

# “Chewing Technique” Using Gums toward Mucositis Prevalence on Chemotherapeutic Cancer Patients

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## Abstract

Mucositis treatment is currently developed more focusing on treatment rather than prevention. Therefore, more therapy related studies with the concept of prevention is essential to be conducted. Chewing techniques using chewing gum become an optional treatment to prevent the occurrence of chemotherapy-related mucositis. This study aimed to determine the effect of chewing techniques using chewing gum to prevent the occurrence of mucositis in patients who received chemotherapy at Hasan Sadikin Hospital Bandung. This quasi experimental study employs the pre-posttest without control design. There were 30 cancer patients from a population of 75 patients who received chemotherapy recruited through consecutive sampling. The incidence of mucositis was measured using the Oral Assessment Guide (OAG) before treatment (day 1) and after treatment (day 6). The results of the study revealed that median pre-test mucositis score was constant (8-8) but the maximum post-test score of mucositis score increased (10). There was no significant difference in pre-posttest mucositis score indicating that the mucositis incident after treatment did not differ significantly compared to before treatment. Chewing activity by using chewing gum stimulates the parasympathetic nerves resulting in dilation of blood vessels in the salivary glands that drain saliva. The mucosal protective process will increase and can prevent the decline of oral mucosal conditions. Simultaneously chewing gum technique has a tendency to prevent increased oral mucositis score among patients who received chemotherapy at Hasan Sadikin Hospital Bandung. The hospital may consider chewing gum techniques in the nursing care for patients who received chemotherapy to prevent increased mucositis score and to improve quality of life.

**Keywords:** *Chemotherapy, mucositis, chewing gum technique.*

## Introduction

International Agency Research on Cancer (IARC) Globocan in 2012 states that there are 14.1 million new cancer cases and 32.6 million cancer patients (within 5 years of diagnosis) worldwide, 48% of which (15.6 millions) occurs in developing countries. The result of the Basic Health Survey from the Ministry of Health (2015) show the prevalence number of tumor/cancer illness in Indonesia, which is 4.3 per 1000 people. Lung,

liver, stomach, colorectal, and breast cancer are the biggest causes of death each year.<sup>1-2</sup> Moreover, cancer has brought about a number of negative impacts on physique, psychology, social relationship, spirituality, and finance. A study to cancer patients show some physical handicaps suffered by patients, including pain, exhaustion, nausea, asthma, insomnia, decreasing appetite, and increasing heart rate.<sup>3</sup>

Four primary method for cancer therapy are surgery, chemotherapy, radiation, and biotherapy.<sup>4</sup> In Indonesia, most cancer patients are tardy for diagnosis and treatment; therefore, patients who consulted the healthcare service are already on the last stadium stage. It leads them to dealing with fewer choices in treatment with chemotherapy as the last resort. It is designed to destroy cancer cells, but its practice can also destroy the

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healthy ones. Of many side effects of chemotherapy, one in particular is mucositis. Approximately 61% of all cancer patients undergoing chemotherapy have suffered mucositis. Oral mucositis can be extremely painful, destroying an abundant network of cells. It can also give impact to the patient’s life quality, increase infection risk, cause delay/interruption or even failure of the entire treatment, and be in dire need hospitalization as well as budget gridlock. Some actions toward mucositis treatment include oral cryotherapy, low laser level therapy (LLL), utilization of honey topical agent, Chlorhexidine, Nistatine, and Triamcinolone acetonid. From these interventions, it is believed that it can cure mucositis, despite the inaccuracy of the chemical compounds, the augmentation of budget, and the difficulty applying it onto healthcare service providers. Currently, there is no concensus regarding proper treatment in oral care to prevent mucositis due to chemotherapy.<sup>5</sup>

Until recently, no consent has been done regarding the proper treatment in oral care to prevent mucositis due to chemotherapy. Although several implementations with therapy intervention are being developed, no effective action has come to fruition regarding oral care treatment to prevent mucositis due to chemotherapy. In the research, the main idea of mucositis prevention is the process of chewing rather than the content of the gum. There for utilization of gums in this research is anticipated to optimize the process.

**Method**

This research applies the *quasi-experiment pretest and posttest without control* design. The researcher implements intervention only on a group which is the intervention group without counterparts. The impact of behavior is assessed by comparing the posttest and pre-test values.

The oral care protocol was done to 30 respondents to chew gum. Data sampling was done twice including the first day before the experiment and the following sixth day. Analysis on the respondent’s oral condition applied Oral Assessment Guide (OAG) tools.

During pre-chemo, the respondents were asked to chew 2 gums for 5 minutes before disposing them, followed by another chewing during chemo for 10 minutes. Later, they were asked to keep chewing gums 3 times a day for 10 minutes and a total of 5 days after each chemotherapy. The oral care protocol was done 10 minutes after breakfast, lunch, and dinner. Six days after chemotherapy, an analysis was done using Oral Assessment Guide tools adopted from Eilerset.al., (1998).<sup>6</sup>

**Result**

The research was conducted for 2 weeks from 19 to 27 June 2017 at Asnawati Ward in Hasan Sadikin Hospital Bandung, followed by respondent’s individual homes because they were non-admitted patients. On the 6<sup>th</sup> day, the researcher met the respondents to assess the scores for posttest mucositis.

**Table 1. Respondent’s Characteristics**

Characteristics	Respondents	F (n=30)	Percentage
Age (Mean±SD 45.40 ± 6.63)	< 40 years	7	23.3
	≥ 41 years	23	76.7
Gender	Male	3	10
	Female	27	90
Education	Elementary	14	46.7
	Junior High	9	30.0
	Senior High	7	23.3
Chemotherapy Cycle	< 3rd chemo	16	53.3
	≥ 3 <sup>rd</sup> chemo	4	46.7
Cancer Types	IDCM	27	90.0
	Ca Colon	2	6.6
	Ca. Lung	1	3.3
Types of Chemotherapy Agents	Fluorouracil, Cyclophosphamid	22	73.3
	Paclitaxel, Carboplatin	6	20.0
	Xeloda, Oxaloplatin	1	3.3
	Docetaxel Carboplatin Doxorubicin	1	3.3

Table 1 shows the age of most respondents  $\geq 41$  (76.7%) with a mean of 45.40 whose majority is female (90%) and elementary schooler (46.7%), with the most chemotherapy cycle is on  $< 3$  (53.3%), the type of cancer is IDCAM (*Intra Ductal Carcinoma Mammae*) (90%) and the most chemotherapy agent applied are Fluorouracil, Doxorubicin, and Cyclophosphamide (73.3%).

The analysis result of mucositis frequency before and after the intervention of chewing gums can be seen on table 2.

**Table 2. Frequency of Mucositis Pre-post test**

Respondent's Category	Pretest		Posttest	
	f	%	f	%
Mucositis	0	0	3	10
Not Mucositis	30	100	27	90

Table 2 shows that during pretest all respondents do not experience mucositis where each parameter with the score of 1 is normal. The normal state indicates normal voice, normal chewing ability, soft pink and damp lips, complete and pink gingiva, as well as strong and clean teeth. On the other hand, the post-test shows that 3 respondents undergo increase the mucositis scores during research.

**Table 3. Analysis Result of Wilcoxon Test for Pre-Posttest Mucositis Scores**

OAG Score	Median (Min-Max)	p-value
Pretest	8 (8-8)	0.102
Posttest	8 (8-10)	

Table 3 shows the median result (min-max) of mucositis pretest score of 8 (8-8), meaning that the value of the respondent's pre-test mucositis score is on the normal range. It indicates that all respondents have normal oral mucosa condition. Meanwhile, the median (min-max) of mucositis posttest score of 8 (8-10) increases on 3 respondents. The analysis result of Wilcoxon test of mucositis pre-posttest score with p-value 0.102 ( $>0.05$ ). There is indicates that no significant average difference of mucositis score before and after the intervention of chewing gums. In a nutshell, it does not improve mucositis score for patients undergoing chemotherapy.

Table 4 shows that the variable which influences mucositis result and is strongly interrelated is that of age with p value 0.00 and correlation value 0.735. It shows that age has positive correlation direction with strong correlation with mucositis score.

**Table 4. Respondent's Characteristics that Influence Mucositis Result**

Category	Median (minimum-maximum)	P value
Age	r = 0,735c	0,00c
Gender	2 (1-2)	0.550a
Education	2 (1-3)	0.502b
Chemotherapy Cycle	2 (1-6)	0.392b
Cancer Type	1 (1-4)	0.949b
Type of Chemotherapy Agent	1 (1-4)	0.760b

<sup>a</sup>Mann-Whitney Test, <sup>b</sup>Kruskal-Wallis Test<sup>b</sup>, <sup>c</sup>Spearman Correlation Test<sup>c</sup>

Meanwhile the variables of gender (p value 0.550), education (p value 0.502), chemotherapy cycle (p value 0.392), cancer type (p value 0.949) and the type of chemotherapy agent (p value 0.760) do not have significant interrelation.

### Discussion

The act of chewing gum has an impact on mucositis prevalence. This can be proven by no significant changes in pretest-posttest mucositis score with p-value 0.102 ( $>0.05$ ). It means that there is no decline in the respondent's oral mucosa condition.

Before chemotherapy, the oral condition of all respondents is normal. Until the 5<sup>th</sup> day of chemotherapy, all respondents chewed gums. Twenty-seven respondents show no increase on mucositis score up to the 6<sup>th</sup> day of post-chemotherapy. This is due to the fact that the chewing activity using gums is a set of mechanical movements that stimulate parasympathetic nerves. Then, it is followed by dilatation in blood vessels to saliva glands, serving as a canalizer.

Saliva is an important factor in preserving the health of teeth and mouth taking the role a protector. It helps as a lubricant covering mucosa and protects oral cavity against mechanical, thermal and chemical irritations. It claims similarly regarding one group pretest-posttest design. She advocates that gums are advantageous to stimulate saliva secretion and increase plaque pH and saliva, hence the best to clean oral cavity. Chewing gums for at least 10 minutes regularly can stimulate the increase of saliva secretion. It also shows similar view, stating that the stimulated saliva secretion may induce its promptness, resulting in a bigger saliva volume. All of this may influence the concentration of saliva

component. Added volume and more watery saliva will reduce the chance of microorganism to colonize the cavity.<sup>6</sup>

Moreover, it will cause the increase of organic and inorganic saliva substances. The components included are immunoglobulin A (IgA), mucin, lysozyme, lactoferrin, and lactoperoxidase, all repressing bacteria growth. On the other hand, the inorganic saliva included are bicarbonate and thiocyanate; while the former protects through repressing the fluctuation of pH saliva's degree of similarity, the latter operates in the lactoperoxidase system by oxidizing bacterial enzymes to cell membranes that may hamper acid production and *streptococcus* growth. This is also similar to what researcher statement that chewing gum may reduce the bacteria population in saliva significantly.<sup>7-8</sup>

Saliva is a complex and colorless oral liquid, secreted from major and minor saliva glands to maintain homeostasis inside the oral cavity<sup>8</sup>. For healthy adults, saliva is produced about 1.5 liters in 24 hours. Its secretion is controlled by innervation system, mainly by cholinergic receptors. The main trigger to increase the saliva secretion is through mechanical trigger.<sup>6</sup>

Saliva has several important functions in the oral cavity, including lubricant, cleaning action, dissolution, chewing and digestion, speaking process, buffer system and, most importantly dental caries repression. Saliva and its glands are crucial parts of the mucosa immune system. The plasma cells inside produce antibody, particularly from Immunoglobulin A (Ig A) to saliva. Besides, there are several types of antimicrobial enzymes which contain lysozyme, lactoferrin, and peroxidase.<sup>9</sup>

Saliva also is a result of a myriad glands located under the oral mucosa. Every day, the human's saliva gland produces almost 600 ml serous saliva and mucin that contains minerals, electrolytes, buffers, enzymes and their inhibitors, growth factor, cytokine, secretory immunoglobulin A (sIgA), and glycoprotein. Proteins in saliva include lactoferrin, lysozyme, peroxidase, defensins and histatin, which may hamper or block microorganism growth in the mouth; e.g., histatine has the characteristics of fungicides.<sup>4-9</sup>

With the increase of saliva production, the process of mucosa protection will accumulate; therefore, it may prevent the decrease of oral mucosa condition. That being said, there is an intervention influence of chewing gum shown by Wilcoxon analysis test displaying that

the intervention may prevent the increase of mucositis score through a mechanical process. This process will trigger the saliva glands. Saliva itself is crucial due to its strong bond with a biological process occurring inside the mouth. Generally, saliva plays a role as a protector of the oral surface, water adjustment, virus issuance, and the product of organic metabolism itself and microorganism, food digestion and tasting as well as differentiation and skin cells growth, epithelium, and nerves.

The respondents with increasing mucositis score are 40, 38, and 35 years old respectively. No significant increase on mucositis score occurs because the age category between children and the elderly is not included in this research. According to researchers, both children and the elderly retain a higher risk of suffering from mucositis compared to other ranges of age. It is due to epithelial cells and mucosa membranes more sensitive to suffer from toxicity. Moreover, the elderly is more known to experience a decline of new cells growth and is related to the function of the liver and kidney<sup>9-10</sup> also supports this view, claiming that young respondents have larger impact in lowering mucositis degree. This is because their bodies have better capability of repairing cells or damaged network than those of the elderly. According Hondst, et.al, the patients above 50 years old have higher risks due to the DNA's low-level capability of repairing itself. Although several researches claim that young age and the elderly are prone to suffer mucositis, they do not share similar views because the respondent's age in this research does not involve children and the elderly.<sup>7-11-12</sup>

According to the chemotherapy cycles, the respondents with increasing mucositis score are undergoing the 1<sup>st</sup> and 3<sup>rd</sup> chemotherapy cycles. This is not entirely supported by the research result by Hendrawati, et.al showing the number of the most oral mucositis cases which occur in patients undergoing chemotherapy the 4<sup>th</sup> cycle (86%) and 1<sup>st</sup> cycle (52%) compared to other cycles. This is due to the number of respondents which is higher in the < 3<sup>rd</sup> cycle.<sup>13</sup>

In this research, the most common type of cancer is IDCM (*Intra Ductal Carcinoma Mamae*) which is 90%. It shows that it is quite common for patients undergoing chemotherapy. The respondents with increasing mucositis score have the IDCM cancer type. As a literature, recollects mucositis mostly occurs in patients with blood cancer undergoing chemotherapy due to

leukemia, knowing that it causes myelosuppression. Patients neutropenia are prone to bacterial infections like mucositis<sup>13</sup>. The increase of mucositis score occurs on respondents with IDCM cancer similarly with most patients in this research. In fact, there are no respondents with the hematologic malignancy or lessercancer types.

The act of chewing gum not only helps increase mucositis score to patients undergoing chemotherapy, but also makes them face difficulty in fulfilling nutrition as well as prevents from much severer mucositis impacts due to chemotherapy. The implication of this research for nursery is that the act of chewing gum may be considered as one of the analysis material in the field of nursing to give intervention to patients undergoing chemotherapy.

### Conclusion

This research concludes that the analysis of *Wilcoxon* test of pre-posttest mucositis score with p-value 0.102 (>0.05) indicates no significant average difference of mucositis score before and after the intervention of chewing gum. It means the intervention of chewing technique using gum does not increase the mucositis score for patients undergoing chemotherapy. The value of pre-test mucositis score of all respondents are within the normal range. However, there are some respondents with increasing posttest mucositis score. The parameter increases in posttest mucositis score occurs in the 4 parameters which are tongue, gingiva, chewing process, and lips.

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