PROGRESSIVE MUSCLE RELAXATION TO REDUCE CHEMOTHERAPY-INDUCED NAUSEA AND VOMITING IN CANCER PATIENTS: A DESCRIPTIVE STUDY

Hesti Rahayu[1)], Endah Panca Lydia Fatma[2)], Elteria Sianturi[3)], Agung Waluyo[4)], Riri Maria[5)], Masfuri[6)], Siti Nurlaelah[7)], Yunisar Gultom[8)]

Faculty of Health Sciences[1)], Faculty of Nursing[2)], Nursing Department[3)]
Universitas Pembangunan Nasional Veteran Jakarta[1)], Universitas Brawijaya[2)], RSUPN Dr Cipto Mangunkusumo Jakarta[3)], Universitas Indonesia[4)]

ABSTRAK

Pasien kanker pada umumnya mengalami mual dan muntah yang sangat mengganggu meskipun sudah diberikan agen antiemetik, sebelum, selama, atau setelah kemoterapi. *Chemotherapy Induced Nausea and Vomiting* (CINV) merupakan mual dan muntah yang dirasakan dan dialami pasien sebagai efek samping kemoterapi. CINV jika tidak tertangani dengan baik dapat menyebabkan berbagai masalah seperti ketidakseimbangan cairan dan elektrolit, menghambat siklus kemoterapi selanjutnya, menurunkan produktivitas dan kualitas hidup. Biaya rehospitalisasi akibat CINV di sistem pelayanan kesehatan menunjukkan angka yang besar. Terapi non farmakologi seperti teknik relaksasi sangat dianjurkan untuk dilakukan oleh pasien dalam rangka mengatasi mual dan muntah sebagai efek samping kemoterapi. Terapi relaksasi selama 25 menit dengan audio efektif dalam menurunkan mual dan muntah pasien kanker. Salah satu teknik relaksasi yang melibatkan audio yaitu *Progressive Muscle Relaxation* (PMR). Studi ini diambil dari salah satu rumah sakit tipe A di Jakarta. Studi ini terdiri dari 20 kasus pasien kanker yang sedang menjalani kemoterapi. Setelah melakukan PMR yang dipandu melalui video edukasi di tablet ruangan yang diinisiasi oleh tim penulis, 4 hari setelah kemoterapi, 35 % pasien kanker mengalami penurunan mual dan muntah, serta pasien merasa lebih nyaman dan relaks. Video edukasi PMR dapat digunakan sebagai panduan pasien dalam melakukan latihan secara mandiri baik ketika di rumah sakit ataupun di rumah. Oleh karena itu, dengan mencegah atau menurunkan potensi masalah yang ditimbulkan oleh mual dan muntah akibat kemoterapi, dapat meningkatkan kualitas asuhan keperawatan terhadap pasien kanker. Hasil studi ini menunjukkan bahwa PMR dapat menurunkan CINV.

Kata Kunci*: kemoterapi, mual, muntah, pasien kanker, PMR, video edukasi*

ABSTRACT

Cancer patients usually experience disturbing nausea and vomiting, although they have consumed some antiemetics before, during, and after chemotherapy. *Chemotherapy-induced nausea and Vomiting* (CINV) is nausea and vomiting experienced by patients as a result of chemotherapy. CINV that are not managed properly can cause some problems, such as fluid and electrolyte imbalance, interrupt the next chemotherapy cycle, and decrease productivity and quality of life. Rehospitalisation costs caused by CINV in the health care system are high. Non-pharmacological therapy, such as relaxation techniques, is strongly suggested for patients to relieve CINV. Twenty-five minutes of an audio relaxation technique is effective in decreasing nausea and vomiting in cancer patients. One of these is Progressive Muscle Relaxation (PMR). This study aimed to describe the implementation of PMR for the CINV of cancer patients. The study was taken from one of the type A hospitals in Jakarta, Indonesia. It consisted of 20 cancer patients who underwent chemotherapy. After doing PMR exercise guided by an educational video on a tablet for 4 days after chemotherapy, it was found that there was a 35% decrease in nausea and vomiting scores; they felt comfortable and more relaxed. This educational video of PMR supports the patients to do the exercise well when

done in the hospital or at home. Therefore, preventing or reducing the potential problem caused by CINV can increase the quality of nursing care for the cancer patient. The results of this study indicate that progressive muscle relaxation can reduce CINV.

Keywords: cancer patient, chemotherapy, education video, nausea, progressive muscle relaxation, vomiting

Coresponding Email: hestirahayu@upnvj.ac.id
Coresponding Address: Limo, Depok City, West Java 16515, Universitas Pembangunan Nasional Veteran Jakarta

BACKGROUND

Cancer patients usually experience disturbing nausea and vomiting, although they have consumed some antiemetics before, during, and after chemotherapy (Sutherland et al., 2018). *Chemotherapy-Induced Nausea and Vomiting* (CINV) is nausea and vomiting experienced by patients as a result of chemotherapy. CINV is caused by stimulation of chemotherapy drugs and their metabolites to the centre of nausea and vomiting, namely the vomiting centre located in the medulla oblongata and the chemoreceptor trigger zone (CTZ). Furthermore, stimulation is responded to through afferent nerve fibres in the vagus nerve and simultaneously, the vomiting centre provides an autonomic reflex stimulus and sympathetic reflex that accompany nausea and vomiting, namely contractions of the abdominal muscles and diaphragm, increased intestinal peristalsis, vasoconstriction, tachycardia and diaphoresis (Wood et al., 2007).

Kris (2011) said that CINV is the most significant effect of chemotherapy from the patient's perspective (Sutherland, 2018). Cohen (2007) added that CINV is reported as the acute, delayed, and combination from both cases (Sutherland., 2018). CINV that are not managed properly can cause some problems, such as fluid and electrolyte imbalance, interrupt the next chemotherapy cycle, and decrease productivity and quality of life (Sommariva, 2016). By the CINV management that is being improved at this time, some patients still experience nausea and vomiting (Sutherland et al., 2018). Non-pharmacological therapy, such as relaxation techniques, is strongly suggested for patients to relieve CINV. Twenty-five minutes of an audio relaxation technique is effective in decreasing nausea and vomiting in cancer patients (Sheikh et al., 2015). One of the audio relaxation techniques is Progressive Muscle Relaxation (PMR).

Jacobson (1938) defined PMR as a procedure to get the muscles to relax in two steps. The first step is to give tension to a muscle group, and the second step is to stop the tension and pay attention to how that muscle relaxes, feel the relaxation sensation physically, and the tension is lost (Ramdhani & Putra, 2009). Physiological mechanisms stimulated by PMR include a decrease in oxygen consumption, a decrease in respiration rate and heart rate, and a decrease in muscle tension (Magor et al., 2014). PMR was founded by Edmun Jacobson in 1920, which was used to decrease anxiety at that time. According to Jacobson, muscle relaxation can stimulate the thinking relaxation (Ramasamy S et al., 2018). PMR can prevent and solve the nausea and vomiting induced by chemotherapy (Tian et al., 2019).

As explained before, nausea and vomiting induced by chemotherapy are the most significant side effects felt by patients from the patient's perspective. The nursing diagnosis from that problem is nausea in relation to chemotherapy. One of the nursing interventions to solve that

problem is non-pharmacological therapy, PMR, which has been proven by evidence to be effective in decreasing nausea and vomiting induced by chemotherapy. Gupta et al (2016) reported that PMR can reduce nausea and vomiting in cancer patients who underwent chemotherapy. In Indonesia, Utami (2016) showed her research result that PMR can decrease the nausea and vomiting in ovarian cancer patients who underwent chemotherapy. This research result is also supported by the other research, such as Charalombous et al (2016), and Tian et al (2019).

On the other hand, most of the patients who received chemotherapy in the chemotherapy room only received pharmacological therapy, such as an antiemetic agent, to prevent or reduce CINV. Most of them experienced CINV during chemotherapy. Besides implementing the pharmacological therapy, nurses need to implement the non-pharmacological therapy as an independent nursing intervention to manage the CINV. This study offered the implementation of non-pharmacological therapy as one of the evidence-based practices to reduce CINV. This study aimed to describe the implementation of PMR for the CINV of cancer patients. By the good management of CINV, it will minimize the fluid and electrolyte imbalance, the cancer patients can receive the chemotherapy on schedule without interruption and can increase the productivity and quality of life.

RESEARCH METHODOLOGY

The methodology of this research is a descriptive study. This study aimed to describe the implementation of PMR for the CINV of cancer patients. The study was in one of the type A hospitals in Jakarta, Indonesia. This hospital is a referral hospital and receives patients from lower-level hospitals. Consequently, most of the patients have multiple types of cancer. The subjects in this project are all cancer patients undergoing chemotherapy. The inclusion criteria for the study are cancer patients at least 18 years old, who can communicate well, do not experience hearing or speech problems, and are willing to be involved in the implementation of this project. The exclusion criteria are cancer patients who have problems with hearing and visual function and have altered consciousness or are in the dying process. This project was carried out during the specialist nursing program in the hospital, and all the patients who participated in the project have agreed and signed the informed consent.

The implementation of PMR is carried out using educational media in the form of videos about progressive muscle relaxation to reduce nausea and vomiting due to chemotherapy. There were 16 movements of PMR.
1: the movement of the right forearm muscle. This movement is intended to train the arm muscle by gripping the right hand while making a fist tighter, feeling the sensation of tension that occurs. Contract the forearm muscles while taking a deep breath, hold for 8 seconds, and exhale through the mouth while relaxing the muscles. Slowly release the fist while feeling relaxed.
2: the movement of right upper arm. This is aimed at training the hand muscles (upper arm / biceps) which is done by holding the right hand so that it becomes a stronger fist while feeling the sensation of muscle tension that occurs. Contract the upper arm muscles while taking a deep breath, hold for 8 seconds, exhale through the mouth while relaxing the muscles. Release the fist slowly, while feeling relaxed.
3: the movement of left forearm muscle. This is intended to train the muscles of the hand (forearm), which is done by holding the left hand while making a fist, strengthening it while feeling the sensation of tension that occurs. Contract the muscles of the forearm while taking

a deep breath, hold for 8 (eight) seconds, exhale through the mouth while relaxing the muscles. Release the fist slowly, while feeling relaxed.
4: the movement of the left upper arm. This is intended to train the hand muscles (upper arm/biceps) which is done by holding the left hand so that it becomes a stronger fist while feeling the sensation of tension that occurs. Contract the upper arm muscles while taking a deep breath, hold for 8 seconds, exhale through the mouth while relaxing the muscles. Release the fist slowly, while feeling relaxed.
5: the movement the face muscle. This is intended to relax the muscles in the face. Raise both eyebrows, frown, and eyebrows until the muscles are felt and the skin is wrinkled. Feel the tension of the forehead muscles while taking a deep breath for about 8 seconds. Then exhale through the mouth while relaxing slowly, and feel the difference between muscle tension and a relaxed state.
6: the movement of the eyes muscle. This is aimed at relaxing the eye muscles, starting with closing both eyes tightly so that you can feel the tension around the eyes and the muscles that control eye movement. Tensing the muscles for approximately 8 seconds, take a deep breath, then exhale through the mouth while relaxing slowly and feel the difference between muscle tension and a relaxed state.
7: the movement of the lower jaw muscle. It is intended to relax the jaw muscles, start by opening the mouth so that can feel the tension around the jaw and the muscles around the jaw. Do muscle tension for about 8 seconds while taking a deep breath, then exhale through the mouth and relax slowly, feel the difference between muscle tension and a relaxed state.
8: the movement of the back neck muscle. It is aimed at relaxing the muscles of the back of the neck. The patient is guided to extend the head back (looking up) so that the patient can feel the tension in the back of the neck and upper back. Stretch the muscles for about 8 seconds while taking a deep breath, then exhale through the mouth and relax slowly, feel the difference between muscle tension and a relaxed state.
9: the movement of the shoulder muscle. It is aimed at training the shoulder muscles. It is done by lifting both shoulders as high as possible, as if touching both ears. Feel the tension of the muscles for approximately 8 seconds while taking a deep breath, then exhale through the mouth and relax slowly, feel the difference between muscle tension and a relaxed state.
10: the movement of the back muscle. It is aims to train the back muscles. This movement can be done by pushing the back and chest forward (puffing out the chest). Feel the tension of the muscles for about 8 seconds while taking a deep breath, then exhale through the mouth and relax slowly, feel the difference between muscle tension and a relaxed state.
11: the movement of the chest muscle. It is done to relax the chest muscles. Take a deep breath to fill the lungs with as much air as possible (expand the chest). Hold for a few moments, while feeling the tension in the chest then down to the stomach. When the tension is released, the patient can breathe normally with relief.
12: the movement of thigh muscle. It is aimed at training the thigh muscles (front), done by sitting upright then tensing both thigh muscles. Feel the tension of the muscles for approximately 8 seconds while taking a deep breath, then exhale through the mouth and relax slowly, feel the difference between muscle tension and a relaxed state.
13: the movement of right foot muscle. It is aimed to train the leg muscles (front/cruris), done by sitting up straight then straightening the right leg and tensing the lower leg muscles. Feel the tension of the muscles for approximately 8 seconds while taking a deep breath, then exhale through the mouth and relax slowly, feel the difference between muscle tension and a relaxed state.
14: the movement of right of sole of the foot. It is aimed to train the plantar muscles, done by sitting up straight then flexing the plantar muscles of the right foot and tensing them. Feel the tension of the muscles for approximately 8 seconds while taking a deep breath, then exhale

through your mouth and relax slowly, feel the difference between muscle tension and a relaxed state.
15: the movement of the left foot muscle. It is aimed at training the leg muscles (front/cruris), done by sitting up straight then straightening the left leg and tensing the lower leg muscles. Feel the tension of the muscles for approximately 8 seconds while taking a deep breath, then exhale through the mouth and relax slowly, feel the difference between muscle tension and a relaxed state.
16: the movement of the left of the sole of the foot. It is aimed to train the plantar muscles, done by sitting up straight then flexing the plantar muscles of the left foot and tensing them. Feel the tension of the muscles for approximately 8 seconds while taking a deep breath, then exhale through your mouth and relax slowly, feel the difference between muscle tension and a relaxed state.

The instrument for assessing nausea and vomiting was the Multinational Association of Supportive Care in Cancer (MASCC) Antiemesis Tool. The reliability value interpreted in the Cronbach alpha MASCC Antiemesis Tool (MAT) coefficient value is 0.77 (Molassiotis et al, 2007). MAT instrument points 1 to 4 were assessed 24 hours after chemotherapy (first day evaluation). MAT instrument points 5 to 8 were asked on the fourth day after chemotherapy (fourth day evaluation). The category of nausea and vomiting from the MAT instrument, either on the 1st or 4th day evaluation, into mild nausea and severe nausea and vomiting, was determined based on the cut-off point value, where the data distribution was obtained from the mean value. The cut-off point of the MAT instrument based on the distribution of data from the implementation of the innovation program was 2, where mild nausea and vomiting if the total MAT value <2, while severe nausea and vomiting if the total MAT value was more than or equal to 2.

PMR is performed twice a day for 5 days. This project was carried out in June 2020 during the COVID-19 pandemic by using the appropriate health protocol. In the first training, patients were accompanied by researchers, guided by the PMR audiovisual, to do the PMR during chemotherapy. For the next training, patients do the PMR independently, guided by the PMR audiovisual and the checklist schedule.

RESULT AND DISCUSSION

This descriptive study has 20 cancer patients as respondents and was carried out in the chemotherapy room. Due to the outbreak of the COVID-19 pandemic, the study was unexpectedly condensed into only seven days of implementation. The description of cancer patients who participated in the PMR exercise can be seen in Table 1.

Table 1. Description of Cancer Patients Who Did PMR Exercise

Variable	Category	Patients (n (%))
Gender	Female	9 (45)
	Male	11 (55)
Age (year)	< 30	1 (5)
	30-39	2 (10)
	40-50	7 (35)
	>50	10 (50)
Education	Elementary School	3 (10)
	Junior High School	4 (15)
	Senior High School	10 (50)
	Bachelor Degree	5 (25)

Marital Status	Not Married	2 (10)
	Married	18 (90)
Cancer Diagnosis	Carsinoma Cell Squamosa	3 (15)
	Nasopharingeal Cancer	7 (35)
	Limfoma Non Hodgkin	2 (10)
	Multiple Myeloma	1 (5)
	Breast Cancer	4 (20)
	Colon Cancer	2 (10)
	Pancreas Cancer	1 (5)
Chemotherapy History	Yes	13 (65)
	No	7 (35)
Chemotherapy Regimen	Cisplatin and 5 FU	11 (55)
	ICE and Mesna	1 (5)
	FAC	1 (5)
	Carboplatin, 5 FU	5 (25)
	5 FU, Intracetan, Leucovorin	1 (5)
	RCHOP	
		1 (5)
Evaluation Day 1	Mild nausea and vomiting	10 (50)
	Severe nausea and vomiting	10 (50)
Evaluation Day 4	Mild nausea and vomiting	9 (45)
	Severe nausea and vomiting	11 (55)
The Difference between Evaluation Day 1 and Day 4	MAT score decrease	7 (35)
	MAT score consistent	7 (35)
	MAT score increase	6 (30)

Based on Table 1, most of the cancer patients who participated in the PMR are male (55%), and the age is more than 50 years old (50%). Most of the patients are married (90%) and have passed the senior high school (50%). Most of the cancer diagnoses are nasopharyngeal cancer (35%), breast cancer (20%), and squamous cell carcinoma (15%). The other cancer diagnoses are colon cancer, non-Hodgkin lymphoma, multiple myeloma, and pancreatic cancer. Most of the patients have a chemotherapy history (65%), with the majority of chemotherapy regimens being cisplatin and 5-FU (55%). Cisplatin has the characteristic high emetogenic, but 5 FU is low emetogenic.

The Chart 1 showed the difference between evaluation day 1 and day 4 using MAT instrument.

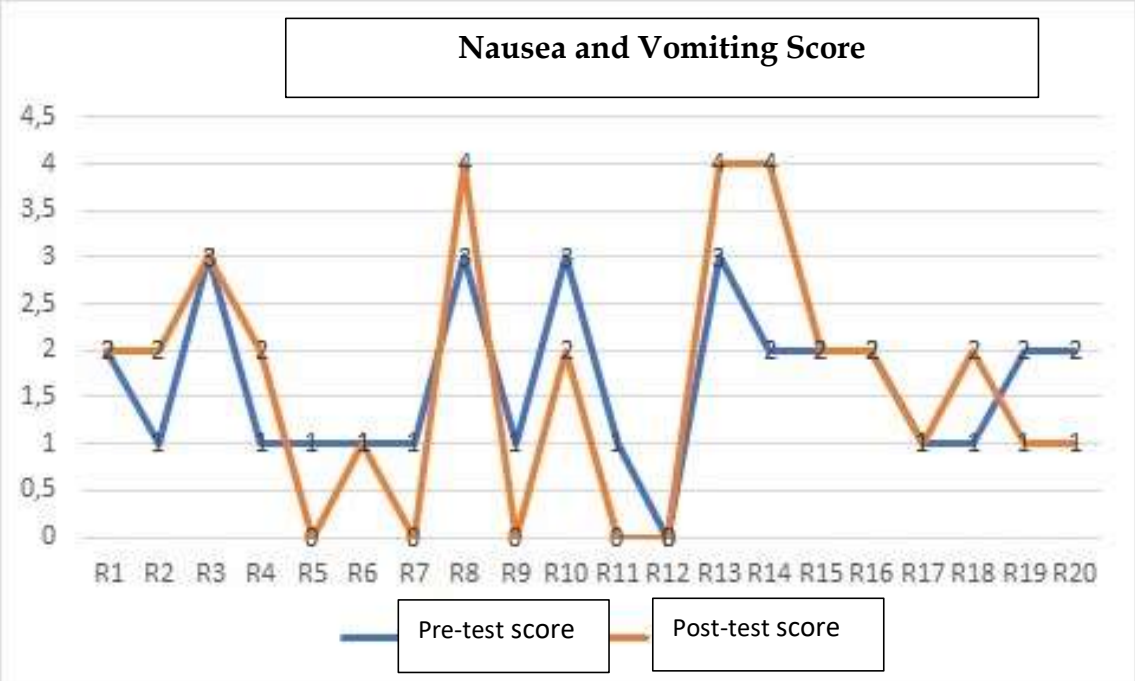

Chart 1 showed that on evaluation day 1, patients with a MAT score of < 2 (mild nausea) was 10 patients, whereas patients with a MAT score ≥ of 2 (severe nausea) was 10 patients. On evaluation day 4, patients whose MAT score was < 2 (mild nausea) was 9 patients, whereas patients had a MAT score ≥ of 2 (severe nausea) was 11 patients. Patients whose MAT score decreased were 7 patients (35%), no difference in MAT score was 7 patients (35%), and an increase in MAT score was 6 patients (30%).

Most of the cancer patients in this study were more than 50 years old. This is consistent with the research result before done by Rif'atunnisa, Rachmawaty, & Sinrang (2017), who showed that participant age was 46.18 +-9.04 and experienced nausea and vomiting. The other research done by Chean et al (2016) also showed that most of the respondents (65.6%) were aged 40-60 years old, and most of them experienced nausea and vomiting after chemotherapy. Age has a correlation with CINV. Age less than 60 years old has a significant risk of experiencing CINV acute and delayed (Juartika et al, 2019).

CINV is categorized into three kind, acute CINV, delayed CINV, and anticipatory CINV. Acute CINV occurred in 24 hours post chemotherapy and the peak is 5-6 hours after chemotherapy. Delayed CINV occurred after 24 hours until 5-7 days. Delayed CINV is usually felt by patients who receive chemotherapy regimens such as cisplatin, carboplatin, siklofosfamid, and doksorubicin. Anticipatory CINV occurred before chemotherapy, caused by anxiety and oral hygiene. Acute CINV occurred in 39 % cancer patients, whereas delayed CINV occurred in 68% cancer patients; acute vomiting occurred in 12% cancer patients, and delayed vomiting occurred in 23% patients (Shinta & Surarso, 2016).

Most of the cancer patients in this study have a history of chemotherapy. Research result done by Rif'atunnisa, Rachmawaty, & Sinrang (2017) showed that there was no significant correlation between chemotherapy history and the CINV. Most of the patient's cancer received the chemotherapy regimen cisplatin and 5FU (55%). Research showed that emetogenic level has a significant relation with the CINV, with a p value of 0.045 (Rif'atunnisa, Rachmawaty, & Sinrang, 2017). It was suitable for this study that most of the cancer patients

received cisplatin, which has strong emetogenic effects. Strong emetogenic can cause nausea and vomiting in 90% patients (Shinta & Surarso, 2016).

Evaluation PMR day 1 compared with day 4 showed that patients whose MAT decreased were 7 patients (35%), no difference was 7 patients (35%), and MAT increased in 6 patients (30%). 35% cancer patients experienced a decrease in nausea and vomiting after doing PMR. This is consistent with the research done by Tian et al (2019) that showed PMR can prevent and solve the nausea and vomiting induced by chemotherapy. Several studies have shown that PMR exercise intervention in cancer patients can reduce nausea and vomiting scores and the severity of nausea and vomiting due to chemotherapy. This is evidenced by the research conducted by Zang et al (2017) and Li et al (2019), showing that PMR is able to reduce nausea and vomiting in both the acute and slow phases, reduce anxiety levels, increase comfort, reduce fatigue and improve sleep quality. _PMR is able to divert the patient's attention from anxiety and stress, reduce muscle tension, cause a feeling of relaxation. Relaxation reduces muscle contractions in the digestive tract associated with nausea and vomiting after chemotherapy. The sensitivity to the nausea to vomiting response on the CTZ decreased, consequently decreasing the effect on vomiting control centres in the brainstem, as well as at the higher brain centres. In addition, relaxation conditions affect the work of the parasympathetic nerves, where these nerves tend to reduce work in various body systems, such as reducing pulse, breathing, and gastrointestinal motility. A decrease in the abdominal vagal nerves by parasympathetic activation can inhibit the excitability of the efferent nerves. When efferent nerve fibers are blocked, the autonomic and sympathetic reflex stimuli also decrease so that nausea and vomiting will be controlled.

There were six cancer patients whose MAT increased, R2 (respondent 2) from 1 to 2 score, R4 from 1 to 2, R8 from 3 to 4, R13 from 3 to 4, R14 from 2 to 4, and R18 from 1 to 2. Based on the chemotherapy regimen, the six cancer patients received a chemotherapy regimen that has a strong and intermediate emetogenic effect, cisplatin and carboplatin. Strong emetogens can cause nausea and vomiting in > 90 % cancer patients, and intermediate emetogens can cause nausea and vomiting in 30-90 % cancer patients (Shinta & Surarso, 2016). In this implementation of PMR, most of the patients received a chemotherapy regimen of cisplatin and carboplatin, which resulted in nausea and vomiting still being felt until 5-7 days (delayed CINV). This is consistent with the research done by Shinta & Surarso (2016) that showed 68% cancer patients experienced delayed CINV.

As a follow-up to the implementation of PMR to reduce CINV, the evaluation of nausea and vomiting with the MAT instruments can be continued until day 7 post-chemotherapy, consistent with the research done by Shinta & Surarso, which showed that delayed CINV can be felt up to 5-7 days. So, the evaluation of nausea and vomiting after doing PMR can be done on day 1, 4, and 7 of chemotherapy to make sure patients have passed the peak of delayed CINV.

The limitation of this study is that researchers did not create the control and intervention groups because of the time limitation when the nursing specialist program was conducted. So the effect of PMR on the CINV couldn't reach a stronger level. The recommendation for the next research may be to conduct intervention research in order to prove the effectiveness of PMR to reduce CINV at a stronger level, so that this intervention can be included as a procedure operational standard for CINV management of cancer patients in the hospital or community setting.

CONCLUSION

The study was taken from one of the type A hospitals in Jakarta, Indonesia. It consisted of 20 cancer patients who underwent chemotherapy. After doing PMR exercise guided by an educational video on a tablet for 4 days after chemotherapy, it was found that there was a 35% decrease in nausea and vomiting scores; they felt comfortable and more relaxed. The educational video of PMR supports the patients in doing the exercise well when done in the hospital or at home. Therefore, preventing or reducing the potential problem caused by nausea and vomiting induced by chemotherapy can increase the quality of nursing care for the cancer patient. The results of this case report indicate that progressive muscle relaxation can reduce nausea and vomiting due to chemotherapy.

REFERENCES

Charalambous et al. (2016). Guided Imagery and Progressive Muscle Relaxation as a Cluster of Symptoms Management Intervention in Patients Receiving Chemotherapy: A randomized control trial. 1-18.

Chen et al. (2018). Sleep Duration and the Risk of Cancer: A systematic revew and meta-analysis including dose-response relationship. *BMC Cancer.* 1-13. https://doi.org/10.1186/s12885-018-5025-y.

Gupta et al. (2016). Effectiveness of Progressive Muscle Relaxation Technique on Physical Symptoms among Patients Receiving Chemotherapy. 12(1): 33-40.

Li, N.; Zhong, Y.P.; Sun, S.R. (2019). *Efficacy of progressive muscle relaxation training on prevention of chemotherapy-induced nausea and vomiting in patients with breast cancer.* Shanghai Nursing, 19, 10-13.

Juartika, W., Harmi, P.K., & Fatmadona, R. (2019). Gambaran Skor INVR (*Index of Nausea, Vomiting and Retching*) pada CINV (*Chemotherapy Induced Nausea and Vomiting*) Kanker Payudara di RSUP M Djamil Padang. *Jurnal Kesehatan Andalas.* 8(4): 209-214.

Magor et al. (2014). Effect of Progressive Muscle Relaxation Technique Versus Acupressure on Chemotherapy Induced Nausea and Vomiting in Leukemic Children. *Internasional Jornal of Current Research*. 6(7): 7674-7682.

Ramasamy et al. (2018). Progressive Muscle Relaxation Tecnique on Anxiety and Depression Among Persons Affected by Leprosy. *Journal of Exercise Rehabilitation*. 14(3): 375-381.

Ramdhani, N & Putra. (2009). Studi Pendahuluan Multimedia Interaktif "Pelatihan Relaksasi". http://lib.ugm.ac.id/data/pubdata/relaksasi.pdf.

Rif'atunnisa, Rachmawaty, R., & Sinrang, A.W. (2017). Faktor Risiko Terjadinya Mual Muntah Lambat Akibat Kemoterapi Pada Pasien Kanker Payudara. *Jurnal Ilmiah Kesehatan*. 11(4): 388-392.

Sheikh, M.A., Ebadi, A., Talaeizadeh, A & Rahmani, H. (2015). Alternative Methods to Treat Nausea and Vomiting from Cancer Chemotherapy: Review article. *Chemotherapy Research and Practice*. 1-6. http://dx.doi.org/10.1155/2015/818759.

Shinta, N & Surarso, B. (2016). Terapi Mual Muntah Paska Kemoterapi. Jurnal THT. 9(2): 74-83.

Sommariva, S., Pongiglione, B., Tarricone, R. (2016). Impact of Chemotherapy-Induced Nausea and Vomiting on Health-Related Quality of Life and Resource Utilization: A systematic review. *Critical Reviews in Oncology/Hematology*. 99:13-36.

Sutherland et al. (2018). Olanzapine for the Prevention and Treatment of Cancer-Related Nausea and Vomiting in Adult. Cochrane Database of Systematic Reviews. DOI: 10.1002/14651858.CD012555.pub2.

Tian, X.; Xu, L.; Tang, R.; Chen, H.; Pi, Y.; Chen, W. (2019). Role of Progressive Muscle Relaxation in Preventing and Alleviating of Nausea and Vomiting Caused by

Chemotherapy among Cancer Patients: A Systematic Review of Six Randomized Controlled Trials.

Utami, S. (2016). Efektivitas Latihan Progressive Muscle Relaxation (PMR) terhadap Mual Muntah Kemoterapi Pasien Kanker Ovarium. 83-90.

Wood, G.J., Shega J.W., Lynch, B., & Roenn, J.H. (2007). *Management of intractable nausea and vomiting in patients at the end of life.* Journal of American Medical Association, 298 (10), 1196-1207.