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COMPARISON OF PLAQUE INDEX IN PATIENTS WITH CANCER WHO ARE UNDERGOING CHEMOTHERAPY BASED ON THE FREQUENCY

**Review In Patients With Cancer Who Are Undergoing Chemotherapy
 in RSUD Ulin Banjarmasin**

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ABSTRACT

Background: *One of the main cancer treatments is chemotherapy – a systemic treatment of cancer. Chemotherapy can kill cancer cells quickly, however it can also kill the healthy cells in human body. The more chemotherapy is done, the more cancer cells are damaged, and so are the healthy cells. One of the healthy cells that will be affected is oral cavity cells which can cause side effects, like xerostomia. Chemotherapy drugs are toxic and it can lead to destructive effects on salivary glands. Xerostomia can cause the reduced function of saliva as self-cleansing, thus it can be one factor to facilitate the forming of plaque.* **Purpose:** *The objective of this research is to identify the difference of plaque index score on cancer patients who are undergoing chemotherapy based on the frequency in RSUD Ulin Banjarmasin.* **Method:** *This research uses expost facto method with cross sectional approach. The samples of this research are 80 patients with cancer who are undergoing chemotherapy.* **Result:** *The data is tested by using nonparametric Kruskal Wallis test with $p < 0.05$ ($p = 0.001$) shows that there is a meaningful difference of plaque index score within each group.* **Conclusion:** *According to the research that has been conducted, it can be concluded that there is a meaningful difference of plaque index score in patients with cancer who are undergoing chemotherapy based on their frequency.*

Key words: *Plaque index, chemotherapy frequency, patients with cancer*

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INTRODUCTION

Cancer is one of the main causes of death worldwide. In 2012, around 8.2 million deaths are caused by cancer. Lung cancer, liver, stomach, colorectal, and breast cancer are the biggest causes of death by cancer each year.¹

The highest prevalence of cancer in Indonesia is found in DI Yogyakarta (4.1%). According to the 2013 prevalence and estimated number of people with cancer in all ages by the province, the number of cancer patients in South Kalimantan is 6.145, which is the second highest

numbers in Kalimantan after North Kalimantan with 6.745.^{1,2}

According to the 2013 National Basic Health Survey (RISKESDAS) the prevalence of cancer (of all ages based on doctors diagnosis) in the regencies/cities of South Kalimantan, Hulu Sungai Selatan and Tabalong rank first and second to have the most percentage of cancer patients in South Kalimantan with each percentage is 3.8% and 3.7%. While Barito Kuala and Tapin have the lowest rank with each percentage is 0.4%.

According to age, cancer in South Kalimantan mostly happens around the age of 45-54 years old and 35-44 years old with each percentage is 6.2% and 3.8%. According to sex, cancer patients mostly happens to be women with percentage of 2.8%, while men only 0.5%.³

Based on the preliminary survey conducted by the researcher in RSUD Ulin Banjarmasin, the numbers of cancer patients who underwent chemotherapy in 2015 were 4.605, while on March of 2016, there were 224 patients. On January-March of 2016, the type of cancers that underwent chemotherapy the most are breast cancer, nasopharyngeal carcinoma, cervical cancer, lymphoma non-Hodgkin, and ovarian cancer.

One of the main treatments of cancer is chemotherapy. Chemotherapy is one of treatment modalities on cancer that is systemic which often has been chosen, especially to treat the advanced cancer, local or metastatic. Chemotherapy is the most effective treatment and has very extensive work to treat all kinds of malignancy, however, it has side effect.

Chemotherapy is a cancer therapy that uses cytotoxic drugs which aim to stop the growth of cancer cells, either with killing the cells directly or stopping the cell division. Cytotoxic is a group of drugs (contains cytotoxicity) which is used to slow down the growth of cancer cells.^{4,5,6,7}

At first, chemotherapy treats cancer specifically with just killing the cancer cells, however nowadays, it is known that chemotherapy can also cause the damage towards healthy cells in the body, like the cells that cover the mucous membranes throughout the body, including the ones in oral cavity, throat, and stomach.^{5,8}

Chemotherapy can remove cancer cells quickly, but it can also damage the healthy cells quickly. The more chemotherapy is done, the more cancer cells are damaged and killed, and so are the healthy cells. Each regular given chemotherapy is called cycles of chemotherapy. The patients who undergo chemotherapy usually have problem with oral cavity. It can be caused by the chemotherapeutic agents that generally produce a direct destructive effect on the tissues surrounding the oral cavity and indirectly induce myelosuppression and immunosuppression. One of the effects of chemotherapy towards oral cavity is xerostomia or a condition of dry mouth because of the reduced salivary flow that happens because there is toxicity on salivary glands as the effect of chemotherapy.^{8,9,10,11,12,13}

The result of the research that is done in RSUP Adam Malik Medan (2009) shows the numbers of xerostomia that become the highest oral complication suffered by cancer patients who are undergoing chemotherapy are 93% and in the public service agency of RSUP Prof. Dr. R. D. Kandou Manado (2013) are 91%.¹¹

According to the research of Aslam et al. (2014) xerostomia has the percentage of 80% in side effects to cancer patients who are undergoing chemotherapy. The reducing of salivary flow (xerostomia) causes the function of saliva as self-cleansing (cleanser of the surface of teeth and mouth) to be reduced, thus increasing the risk of the formation of plaque accumulation, especially if the dirt in the oral cavity is not cleaned properly.^{5,12,14,15}

Based on those backgrounds, the author is concerned to do a research on cancer patients in Banjarmasin to identify the comparison of plaque index on cancer patients who are undergoing chemotherapy based on frequency in RSUD Ulin Banjarmasin.

MATERIALS AND METHOD

The method of this research is *ex post facto* method with cross sectional approach. The samples of this research are cancer patients who are undergoing chemotherapy in RSUD Ulin Banjarmasin with 5 types of the most cancers (breast cancer, nasopharyngeal carcinoma, cervical cancer, lymphoma non-Hodgkin, and ovarian cancer). The numbers of samples that are being examined are 78 samples and will be divided into 6 groups based on the frequency of chemotherapy. Each group consists of 13 samples. This research took place in Edelweiss Room (chemotherapy) of RSUD Ulin Banjarmasin from July to September 2016.

The equipment that are used in this research are patient records (name, age, sex, type of cancer, type of chemotherapy drug that is used, and the frequency), stationary, diagnostic set, nierbeken, glass, mask, and handscoon. The materials that are used in this research are disclosing agent, cotton pellet, tissue, and mineral water.

The initial procedure of this research is the secondary data collection from cancer patient who are undergoing chemotherapy in RSUD Ulin Banjarmasin. After the number of cancer patients who underwent chemotherapy for one month of 2016 have been obtained, and then it carried out with random sampling.

The next stage is the preparation of pre-research. Secondary data collection is done with data collection through the patient's medical record form of name, sex, type of cancer, type of chemotherapy drug that is used, and the frequency of chemotherapy. Next, the patients/guardians who are willing to be subject of the research sign the informed consent.

The final stage is the clinical examination. The assessment of oral hygiene status was assessed using plaque index. In this research, the method that is used is Patient Hygiene Performance (PHP) Index by Podshaley and Haley. This research uses a procedure with the application of disclosing agent on the surface of examined teeth. The teeth that are examined are 16, 11, 26, 36, 31, and 46.

THE RESULT

The result of the examination of the plaque index scores on cancer patients who are undergoing chemotherapy based on the frequency is as follows:

Table 1. The plaque index score of cancer patients who are undergoing chemotherapy

Group	Frequency of Chemotherapy	Average Score of Plaque Index
Group 1	1	3.86
Group 2	2	4.28
Group 3	3	4.52
Group 4	4	4.67
Group 5	5	4.72
Group 6	6 and ≥6	4.62

According to the result table above, there are differences of plaque index scores in all groups of cancer patients who are undergoing chemotherapy based on the frequency. The more frequent the chemotherapy is, the higher the plaque index score will be, but the plaque index score on the frequency of sixth chemotherapy and more than 6 is lower than plaque index score of groups 4 and 5.

The comparison of plaque index scores on cancer patients who are undergoing chemotherapy

based on the frequency can be seen in the diagrams below:

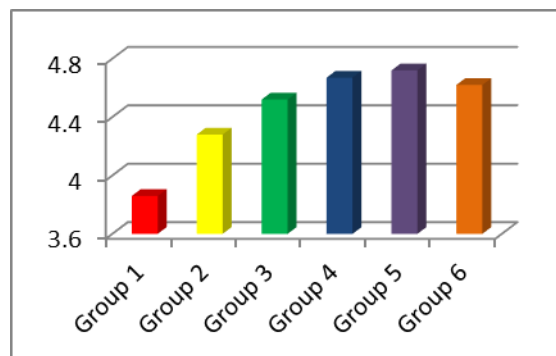


Figure 1. Bar chart of comparison of plaque index in all groups

The data in Figure 1 shows that there are differences in the average score of the plaque index in all groups. The more chemotherapy is done, the higher the plaque index score. Based on the results as depicted in the bar chart above, it is concluded that the highest plaque index score is group 5, while the lowest plaque index score is group 1. In group 6, there is a decrease of plaque index score which is lower than groups 5 and 4.

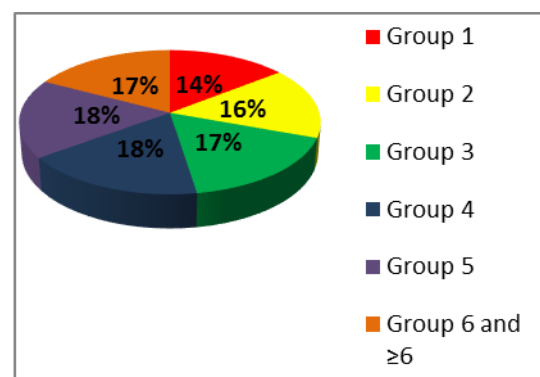


Figure 2. Round chart of comparison of plaque index in all groups

The data obtained from Figure 2 shows differences in the percentage of plaque index scores in all groups. The more chemotherapy is done, the higher the plaque index score. Based on the chart above, there are similarities in the percentage of plaque index score in groups 3 and 6 as well as group 4 and 5. This is due to differences in plaque index scores between the groups are not too significant.

Based on the result above, there is a difference in plaque index scores in all groups. The

difference proved through statistical testing. Prior to statistical test, the data normality test is run over first. Based on the normality test that is performed, the data obtained is not a normal distribution because the significance value is less than 0.05 ($p < 0.05$), so the test that is used is nonparametric test, the Kruskal-Wallis test that is used to analyze the data from more than 2 groups which is not distributed normally. From the statistical test result was obtained $p = 0.001$. Then $p < 0.05$, it shows a significant difference in plaque index scores between each group.

ANALYSIS

Chemotherapy is one of the main treatments of cancer that uses cytostatic drugs which have the effect of killing cancer cells but also kill healthy cells in the body, one that will be affected is the cells in the oral cavity. This occurs because of the toxicity caused by those cancer drugs. Chemotherapy works by killing cancer cells that split rapidly, however, the chemotherapeutic agents can also damage the healthy cells quickly. This leads to side effects on the body.

In the Journal of Cancer by Aslam et al. (2014) suggests that the side effects of chemotherapy vary widely, but it is not influenced by the type of cancer. According to Understanding & Managing Chemotherapy Side Effects by Loprinzi et al. (2014) suggests that chemotherapy can also damage the cells that cover the mucous membranes throughout the body, including those in oral cavity, throat and stomach. In the book of Chemotherapy And You by the National Cancer Institute (2011), it is explained that the side effects get better or go away after chemotherapy treatment is complete / short period.^{5,8,16}

Cancer patients have a high risk of oral complications. It can affect the whole oral cavity, including teeth, gums, oral cavity lining (mucosa), and salivary glands. Complications of oral cavity can lead to difficulty in eating, talking, chewing, or swallowing. Such conditions can affect the health and quality of life of patients.¹⁷

There are two side effects of chemotherapy, direct and indirect effects. The direct effect is the effect caused by the toxicity of chemotherapy drugs itself, while the indirect effect is the effect caused by changes in other tissues. In this research, those examined are direct effects caused by chemotherapy drugs seen from the frequency of chemotherapy. The direct effect that is studied is the dental plaque which one factor for the

formation is xerostomia, which is one side effect of chemotherapy.

Soni et al. in the Brazilian Journal of Otorhinolaryngology by Volpato et al. (2007) divides the oral complications of cancer chemotherapy into two main forms, direct stomatotoxic which is the side effect produced by the action of the drug on the healthy tissue/cells in oral cavity, and indirect stomatotoxic which is the side effect in the oral cavity due to a change in another tissue.¹⁸

The side effects of chemotherapy can be classified as follows:

- a. Acute, formed within 24 hours after the administration of chemotherapy.
- b. Delay/late, formed after 24 hours up to 6 to 8 weeks after chemotherapy treatment is given.
- c. Short period, a combination of acute side effects and delay.
- d. Long periods, formed after a few months or a few years after chemotherapy treatment.
- e. Expectations, occurred to 75% of patients.
- f. Usual, occurred to 25% -75% of patients.
- g. Unusual, occurred to less than 15% of patients.
- h. Rare, occurs to only 5% of patients.
- i. Very rare, occurred to less than 1%.¹⁹

One side effect of chemotherapy drugs is xerostomia which is caused by the toxicity in the salivary glands thereby preventing the flow of saliva. Xerostomia leads to reduced self-cleansing quality of saliva, making it easier to form the plaque on teeth. In this research, it was found that patients complain the conditions of their cavity mouth that constantly feels dry and thirsty.

Bradfield and Hamilton in Best Practice Guidelines for the Management of Oral Complications from Cancer Therapy (2006) states that the example of the complications of chemotherapy on oral cavity are mucositis, oral infections (viruses, fungi and bacteria), taste dysfunction, xerostomia, neuropathy, gastrointestinal mucositis, and bleeding. In addition, the side effects in the oral cavity can be infection of the gums, teeth and tongue, the increased sensitivity to hot or cold food, and problems in eating when the mouth suffers severe injuries. The problem of oral cavity usually begins 5-7 days after the first treatment and will disappear after the treatment is discontinued.^{16,20,21}

In this research, the patients undergo chemotherapy to 6 times or more with the range from one chemotherapy to the other is 3 weeks.

Jusuf Anwar et al. (2009) states that when chemotherapy is started, it should be given enough time so the drugs can work. In general, chemotherapy can be given 4-6 cycles with a break period of one cycle to the next cycle is 21-28 days (3-4 weeks) depends on the type of the drug that is used. The break period is called the period of rest which aims to provide an opportunity for the body to form new healthy cells.^{16,22}

The research that is conducted on cancer patients who are undergoing chemotherapy based on the frequency results to plaque index score that is different within each frequency. There are significant differences in plaque index scores to all frequency of chemotherapy groups, where if the frequency is more and more, the higher the plaque index score. However, the plaque index score of group 6 is lower than groups 4 and 5. From the result of the research shows that group 1 has the lowest plaque index score or the group of cancer patients who receive chemotherapy for the first time with a score of 3.82 with the percentage of 14% of the total number of 78 patients, while group 5 has the highest plaque index score with a score of 4.72 with the percentage of 18% of the total number of 78 patients.

The result shows that the more frequent it is done, the more cancer cells are damaged and a growing number of healthy cells in the body are also damaged. In this research, the more frequent the chemotherapy is, the higher the plaque index scores will be. This condition is caused because the more and more chemotherapy is done, the more chance of healthy cells exposed to the toxicity of cancer drugs, where there is a destructive effect on healthy cells. One example of healthy cells that are affected is the healthy cells of oral cavity.

According to Smeltzer & Bare (2002) in a research conducted by Maria et al. (2013) states that the more frequent the chemotherapy is, the more cancer cells to be damaged and die, as well as the healthy cells in the body. After one to three weeks, then the healthy cells that are exposed to the toxicity of chemotherapy drugs will be recovered but suffered significant damage that will decrease the function and durability of the patient's body. How often and how long the treatment of chemotherapy is given depends on:

- a. The type of cancer and its severity
- b. The goal of treatment
- c. The type of chemotherapy
- d. How is the body's reaction to chemotherapy itself.^{16,23}

Chemotherapy can cause many side effects to the body, it can be part or all of them. It depends on the type and amount of chemotherapy that is done. How long the side effects of chemotherapy lasts depend on the individual patient's own health and the type of chemotherapy that is done.¹⁶

In a research that is conducted by Pandelaki et al. (2011) states that the frequency of oral complications vary depending on the type of treatment given. Research conducted at the University of Baghdad, Iraq (2010), of 125 patients who undergo chemotherapy, all of them have oral complications. The research is also conducted by students of the University of North Sumatra (2009) who study oral complications on 67 cancer patients who receive chemotherapy in RSUP Adam Malik Medan. The result shows that 94% of 67 people are experiencing at least 1 lesion oral complications. Those oral complications include 93% of experiencing xerostomia, 63% of have oral mucositis, 24% of having oral infections, 19% of taste dysfunctional, and 12% of bleeding. Based on the research that is conducted at the Public Service Agency of RSUP Dr. Prof. R. D. Kandou Manado (2013) the number of xerostomia on cancer patients who are undergoing chemotherapy is 91%. Based on the result of the research by Aslam et al. (2014) the oral complications of xerostomia has the percentage of 80% over the side effects of cancer patients who are undergoing chemotherapy.^{5,11}

Xerostomia or dry mouth can be one of the factors that can increase the accumulation of plaque on the teeth. Such condition happens because of reduced salivary flow from the normal amount, thus the self-cleansing quality of saliva decreases. In this research, the condition is due to the effects of drug toxicity of chemotherapy in the salivary glands that can impede the flow of saliva/salivary gland dysfunction.

That condition suits the journal by Kaurow Christian et al. (2015) and the journal by Ristevska et al. (2015) which states that a reduction in salivary flow (xerostomia) causes the salivary function as a self-cleansing (cleaning the surface of the teeth and mouth) to be reduced, thus increasing the risk of the formation of plaque accumulation. Silvana Lubis in the Journal of Cancer (2007) states that the condition will progress if the dirt in the oral cavity is not cleaned properly.^{12,14,15}

In addition to the frequency of chemotherapy, the side effects of chemotherapy are also influenced by several other factors, such as the type of drug, drug dosage, dosage regimen of the

chemotherapy drug, and the individual factors of the patients themselves.

In the group 6 or group of cancer patients who have undergone six times and more than six times chemotherapy, it is obtained plaque index score with a score of 4.62 or plaque index score lower than group 4 or 5 with a score of 4.72 and 4.52. That situation may happen during the sixth or more than six chemotherapies, the cells in the body have started to adapt with the toxicity of chemotherapy drugs also at that frequency, the dose of chemotherapy drugs that is given is lower compare to the previous frequencies so that the side effects occur less. It also can be caused by several other factors that can affect the formation of plaque index, the patient's own individual factors and some factors that cannot be controlled by the researcher.

Based on the journal by Hasnah et al. (2015) states that some classes of chemotherapy drugs can give the effect of depression to the bone marrow, which can lead to a decrease in the number of blood cells such as red blood cells (hemoglobin, hematocrit), white blood cells, thrombocyte (platelets), and changes in blood pressure and pulse.²⁴

In the book of Ilmu Pencegahan Penyakit Jaringan Keras dan Jaringan Pendukung Gigi (2002), Carlsson (1989) states the factors that affect the formation of dental plaque is a physical environment (the tooth structure and tissues), friction by chewed food, and the influence of diet.²⁵

Based on the research that has been conducted, shows that the frequency of chemotherapy may affect the plaque index of cancer patients who are undergoing chemotherapy, in which the frequent the chemotherapy is, the higher the plaque index score will be. In this research, the increasing of plaque index score occurs from chemotherapy frequency 1 to frequency 5, while the plaque index score on the group of chemotherapy frequency 6 is lower than group 4 and 5. The Increasing of plaque index scores are also influenced by the lack of knowledge about the effects of chemotherapy on the patient's oral cavity and how to maintain a good and right way of oral hygiene.

Based on the result of the research, it can be concluded that the average score of the plaque index of each group are in the bad category and there are significant differences in plaque index scores between each group of cancer patients who are undergoing chemotherapy based on the frequency.

The suggestion after this research is for the health care workers to provide some education about the side effects of chemotherapy, particularly the side effects that would occur in the oral cavity and how to take care of it for cancer patients and their families before undergoing chemotherapy and after undergoing chemotherapy. For hospitals to include the role of dentists in the treatment of oral cavity of cancer patients who are undergoing chemotherapy. For the practitioners to enforce the knowledge of related fields to provide joint care from both specialists, dentists, and nurses to cancer patients who are undergoing chemotherapy to improve the general health as well as the oral cavity of the patients. For dentists to provide education and care of the oral cavity of cancer patients who are undergoing chemotherapy in order to consider the condition of the patients both physically and psychologically.

For the next researchers to make this research as a reference for further research in order to investigate the more plaque index in the frequency of chemotherapy and prior to chemotherapy and examine the variables other than the frequency of chemotherapy that can affect healthy cells of the body due to chemotherapy, especially the oral cavity so that it can increase the knowledge and scientific information, especially in the field of dental public health sciences.

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