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Review Article

Chemotherapy induced nausea-vomiting and breathing exercise: a review

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ABSTRACT

The gradual deterioration of the functions of cells, that have great vital importance, can lead to various diseases in many organs and systems such as cancer that is the second cause of death in the worldwide. Some complications may occur with the initiation of chemotherapy and the quality of life of patients may become worse. Chemotherapy induced nausea and vomiting in cancer patients have continued to be one of the most common and disturbing symptoms in recent years. Nausea and vomiting may not seem dangerous on their own, but in many patients receiving chemotherapy, they can cause loss of appetite and consequent inability to eat, and death due to malnutrition. Today, the cause of nausea and vomiting is not completely understood and the pathophysiology of nausea cannot be even clearly explained. There is no definitive and effective drug treatment method for nausea and vomiting. This uncertainty has led to the use of various complementary and alternative treatment methods and breathing exercises have come into prominence in these treatment methods. In nursing practice, the intervention of breathing exercise in the clinical setting is mostly unknown or cannot be applied. For this reason, nurses may need to get help from a specialist trainer about breathing exercises to teach patients and guide them. This review provides information about breathing exercise to manage nausea and vomiting in cancer patients undergoing chemotherapy.

Keywords: Breathing exercise, Nursing, Nausea and Vomiting, Chemotherapy

INTRODUCTION

Cancer ranks second in mortality after cardiovascular diseases in many countries around the world. This keeps cancer on the agenda as an important health problem.[1] Cancer affects human health of factors including ages, genders, and socioeconomic backgrounds.[2] Compared to high income countries as the European Union and the United States, the cancer rate in Turkey is upper.

While the number of people diagnosed with cancer was 20 million in 2022, this number is thought to be approximately 40 million in 2050 in the worldwide.[3,4] While cancer continues to be a major health problem in the world, chemotherapy is still used in cancer treatment. Although chemotherapy used for cancer treatment works to eliminate abnormal cells, it causes toxicity and has many side effects in the treatment and prolonging life.[2] Determining the symptoms that may develop due to chemotherapy and applying individualized care are important to improve the quality of life.[5,6] The incidence of chemotherapy-induced nausea and vomiting (CINV) has been observed in 40%- 70% in cancer patients.

Despite the proper administration of pharmacological agents and non-pharmacological methods for prophylaxis, nausea and vomiting continue to be a clinically important side effect for patients receiving chemotherapy.[7,9] Chemotherapy-induced nausea and vomiting are common and difficult to cope with side effects in cancer patients. Although antiemetics are used to prevent chemotherapy-induced nausea and vomiting, they may not always be effective.[8] Therefore, it is necessary to develop nursing care to manage symptoms

resulting from chemotherapy, such as nausea and vomiting. Non-pharmacological methods just like breathing and relaxing exercises, acupressure, reflexology or herbal treatments are also used today to reduce the severity and incidence of nausea and vomiting.[12]

CHEMOTHERAPY INDUCED NAUSEA AND VOMITING

Nausea and vomiting are frequently encountered symptoms in patients with cancer and may occur together or separately. Nausea occurs as an uncomfortable condition in the throat or upper stomach following exposure to toxins, drugs, and gastrointestinal diseases. Vomiting is a response to nausea mediated by the brainstem, which has a protective function of expelling swallowed toxins before digestion. Retching, on the other hand, involves muscle contractions and a forced, rhythmic breathing pattern that occur before vomiting and is different from vomiting (the effortless passage of stomach contents into the mouth).[13,14]

Vomiting, which is a physical event, can be easily detected. Nausea, on the contrary, is a multidimensional perception involving higher brain centers. Nausea and vomiting result from a variety of etiologies, including motion sickness, gastrointestinal disease, pregnancy, drug therapy, and psychological stimuli. One of these etiologies is chemotherapy, which is commonly known as a treatment method in cancer patients.[10,11] The risk factors of chemotherapy-induced nausea and vomiting in patients that were identified by meta-analysis of studies included history of nausea or vomiting, female sex, expectancy of chemotherapy-induced nausea and vomiting, younger age, anxiety, history of morning sickness, and low alcohol intake.[40] There are types of chemotherapy induced nausea and vomiting. Acute nausea and vomiting occur in the first few minutes and the first 24 hours.

It reaches its peak in the fifth or sixth hours. Delayed nausea and vomiting start after the first 24 hours following drug intake; may last up to 5-7 days. It is most commonly seen in the 48th-72nd hours. Apart from these, patients may experience anticipatory, breakthrough and refractory nausea and vomiting. Anticipatory nausea and vomiting are learned or situational responses and are often seen after poorly controlled nausea and vomiting. Breakthrough emesis is sudden onset of nausea and vomiting despite adequate prophylactic treatment. It requires rescue treatment. Refractory nausea persisting until the next chemotherapy cycle after antiemetic prophylaxis and rescue therapy in the first cycles have failed.[15,22]

Studies have shown that acute and delayed nausea and vomiting are seen in more than 42-52% despite antiemetic prophylaxis. The risk of nausea and vomiting increases to 90% in patients receiving highly emetogenic chemotherapy. This rate can be reduced to 30% in patients receiving moderate emetogenic chemotherapy and 10% in patients receiving low emetogenic chemotherapy.[15-17]

PATHOPHYSIOLOGY OF CHEMOTHERAPY-INDUCED NAUSEA AND VOMITING

Chemotherapeutic agents stimulate vagal afferents near enterochromaffin cells in the gastrointestinal tract, and then the peripheral pathway is activated by the oxidative effects of free radicals generated by chemotherapeutic agents. Thus, enterochromaffin cells are stimulated and secrete serotonin. Serotonin binds to 5HT3 receptors that are expressed by abdominal vagal afferent fibres reach the vomiting center and activates the vomiting response in 24 hours. This is defined as acute chemotherapy induced nausea and vomiting. Chemotherapeutic agents induce the release of substance P from neuronal cells in the central and peripheral nervous systems. Substance P binds to Neurokinin-1 (NK-1) receptors and directs the vomiting response to the central nervous system and that is identified delayed CINV.[18-20] According to the studies, 5HT3 plays an important role in acute CINV, while NK-1 receptor has an active role in delayed CINV.[20] The pathophysiology of nausea is difficult to define because it is a subjective sensation, but it is often perceived to be in the stomach and precedes vomiting. It is not clear whether the same neurotransmitters and receptors that cause vomiting, such as serotonin and substance P, are involved in nausea.[10,18]

CHEMOTHERAPY-INDUCED NAUSEA AND VOMITING AND NURSING APPROACHES

CINV is the major gastrointestinal toxicity observed during chemotherapy despite the administration of antiemetic agents.[24,28] These gastrointestinal side effects during chemotherapy greatly affect the quality of life of patients and may even lead to the termination of chemotherapy. Therefore, effective prevention or alleviation of chemotherapy-induced nausea and vomiting is important for patients' quality of life.[19] In the last four decades, it has been accepted that CINV is associated with various neurotransmitters and of these neurotransmitters, 5-HT and SP play a vital role in the pathophysiological mechanism of chemotherapy-induced nausea and vomiting by binding to the 5-hydroxytryptamine type 3 (5-HT3) receptor and neurokinin-1 receptor, respectively.

In this context, international antiemetic guidelines recommend 5-HT3, neurokinin-1 receptor antagonists and corticosteroids for the standard antiemetic protocol of CINV. In addition, dopamine antagonists or antihistamines are currently used. However, the European Society of Medical Oncology (ESMO) and the American Society of Clinical Oncology (ASCO) don't recommend dopamine receptor antagonists (chlorpromazine, olanzapine, quetiapine etc.) in the management of nausea

and vomiting due to their known neurological side effects.[21,22]

Nurses play an active role to prevent and alleviate chemotherapy related nausea and vomiting in patients undergoing chemotherapy. Nurses have to be informed about the antiemetic guidelines. They have to know the patient's history and implement the pharmacological methods in accordance with the joint decision of the physician. Nausea and vomiting may continue during chemotherapy in some patients even after antiemetic treatments.[23,28] Thus situated, nurses can make recommendations to patients with chemotherapy-induced nausea and vomiting, accompanied by a dietitian to change their eating habits. In a study, it was reported that early nutritional education given to patients who is going to receive chemotherapy (eating little and often, chewing food well, giving easy-to-digest and soft foods, avoiding excessively fatty and spicy foods, etc.) reduced nausea and vomiting after starting chemotherapy.[22,24]

Nevertheless, the possibility of the patient vomiting during nausea should be considered and the risk of aspiration should be prevented as placing the patient in the semi-fawler position if the patient is conscious.[27] Non-drug applications also can be used to manage CINV. Alternative treatments include oral intake of herbal (mint, ginger, bitter orange) treatments or inhalation of their essences (aromatherapy), acupuncture or acupressure, relaxation techniques (muscle relaxation, breathing exercises, imagery, systematic desensitization, yoga, music therapy, massage).[6,9,16] In another study, Swedish Massage including effleurage, petrissage, tapotement, friction, and vibration using facilitating oil on the skin that's a nursing intervention, has been effective in diverting the patient's attention.[25]

Nurses can provide training to patients' relatives about massage. A meta-analysis of ten studies emphasized the importance of aromatherapy to manage CINV in cancer patients.[25,26] Aromatherapy is a widely used complementary and alternative therapy. Nurses can recommend essential oils obtained from medicinal plants to patients to inhale. A systematic review suggested a conservative effect of acupressure on managing CINV.[29] It's been found that breathing exercises, one of the relaxation techniques alleviated the severity and the incidence of CINV in a study.[9] During nausea, the patient's room can be ventilated and the patient can be consciously inhaled with fresh air. Nurses can teach patients deep and diaphragmatic breathing and encourage them to practise. Breathing exercises can be practised accompanied by music that relaxes the patient.

BREATHING EXERCISE AND CHEMOTHERAPY-INDUCED NAUSEA AND VOMITING MANAGEMENT

Breathing is the most important and necessary part of daily life. Chronic stress in cancer patients undergoing chemotherapy can overstimulate the nervous system, causing harmful effects like inflammation, high blood pressure, muscle pain, and digestive problems just as nausea and vomiting. Therefore, breathing is an excellent tool to help facilitate the relaxation response. Breathing slowly and deeply can help the body regain homeostasis.[30] Some studies found that breathing exercises reduced dyspnea, anxiety, pain, fatigue, blood pressure and CINV in patients with different diseases and this shows the importance of breathing exercises in future researches.[9,37-39]

Breathing exercises can be performed in different patterns as diaphragmatic breathing, progressive muscle relaxation, yogic breathing, relaxation breathing in different patient groups. Diaphragmatic breathing has an effect on the brain, cardiovascular, respiratory and gastrointestinal systems through modulation of autonomic nervous function. In some cases, supine positions are beneficial for diaphragmatic breathing because the abdominal muscles are not pasturally required and therefore allow the abdomen to rise and fall more freely. The application of this technique causes the pulse to slow down and the body to relax in general.[33,34] Progressive muscle relaxation includes progressive breathing and relaxing of the muscles throughout the body regionally, accompanied by music. It is used as a kind of relaxation technique when muscles tighten.[35] Yogic breathing is known as pranayama. There are several types of pranayama to implement with physically and they provide to reduce stress related factors.[36] Relaxation breathing consists of diaphragmatic breathing and relaxing methods.[37]

Breathing exercise is an integral part of complementary and supportive care and has significant benefits in several types of cancer.[33] It can be a cost-effective method to prevent nausea and vomiting of cancer patients undergoing chemotherapy.[9,32] Today, nurses are healthcare professionals who provide care for patients that is known as nursing care or support. Breathing exercise, which is one of the relaxation techniques, can be applied by nurses for 10-15 minutes while patients were lying on their backs on the bed or sitting on a chair. Some studies conducted on cancer patients with chemotherapy induced nausea and vomiting reported that breathing exercises can be applied in the clinical setting.[9,32]

While applying breathing exercises, the patient focuses on inhaling and exhaling, thus calming down by getting rid of negative thoughts in their minds during the chemotherapy period. Inhalation and exhalation techniques are applied using the diaphragm to meet the body's oxygen needs. Diaphragmatic breathing is defined as slow and deep inhaling through the nose using the diaphragm and exhaling through the mouth with minimal movement of the chest, with one hand placed on the chest and the other on the abdomen. During inhalation, care should be taken to keep the chest as still as possible and

to move the stomach against the hand, focusing on the contraction of the diaphragm.[31] Patients can close their eyes and imagine themselves in the ambiance where they will feel comfortable. At the same time, patients can feel more restful when they listen to the sound of water, rain or waves.[34,35] So patients can learn to manage their emotions and thoughts and can control their entire body owing to breathing exercise.

CONCLUSION

Despite different results may emerge in studies investigating breathing exercises in CINV, the importance of breathing exercises increases based on evidence. As a complementary or supportive treatment, it has not been determined definitely due to limited evidence, that's why researches analyzing the relationship between breathing exercises and CINV should be continued.

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