredients used have excellent antiviral, anti-bacterial and antifungal effects to improve oral conditions (Nikmah et al., 2020).

In the journal Fan et al. (2014) RCT (Randomize Control Trial) research design. conducted in South Korea with 66 stroke patients in the rehabilitation department at Daegu Youngnam University Hospital. 35 intervention groups and 31 control groups. The control group in this study received a survey of oral conditions conducted the day before discharge, one meeting explaining instructions on how to brush teeth properly and oral health education. In contrast to the intervention group who received instructions on how to brush their teeth properly and oral health education as many as 5 meetings. In addition to examining the state of oral health, demographic assessments, oral health behaviors and health behaviors were also investigated through questionnaires at the first time of a hospital visit (Jahirim & Guntur, 2020). The condition of the oral cavity improved significantly in the intervention group at the 3rd meeting. This can provide important information for the planning and implementation of subsequent oral health programs (Maksum et al., 2022).

## CONCLUSIONS AND SUGGESTIONS

The results of the rapid review study found that there are six oral hygiene interventions that can be performed on stroke patients and have a positive impact on health status. Six interventions can be done with the first program (use of children's toothbrushes, interdental toothbrushes, tongue cleaners and gauze with 0.5% chlorhexidine), the second program (the use of a powered toothbrush, gargling with 0.2% chlorhexidine gluconate), the third program (suction of the oral cavity, brushing teeth with the Bass method, coating teeth with fluoride toothpaste), the fourth program (oral care and the use of chlorhexidine digluconate mouthwash 0.12%), the fifth program (the use of gauze with aromatic solution) and the sixth program (providing education on how to brush teeth and oral health 5 meetings before hospital discharge). The six interventions can affect oral health status such as decreased PI, GI, Candida colonization, oral hygiene, gum bleeding and prevention of SAP (Stroke-Associated Pneumonia).

Researchers recommend the six interventions to be some considerations for oral hygiene interventions in stroke patients in Indonesia, considering that there has been no research on oral hygiene interventions in this country.

Suggestions for future researchers are expected to examine the effectiveness of these six intervention programs on the health status of stroke patients, especially their effectiveness when carried out in Indonesia.

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The authors state that there is no potential conflict of interest with respect to the writing and publication of this article.

### Reviewer's Advice

The authors leave it entirely up to the maintainers to review our articles, and the reviewer results are relayed back to us if they need to be corrected according to the input of the reviewer team..

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