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Lemon Aromatherapy as a Nursing Intervention in Reducing Nausea and Vomiting in Patient with Nasopharyngeal Cancer during Chemotherapy at Indonesia Hospital

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Nasopharyngeal Carcinoma is an epithelial malignancy originating from the nasopharynx which is posterior to the nasal cavity. Chemotherapy is one of the therapies that can be given to patients with malignancy. Chemotherapy has some side effects, depending on the chemotherapy agent given. Nausea and vomiting are common side effects in patients undergoing chemotherapy. Purpose of this study to provide an overview of lemon aromatherapy as a nursing intervention in reducing nausea and vomiting in nasopharyngeal cancer patients undergoing chemotherapy. The method used is a case study, done by analyzing nursing care in one patient with a diagnosis of nasopharyngeal cancer undergoing chemotherapy. The results of nursing care carried out for 4 days discovered a decrease in nausea and vomiting as showed by VAS measurements of nausea, vomiting frequency, heart rate, meal portions, and salivation. Analysis of lemon aromatherapy as a nursing intervention in reducing nausea and vomiting in nasopharyngeal cancer patients during chemotherapy treatment found a decrease in nausea and vomiting as evidenced by a decrease in the VAS nausea scale from VAS six on the first day to VAS zero (no nausea) on the fourth day. Therefore, giving lemon aromatherapy helps in reducing nausea and vomiting during chemotherapy.

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1. Introduction

Non-communicable diseases (NCDs) account for 74% of deaths globally. Cancer is the second most common cause of death from non-communicable diseases (NCDs) after cardiovascular disease (WHO, 2022). Based on study in 2018, the highest incidence of cancer cases in Indonesia was breast cancer (16.7%) followed by cervical cancer (9.3%), colorectal cancer and lung cancer having the same incidence (8.6%), liver cancer (5.3%), nasopharyngeal cancer (5.2%), Hodgkin lymphoma (4.1%), blood cancer (3.9%), ovarian cancer (3.8%), and thyroid cancer (3.3%).

Nasopharyngeal cancer (NPC) is a malignancy that appears in the nasopharynx (the area above the throat and behind the nose). Clinical manifestations of nasopharyngeal cancer can be invisible, because the symptoms resemble those of common nasal diseases such as rhinosinusitis. Patients usually show symptoms when the cancer has progressed thus they are often diagnosed with end-stage disease. Patients with nasopharyngeal cancer usually present with neck swelling, hearing loss, tinnitus, blurred vision, headaches, and cranial nerve palsies (Abdullah, Balasubramanian, & Lazim, 2020). In addition to physical symptoms, psychological problems will also appear in patients with cancer. Psychological problems that may occur in patients with cancer are grief, guilt, anger, fear, isolation, body image disturbance, and sexual dysfunction.

Based on the results of interviews from chemotherapy room at one of General Hospital in Jakarta, the application of lemon aromatherapy has not been carried out in reducing the side effects of chemotherapy. Based on these data, the authors are interested in implementing evidence-based practice of giving lemon aromatherapy in reducing nausea and vomiting in cancer patients during chemotherapy.

2. Research Method

The method used is a case study, done by analyzing nursing care in one patient with a diagnosis of nasopharyngeal cancer undergoing chemotherapy. Lemon aromatherapy action is carried out using Bathaholic® Lemon Essential Oil with a composition of 100% Citrus limonum. Before administering aromatherapy, the assessments of the patient's olfactory function, allergies, and preferences of fragrances are first carried out. After that, the patient is informed about the purpose of giving lemon aromatherapy and asked for his willingness to be given lemon aromatherapy. Aromatherapy is carried out by dripping 2-3 drops of lemon essential oil onto a cotton swab, then the cotton is clipped to the patient's collar.

3. Result and Discussion

Mr. X, aged 42 years old, presented to the inpatient room on May 1, 2023 with nasopharyngeal cancer medical diagnosis. Patient came for his fourth cycle of chemotherapy on May 2, 2023. Nursing assessment was carried out on May 2, 2023 which is the first day of chemotherapy. Patient complains of weight loss after illness, the client's weight before illness (December 2022) 73 kg, after the first chemotherapy (March 2023) weight 43 kg, and currently the client's weight is 50 kg. The client said the weight loss experienced was due to nausea and vomiting while undergoing chemotherapy. Nausea and vomiting he experienced usually occurs on the second day of chemotherapy for ± 1 hour and can continue for up to 1 week after chemotherapy complete. The client said that after falling ill, the changes he felt became tired easily. The client's rest and sleep patterns have changed after being sick, the client said the client could not sleep during the day and slept only 5 hours at night because of difficulty sleeping.

Mr. X's past medical history stated that the patient ever admitted to the hospital causes Nephrolithiasis, patient have allergies to mackerel tuna, patient has no family member had nasopharyngeal cancer or other types of cancer. The patient said that he has history of smoking for 24 years as much as one until two packs of cigarettes per day, and after falling ill patient stopped smoking. The patient also has a history of drinking alcohol for at least 10 years.

Physical examination showed the patient's weight is 50 kg, TB 163 cm, BMI 18.81 kg/m2, LILA 22 cm, %LILA 67.5%, abdominal circumference 73 cm. There are enlarged lymph nodes in the right sternocleidomastoid area. In the visual system found anemic conjunctiva. Patient experienced alopecia due to hair loss after chemotherapy treatment.

Mr. X's laboratory results on May 01, 2023: Hemoglobin 11.3g/dL, Hematocrit 33.4%, Leukocytes 10.9 thousand/uL, Platelets 237 thousand/uL, Erythrocytes 3.55 million/uL, MCV 94.3fL, MCH 31.8Pg, MCHC 33,8g/dL, RDW-CV 16%, Basophils 1%, Eosinophils 1%, Neutrophils 80%, Lymphocytes 10%, Monocytes 7%, Absolute lymphocyte count 1082/uL, Neutrophil lymphocyte ratio 8,1.

Mr. X's biopsy results on December 07, 2022: Macroscopic: Received irregular tissue of 0.2 cc white, supple. All prints: 1 cup, 1 block. Microscopic: Preparations with information on the origin of the nasopharyngeal mass biopsy in the form of pieces of tissue showing the presence of tumor cells composed of solid trabecular, large nuclei, round oval to spindle, hyperchromatic with real nuclei. Atypical mitoses are easy to find. Impression: nonkeratinizing, undifferentiated squamous cell carcinoma, nasopharynx.

Mr. X's medication includes the chemotherapy drugs given on May 01, 2023 Docetaxel 110.25 mg i.v, Cisplatin 110.25 mg i.v, Curacil 1102 mg i.v. Curacil continued 1 x 1102 mg given on May 3-5 2023. Chemotherapy pre-medication: ondansetron 8 mg IV, ranitidine 50 mg IV, dipenhydramine 10 mg IV, dexamethasone 5 mg IV.

Nursing diagnosis based on Standard Indonesian Nursing Diagnoses was nausea (D.0076) related to the effects of effects pharmacological agents (chemotherapeutic drugs) evidenced by the patient reported to felt nauseous and wanted to vomit while in the chemotherapy room, the patient said he has no appetite and salivated a lot, the patient is on chemotherapy, the patient eats ¼ portion of lunch, blood pressure 133/90 mmHg, heart rate 72 bpm, respiratory rate 18 bpm, body temperature 36,7oC, VAS nausea 6. Nursing diagnoses nausea was founded in the second day of chemotherapy.

Nursing goals and outcomes: after nursing intervention for 1 x 24 hours, the level of nausea decreased (L.08065) with the following criteria: decreased feeling of wanting to vomit (VAS nausea 1-2), pulse within normal range (60-100bpm), appetite improved (finished 1 serving of food), improved saliva production.

Nursing interventions: Management of nausea (I.03117) and management of vomiting (I.03118), wich includes monitor nausea and vomiting (frequency, duration, saliva production, VAS nausea), monitor fluid and electrolyte balance, provide non-pharmacological therapy to treat nausea (relaxation of deep breathing, lemon aromatherapy), suggest using aromatherapy to reduce nausea and vomiting due to chemotherapy, collaboration of pre-medication chemotherapy ondansetron 8 mg IV, ranitidine 50 mg IV, dipenhydramine 10 mg IV, dexamethasone 5 mg IV.

Nursing implementations have been carried out following the planned interventions. Nursing implementation was carried out for 4 days, with aromatherapy for 3 days. Chemotherapy was over on the 4th day and it was found that there was a decrease in the nausea scale, the first day vas nausea 6 and the fourth day vas nausea 0 (there's no nausea).

Based on the results of this study, the patient had a history of smoking cigarettes for 24 years as much as 1-2 packs per day. The effects of smoking can be in the form of direct damage by carcinogenic substances in tobacco smoke or it can also be through smoke carrying EBV, which is eventually deposited in the nasopharyngeal mucosa and adjacent airways. This is supported by research where it was found that the risk of nasopharyngeal cancer increases along with the increase of duration and intensity of smoking . When compared to individuals who have never smoked, the risk of nasopharyngeal cancer increases significantly with an OR value of 1,44 in individuals who have smoked for 11-20 years and OR 1,72 in individuals who have smoked for more than 20 years. Some research shows nicotine was found to be able to stimulate nasopharyngeal carcinoma cell proliferation by simultaneously stimulating a7AChR, ERK, HIF-1a and VEGF/PEDF signaling. Nicotine interacts with a7AChR on the surface of nasopharyngeal carcinoma cells, activates the ERK/MAPK signaling pathway, increases HIF-1a expression, increases the VEGF/PEDF ratio, thereby promoting

nasopharyngeal carcinoma cell proliferation.

The patient also had a history of consuming alcoholic beverages for 10 years. Acetaldehyde, the oxidative product of alcohol, is known to be toxic, carcinogenic and mutagenic. In addition, chronic alcohol consumption has been shown to induce cytochrome P450 (CYP2E1) enzyme activity in mucosal cells, which can stimulates the formation of free radicals and result in cell injury. Some research found that a meta-analysis of cohort studies showed no significant relationship between alcohol consumption and nasopharyngeal cancer, but case-control studies showed that a history of alcohol consumption increases the likelihood of nasopharyngeal cancer compared to those who do not consume alcohol. Compared with non-drinking individuals, drinking with high frequency (≥ 7 times/week) increases the probability of nasopharyngeal cancer.

The patient complains of weight loss after undergoing chemotherapy, this is because the patient always experiences nausea and vomiting as side effects of the chemotherapy. One of the chemotherapy drugs given to patients is cisplatin. It works by crossing DNA strands, preventing DNA from separating in mitosis. However, cisplatin has many side effects, one of which is vomiting. Cisplatin is in the platinum group drugs which has the most severe side effect of nausea and vomiting among other chemotherapy drugs . Apart from cisplatin, the patient also received the chemotherapy drug called Curacil, where side effects of this drug also included nausea and vomiting. Nausea and vomiting due to chemotherapy occurs because of the Chemoreceptor Trigger Zone (CTZ) which is at the base of the fourth ventricle and is outside the blood-brain barrier. Therefore, this zone responds directly to chemical stimuli in the blood or cerebrospinal fluid, so that the CTZ is sensitive to poisons, drugs, and biochemical disturbances. Then the impulse will continue from the CTZ to the Vomiting Center (VC) which induces nausea and vomiting.

This study also found fatigue in patient. This is in line with a research that shows fatigue is a very common complaint among nasopharyngeal cancer patients undergoing chemotherapy with cisplatin and curacil in the first cycle (65%) and its incidence

begins to decrease until the third cycle (34%). This also occurs in patients who received cisplatin and curacil therapy in the fourth cycle.

Based on the results of the physical examination, the patient was found to have enlarged lymph nodes. Spread to the lymph nodes is very easy to occur, this happens because of the many lymph node stroma in the submucosa layer of the nasopharynx. This spread usually begins in lymphatic nodes located lateral to the retropharynx, namely the nodes of Rouvierre. Cells will grow and develop in the Rouvierre nodes so that the gland will enlarge and a lump will appear on the side of the neck. This lump appears without pain, so it is often ignored. Furthermore, cancer cells can continue to grow, penetrate the gland and the muscles underneath. The glands become attached to the muscles and are difficult to move. Some research also found that 90,91% of nasopharyngeal cancer patients had clinical signs of enlarged lymph nodes.

Based on the hematology lab examination, the patient had anemia where the hemoglobin value was 11,3 g/dL. The causes of anemia in cancer patients are complex and multifactorial. The hormones serotonin and bombesin secreted by tumor cells can reduce appetite and trigger anorexia. Nasopharyngeal cancer can also causes inflammation of the oral mucosa and mucous membranes of the digestive tract, pain, and psychological problems. Decreased intake can lead to impaired immunity, susceptibility to infection, and weight loss. In addition, cancer therapy also affects the hematological status. One of them is chemotherapy. Chemotherapy agents work in several ways such as destroying, suppressing, and preventing the spread of rapidly growing cancer cells . One of the chemotherapy drugs given to patient is docetaxel. Docetaxel is a taxane group that works to inhibit cell division in the cell cycle in G2 and M phases. Docetaxel significantly suppresses the spinal cord which will cause anemia, leukopenia, and thrombocytopenia.

Nursing diagnoses in patient are nausea, nutritional deficits, fatigue, and risk of infection. In this chapter, only one diagnosis will be discussed, namely Nausea. Nausea is related to the effects of pharmacological agents (chemotherapeutic drugs)

evidenced by the patient reported to felt nauseous and wanted to vomit while in the chemotherapy room, the patient said he has no appetite and salivated a lot, the patient is on chemotherapy, the patient eats ¼ portion of lunch, blood pressure 133/90 mmHg, heart rate 72 bpm, respiratory rate 18 bpm, body temperature 36,7oC, VAS nausea 6. Based on the Indonesian Nursing Diagnosis Standards (IDHS) nausea is an uncomfortable feeling in the posterior part of the throat or stomach that can cause vomiting characterized by complaints of nausea, an urge to vomit, and no appetite. Nausea in patient is caused by side effects of chemotherapy, where the IDHS explains several etiologies of nausea and one of them is the effect of pharmacological agents. In patients the chemotherapy agents given are docetaxel, cisplatin, and curacil where they have side effects of nausea and vomiting drugs.

The effect of giving curacil and cisplatin in nasopharyngeal cancer patients undergoing chemotherapy found that nausea and fatigue were showed decrease from the first cycle to the third cycle. This may occur due to the body's ability to adapt to chemotherapy. However, side effects such as weight loss, leukopenia, neutropenia, thrombocytopenia, and anemia increases with each chemotherapy cycle. Nausea and vomiting caused by chemotherapy are very common side effects in patients undergoing chemotherapy, these complaints can also reduce patient adherence to treatment, as well as have a negative impact on the patient's quality of life and clinical status.

Nursing planning is prepared based on priority nursing diagnoses. In patient, nausea is the first priority. Diagnosing nausea is a priority based on Abraham Maslow's hierarchy of needs, where physiological needs are the main basic human needs. Physiological needs include the need for oxygen, fluids, nutrition, body temperature, elimination, shelter, and sex . In patient, the nausea occurred as a result of chemotherapy interferes with the patient's basic needs for meeting fluid, nutritional, and psychological security needs.

Nursing interventions for the diagnosis of nausea in patient are nausea management and vomiting management. One of the actions in it is giving lemon aromatherapy. In patient, the interventions carried out were management of nausea and management of vomiting.

After the intervention for 1 x 24 hour, it is expected that the level of nausea will decrease with the criteria of the result being a feeling of wanting to vomit decreased (VAS nausea 1-2), heart rate within the normal range (60-100bpm), appetite improved (eat 1 portion meal), and salivation improved. The 24-hour period is determined based on the clinical condition of the patient and the direct result of not treating nausea and vomiting. If nausea and vomiting are not controlled or treated, other health problems will arise such as dehydration, hypokalemia, metabolic alkalosis. In addition, nausea and vomiting can also cause a decrease in appetite or anorexia, which if left untreated will lead to nutritional deficiencies.

One of the nursing actions given to patient to treat nausea and vomiting is giving lemon aromatherapy. Several studies have found the benefits of lemon aromatherapy in reducing nausea and vomiting. Research conducted at a palliative service in a hospital in Austria with 66 cancer patients as study subjects and 222 use of lemon aromatherapy, found that lemon aromatherapy was 2,7 times more effective in relieving nausea and vomiting. Other researches also mention the benefits of using lemon aromatherapy in relieving nausea and vomiting due to chemotherapy. Apart from nausea and vomiting due to side effects of chemotherapy, lemon aromatherapy has also been found to reduce the incidence of emesis gravidarum, even better than Vitamin B6.

The use of aromatherapy works by way of the evaporated molecules coming into contact with the olfactory nerve cells. From the olfactory impulses will be forwarded to the limbic system, the part of the brain that influences survival, instincts, and emotions. According to scientists, the activity of nerve signals that pass through this area can cause mood swings by changing brain chemistry.

The pharmacological activity of essential oils begins when they enter the body through the olfactory, respiratory, gastrointestinal, or integumentary systems. All body systems can be affected once the chemical molecules that make up essential oil reach the circulatory and nervous systems. Some of the compounds in essential oil can enter the body, although in practice the absorption rate varies depending on the route of

administration. Inhaled aromas has the fastest effect, although compounds have been detected in the blood after massage. When inhaled, the many different molecules in each essential oil act as olfactory stimulants that travel through the nose to the olfactory bulb, and from there impulses travel to the brain. The amygdala and hippocampus are very important in scent processing. The amygdala regulates emotional responses. The hippocampus is involved in the formation and retrieval of explicit memories. The limbic system interacts with the cerebral cortex, contributing to the relationship between thoughts and feelings; it is connected directly to the part of the brain that controls heart rate, blood pressure, breathing, stress levels, and hormone levels. Although inhaling essential oil affects the mind and body through the olfactory process, most of the molecules from the inhaled vapor travel to the lungs, where they can be absorbed into the circulatory system.

Nursing implementation was carried out for four days with aromatherapy for three days. Aromatherapy is carried out using cotton/pads as a medium for the evaporation of essential oil. The use of aromatherapy can be done in several ways including inhalation, internal use, and oral use. The use of aromatherapy pads is included in the use of direct inhalation aromatherapy. In use, aromatherapy pads or patches are used in the collar bone area so that the essential oil can evaporate upwards. The application of aromatherapy is carried out on patient using pads in which essential oil drops are clamped to the collar of the shirt.

The aromatherapy given to patient uses 100% lemon essential oil, where the dose is around 2-3 drops. The usage of essential oil, the doses are given using drop sizes, where 1 mL of essential oil is equivalent to 20-40 drops or 0.15 mL is equivalent to 3-6 drops of essential oil. Inhalation is an important route of exposure because of the role of smell in aromatherapy and from a safety point of view, inhalation has a very low level of risk. Even in relatively small enclosed spaces and assuming 100% evaporation, concentrations of essential oil or their constituents are unlikely to reach hazardous levels, either from aromatherapy massage or from essential oil evaporation. The only possible risks are from prolonged exposure (perhaps 30 minutes or more) to relatively high levels of an essential oil's vapor, as can occur when inhaling

directly from a bottle of pure oil, or moderate exposure (perhaps 10 minutes or more) to high concentrations of neurotoxic constituents such as pinocamphone or thujone. Aromatherapy for patient is carried out using Lemon Bathaholic® Essential Oil which has been tested by The Indonesian Food and Drug Authority (BPOM) so that this lemon aromatherapy nursing action is safe to use.

Table 1. Result of Using Lemon Aromatherapy During Chemotherapy

Day	Result
1	VAS nausea 6 Vomiting 1 times Heart rate 72 bpm Appetite (meal portion): ¼ portion Increased saliva production
2	VAS nausea 4 Vomiting 1 times Heart rate 85 bpm Appetite (meal portion): 1 portion No excessive saliva production
3	VAS nausea 2 No vomiting Heart rate 80 bpm Appetite (meal portion): 1 portion No excessive saliva production
4	VAS nausea 0 No vomiting Heart rate 80 bpm Appetite (meal portion): 1 portion No excessive saliva production

The results of nursing care carried out for 4 days showed a decrease in the nausea scale as evidenced by VAS measurements of nausea, vomiting frequency, heart rate, meal portions, and salivation. The first day of VAS nausea 6, Vomiting 1 time, heart rate 72 bpm, eat ¼ meal portion and increased saliva production. On the fourth day of VAS nausea 0, no Vomiting, heart rate 80 bpm, eat 1 portion, no excessive salivation. Lemon aromatherapy using in day one until day three, day fourth chemotherapy has done and patient doesn't feel nausea (VAS nausea 0).

Aromatherapy provides benefits in the area of cancer and palliative care. Aromatherapy has positive results on several problems of cancer patients such as nausea, fatigue, bad odor,

shortness of breath, reducing pain, wound management, skin and mouth care. This is also in line with the response from the implementation of aromatherapy performed on patients.

In patients, lemon aromatherapy is given during the chemotherapy action. Aromatherapy was given for 3 days, obtained on the third day the patient said that when using aromatherapy, the client had no nausea and when the client felt nauseous, the client inhaled the lemon aromatherapy given and felt nausea reduced. During three days of lemon aromatherapy, there was a decrease in the nausea scale from VAS nausea 6 on the first day, VAS nausea 4 on the second day, VAS nausea 2 on the third day, and VAS nausea 0 on the fourth day. This instrument for evaluating the level of nausea and vomiting was also used in one study in assessing the effect of giving lemon aromatherapy to nausea and vomiting of cancer patients undergoing chemotherapy . In addition, giving lemon aromatherapy to patients gets results that are in line with research that the use of lemon aromatherapy was able to reduce nausea and vomiting and as much as 73% of the application of lemon aromatherapy was found to be able to relieve nausea and vomiting.

4. Conclusion

Analysis of lemon aromatherapy as a nursing intervention in reducing nausea and vomiting in nasopharyngeal cancer patients during chemotherapy treatment found a decrease in nausea and vomiting as evidenced by a decrease in the VAS nausea scale from VAS six on the first day to VAS zero (no nausea) on the fourth day. Therefore, giving lemon aromatherapy helps in reducing nausea and vomiting during chemotherapy.

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