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THE EFFECTIVENESS OF ACUPRESSURE ON NAUSEA AND VOMITING AMONG PATIENTS WITH CANCER RECEIVING CHEMOTHERAPY IN EAST KALIMANTAN

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Abstract

Chemotherapy is one of the therapies for cancer patients which causing side effects, including nausea and vomiting. Improper management of these effects may contribute to fluid and electrolyte imbalance and disrupt the cycle of chemotherapy. Acupressure is one of the complementary therapies to reduce nausea and vomiting due to chemotherapy. This study aimed to analyze the effectiveness of acupressure on nausea and vomiting in patients undergoing chemotherapy at the cancer Shelter in East Kalimantan, Indonesia. This was a quasi experimental study, using a time series design. There were 11 samples recruited using purposive sampling technique. Repeated ANOVA test was performed to analyze the data. The results showed there was a significance decrease in the level of nausea and vomiting every time the patient was given acupressure ($p<0.05$), from the mean score of 18.91 on prettest, then it progressively reduced to 13.73 (posttest 1), 10.27 (posttest 2), and 7.18 (posttest 3) . The administration of effective acupressure therapy can be given at any time to reduce the level of nausea and vomiting. Future comparative studies with other types of treatment like aromatherapy and a larger sample size should also be considered.

***Keywords**: Acupressure, cancer, chemotherapy, nausea, vomiting.*

Abstrak

Kemoterapi merupakan salah satu terapi bagi pasien kanker yang menimbulkan efek samping antara lain mual dan muntah. Manajemen yang tidak tepat dari efek ini dapat menyebabkan ketidakseimbangan cairan dan elektrolit dan mengganggu siklus kemoterapi. Akupresur merupakan salah satu terapi komplementer untuk mengurangi mual dan muntah akibat kemoterapi. Penelitian ini bertujuan untuk menganalisis efektivitas akupresur terhadap mual muntah pada pasien yang menjalani kemoterapi di Cancer Shelter Kalimantan Timur, Indonesia. Penelitian ini merupakan penelitian eksperimen semu, dengan menggunakan desain deret waktu. Ada 11 sampel yang direkrut menggunakan teknik purposive sampling. Uji ANOVA berulang dilakukan untuk menganalisis data. Hasil penelitian menunjukkan ada penurunan yang signifikan pada tingkat mual muntah setiap kali pasien diberikan akupresur ($p<0,05$), dari skor rata-rata 18,91 pada prettest, kemudian menurun secara progresif menjadi 13,73 (posttest 1), 10,27 (posttest 2), dan 7.18 (posttest 3). Pemberian terapi akupresur yang efektif dapat diberikan setiap saat untuk menurunkan tingkat mual dan muntah. Studi banding di masa depan dengan jenis pengobatan lain seperti aromaterapi dan ukuran sampel yang lebih besar juga harus dipertimbangkan.

Kata Kunci: Kata kunci: Akupresur, kanker, kemoterapi, mual, muntah.

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Introduction

Cancer begins when abnormal cells are altered by genetic mutations in cellular DNA. The abnormal cells form clusters and begin to proliferate abnormally, ignoring the cell's environment's growth-regulating signals (Carbone et al., 2020; Ehrlich, 2019; Firmana, 2017). In 2020, cancer was one of the main causes of mortality worldwide. Global Burden of Cancer (Globocan), International Agency for Research on Cancer (IAEC), stated that there were 14,067,894 new cases and 8,201,575 deaths from cancer worldwide (Pusat Data dan Informasi Kementerian Kesehatan Republik Indonesia, 2015; Sung et al., 2021).

The prevalence of cancer in Indonesia continues to increase from 1.4% to 1.49% in 2018. World Health Organization (WHO) stated that the number of cancer cases until 2018 was 18.1 million cases and 9.6 million deaths. It was estimated that it will continue to increase to more than 13.1 million by 2030 (Cao, Chen, Yu, Li, & Chen, 2021; Kementerian Kesehatan Republik Indonesia, 2018). The incidence of cancer in East Kalimantan for cervical cancer is 0.4% based on medical diagnosis with an estimated number of 752 patients, breast cancer 1.0% ((1,879 patients), colon and rectum cancer 1.2% (1,923 patients), lung cancer 0.8% (875 patients), and leukemia 0.3% or 653 patients (Kemenkes RI 2018).

One of the treatments that can be given to cancer patients is chemotherapy (Afrianti & Pertiwi, 2020; Tanay, Armes, Moss-Morris, Rafferty, & Robert, 2021). This therapy is considered more effective because the drug will be given directly through the blood vessels and reach the cancer cells that metastasize to other tissues (Bennardo et al., 2021; Cascella & Stones, 2021). However, the side effects of chemotherapy are divided into physical and psychological. The most frequent of side effects were nausea and vomiting. Complaints of nausea and vomiting may contribute to poorer quality of life and sometimes can make the patient skip the chemotherapy (Meissner et al., 2019; Sun et al., 2021; H. Zhao et al., 2022). It is estimated that 60% of people undergoing chemotherapy experience nausea and vomiting. Uncontrolled nausea and vomiting can cause electrolyte and fluid imbalance, dehydration, anorexia and weight loss (Navari & Schwartzberg, 2018; Schwartzberg et al., 2020).

Pharmacological management consists of giving serotonin antagonists, central nervous system depressants, antihistamines and antiemetics (Belkacemi & Darmani, 2020). The non-pharmacological management includes music therapy, acupressure, yoga and acupuncture, non-pharmacological treatment in controlling nausea and vomiting are easy to learn and more effective than pharmacological therapy (Nguyen & Lee, 2017; X. Zhang, Qiu, Li, Cai, & Qi, 2021).

Acupressure is one of the complementary therapies that can reduce nausea and vomiting due to chemotherapy in cancer patients (Genç, Can, & Aydiner, 2013), through manipulation effects at points P6 and ST36, providing benefits in the form of improving energy in the spleen and stomach meridians, thereby strengthening digestive tract cells against the effects of chemotherapy which can reduce nausea and vomiting stimulation to the vomiting center. This manipulation can also increase the beta endorphins in the pituitary which can be a natural antiemetic through its work to reduce nausea and vomiting impulses in the Chemoreceptor Trigger Zone (CTZ) and vomiting center (Alfar, Safwat, & Afify, 2019; Miao et al., 2017; Shin & Park, 2018; Q. Zhao et al., 2020).

Methods

This was a quasi-experimental approach with a time series design. The population were patients with cancer undergoing chemotherapy at a cancer shelted in East

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Kalimantan of Indonesia. The sample size in the study was determined based on Dahlan (2016). The following is the sample size calculation formula:

$$n1=n2=\left(\frac{(Z\alpha+Z\beta)S}{(X1-X2)}\right)^2$$
$$=\left(\frac{(1.645+0.842)2.64}{4}\right)^2$$
$$=\frac{43.108}{4}=10.77=11$$

Notes:
- *n: Sample size*
- *Zα: Type I error (5%), one-tailed, Zα=1,645*
- *Zβ: Type II error ((10%), Zβ=0,842*
- *S: Standar deviation of groups, S=2,64*
- *X1-X2: Minimum mean difference considered as significant=4*

Purposive sampling technique was used to select the samples with the following inclusion criteria: Adult cancer patients undergoing chemotherapy, conscious, experiencing nausea and vomiting after chemotherapy, willing to be given acupressure therapy, able to communicate verbally, and are given antiemetic drugs. The exclusion criteria were unstable patients, having a history of nausea and vomiting due to travel or pregnancy, injured skin, swelling, fractured bones, burned skin in the area to be given acupressure therapy. Assessment of nausea and vomiting using the Rhodes Index Nausea, Vomiting and Recting (RINVR).

Approval was obtained from the Institutional Review Boards (IRBs) of the Faculty of Medicine Mulawarman University (Reference No: 37/ KEPK-FK/ IV). Data collection in this study was carried out after the patient met the inclusion and exclusion criteria and signed the informed consent. Before the intervention, the researchers assessed nausea and vomiting in respondents as the data pretest for cancer patients after chemotherapy. The intervention given was acupressure at points P6 and ST36. The intervention was given on day 2-5 after chemotherapy.

Bivariate analysis was conducted to determine the difference in the mean score of nausea and vomiting before and after the intervention. The normality test was carried out first using Shapiro-wilk. Repeated ANOVA test was utilized because the data were normally distributed. The alpha was set at 0.05.

Result

Table 1 showed the demographic and clinical characteristics of respondents. The mean age of respondents was 52 years (SD=22,73), with the interval age from 43-67. Majority were female with a total of 6 respondents (54.5%). The most common cancer were breast and rectal cancer suffered by 3 respondents (27.3%), The most of patients were included at stage 3 as many as 6 respondents (54.5%) Based on the type of treatment, the most frequent were chemotherapy, surgery and radiotherapy as many as 7 respondents (63.6%).

Table 1 Distribution of demographic and clinical characteristic of study subjects (n=11)

Variables	n / Mean	% / SD
Age	52	22.73
Gender		
Male	5	45.5
Female	6	54.5
Type of cancer		
Cervical	2	18.2
Rectal	3	27.3
Brain	1	9.1
Colon	1	9.1
Breast	3	27.3
Nasopharynx	1	9.1
Stage		
II	2	18.2
III	6	54.5
IV	3	37.3
Type of treatment		
Chemotherapy & Surgery	1	9.1
Chemotherapy & Radiotherapy	1	9.1
Surgical & Chemotherapy	2	18.2
Radiotherapy	7	63.6

After being given acupressure therapy, the results showed that there was a decrease every time the intervention was given. On the pretest, the mean score was 18.91, then it gradually decreased to 13.73 (posttest 1), 10.27 (posttest 2), and 7.18 (posttest 3).

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Table 2. The mean level of nausea and vomiting before and after the intervention (n=11)

Test	Mean	(SD)	*p*
Pretest	18.91	6.268	<0.05
Posttest 1	13.73	6.326	
Posttest 2	10.27	6.886	
Posttest 3	7.18	5.618	

Post hoc paired wise comparison results is depicted in Table 3. There were significant effects of acupressure therapy in reducing nausea and vomiting in cancer patients undergoing chemotherapy ($p<0.05$).

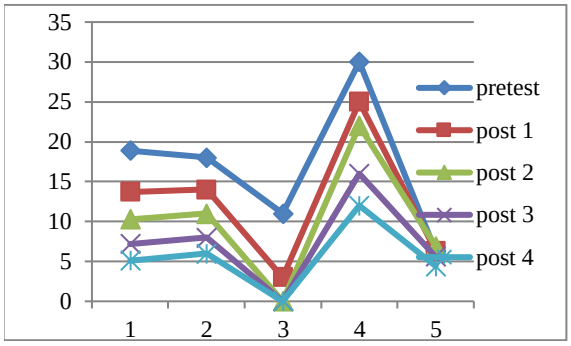
Table 3. Paired wise comparison test result (n=11)

Intervention	Mean	CI 95%	*p*
Before 1st interv.	5.182	3.148-7.215	<0.001
Before 2nd interv.	8.636	6.852-10.421	<0.001
Before 3rd interv.	11.727	8.662-14.793	<0.001
Before 4th interv.	13.818	11.134-16.502	<0.001
1st to 2nd interv.	3.455	6852-10.421	<0.001
1st to 3rd interv.	6.545	3.155-9.936	0.002
1st to 4th interv.	8.636	5.643-11.630	<0.001
2nd to 3rd interv.	3.091	679-5.503	0.021
2nd to 4th interv.	-3.455	-6.263-645	0.017
3rd to 4th interv.	2.091	180-4.602	0.035

Notes: Interv.=Intervention

The study findings portrayed in Graph 1 showed that at the beginning of the pretest, respondents experienced severe nausea and vomiting after being given the first acupressure therapy intervention. Up to the fourth intervention, there was a decrease. At the time of the first posttest, 6 respondents experienced a decrease in the score of nausea and vomiting to moderate (9-16), 4 other respondents experienced a decrease with a score of (1-8) mild nausea and vomiting. The second to fourth administration of respondents experienced a decrease in mild nausea and vomiting among 8 respondents, 1 person with moderate nausea and vomiting and 2 others did not experience nausea and vomiting.

Graph 1. The mean score of nausea and vomiting in cancer patients undergoing chemotherapy before and after being given acupressure therapy (n=11)



Discussion

The most frequent symptoms felt by patients with severe to bad complaints or on a scale (17-32) were patients said they had vomited 7 times or more, due to vomiting the patient was unable to eat and felt pain in the abdomen for quite a long time. >6 hours, feeling dizzy, making the patient unable to carry out normal activities, this makes the patient weak and anxious. Complaints felt by respondents on a moderate scale (9-16) include vomiting about 3-4 times. Nauseous, abdominal pain, and headaches make the patient uncomfortable (Kim et al., 2007).

The nausea and vomiting experienced by the patient as the side effects of stimulation of chemotherapy drug substances and their metabolites to the nausea and namely the vomiting center located in the medulla oblongata and chemoreceptors (Chen, Wu, Chen, & Zhou, 2021; Huang et al., 2021). Trigger zone (CTZ) located in the area postrema (AP) behind the fourth ventricle through afferent nerve fibers (Wickham, 2020). Furthermore, the stimulus is responded through afferent nerve fibers in the vagus nerve and simultaneously the vomiting center provides an autonomic reflex stimulus and sympathetic reflex that accompanies nausea and vomiting in the form of abdominal and diaphragm muscle contractions, bowel peristaltic movements, vasoconstriction, tachycardia, and diaphoresis (Ergin, Midilli, Akdağ, & Kirgöz, 2021; Xie et al., 2017). This process involves several neurotransmitters and the symptoms of nausea and vomiting in

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chemotherapy patients are not only influenced by neuropathophysiological factors, but can be influenced by psychological factors (Gupta, Walton, & Kataria, 2021; Huang et al., 2021).

Side effects of chemotherapy are not optimal in the initial cycle can cause discomfort for the patient this affects the emotional response (anxiety) which can worsen the incidence of nausea, *retching*, and vomiting (Greenlee et al., 2017; Macleod & Maddocks, 2018; Yeo et al., 2020). This anxiety will stimulate the sympathetic nervous system through the hormone adrenaline. Stress receptors occur when the pituitary hypothalamus signals the adrenal glands to produce adrenocorticotrophic hormone (ACTH) (Dai et al., 2020; Iftikhar, Islam, Shepherd, Jones, & Ellis, 2021). Furthermore, ACTH will stimulate the adrenal medulla to produce epinephrine and stimulate the adrenal cortex to produce cortisol. Increased levels cortisol can lead to stress and an increase in stomach acid, while an increase in epinephrine can lead to an increase in blood sugar levels (Iftikhar et al., 2021).

The results of the study were based on the mean score of nausea and vomiting in cancer patients who underwent chemotherapy before being given acupressure therapy varied in each patient with a nausea and vomiting score of at least 12 with a moderate level of nausea and vomiting (9-16) and a maximum nausea and vomiting score of 30 with a score level of severe to poor nausea and vomiting (17-32). Nausea and vomiting scores were divided into 5 categories; 0 = no nausea and vomiting, 1-8 = mild nausea and vomiting, 9-16 = moderate nausea and vomiting, 17-24 = severe nausea and vomiting and 25-32 = bad nausea and vomiting (Iftikhar et al., 2021). Study finding shows that the level of nausea and vomiting of cancer patients undergoing chemotherapy at the East Kalimantan Cancer Shelter is at a severe to poor level. This study is in line with research conducted (Li, 2021; Liu et al., 2021), Nausea and vomiting are one of the most common side effects during radiation, of which approximately 50% to 80% of patients undergoing radiotherapy will suffer (Li, 2021).

With a mean level of nausea and vomiting of 19.95 or it can be said that the patient has severe nausea and vomiting. Previous studies also have shown that cancer patients undergoing chemotherapy have a mean CINV as high as 60%-90%, especially late-onset nausea and vomiting, which is the most difficult to control and predict accurately cause problems such as electrolyte disturbances and malnutrition, but can also increase a patient's anxiety, depression, and other negative emotions, reduce patient adherence to medication, and even lead to medication interruptions, which are life-threatening (Byju, Pavithran, & Antony, 2018; Essawy, Abohadida, Abd-Elkader, Fathy, & Hassab, 2021; Shi et al., 2019).

The administration of acupressure therapy is effective in reducing the level of nausea and vomiting every time it is given from the first administration to the fourth intervention, so that effective acupressure therapy is given to the patient every time the patient feels nausea and vomiting, to help reduce the patient's level of nausea and vomiting, Nurses can also make patients independent by teaching how to perform acupressure actions at points P6 and ST36 so that when patients feel symptoms of nausea and vomiting again, they can do it themselves to reduce nausea and vomiting and to make patients more comfortable, This result is in line effective acupressure therapy is carried out at any time, when the patient feels nausea and vomiting (Tsugita et al., 2021).

Acupressure therapy is effective because when given acupressure therapy at points P6 and ST36 it can improve the flow of energy

originating in the spleen and stomach. Thus it will strengthen the cells of the digestive tract against chemotherapy so that the stimulation of nausea and vomiting to the vomiting center will be reduced, not only that the emphasis on points P6 and ST36 can stimulate the release of beta endorphine in the pituitary. Beta endorphine cells are one of the natural antiemetics that function to reduce nausea and vomiting impulses in the Chemoreceptor Triger Zone (CTZ) and vomiting center, also stated that giving acupressure therapy at points P6 and ST36 can reduce nausea and vomiting because it can reduce nausea and vomiting. help repair energy "Qi" in the stomach thereby reducing the response to nausea and vomiting (S. Zhang et al., 2021).

Theory of Chinese medicine stated that nausea and vomiting due to chemotherapy occurs due to blockage or an imbalance of vital energy in the stomach, giving acupressure therapy at points p6 and ST36 is believed to reduce the level of nausea and vomiting because at that point it can improve vital energy in the stomach so that the stomach can work normally. Energy that is in a balanced condition will carry out its function in providing nutrients to tissues and will activate the function of organs and balance body functions (Rafiee Sarbijan Nasab et al., 2021; S. Zhang et al., 2021). Nausea and vomiting occur due to the flow of *qi* that is not in its flow, causing an imbalance in the stomach and spleen so that the action of giving acupressure therapy is carried out by manipulating points along the meridians or nerve fibers that affect the stomach and spleen, so that the disharmonious energy returns to the stomach and spleen. in a balanced condition (Tan, Liu, Suen, Molassiotis, & Wang, 2020).

This study has some potential limitations. The sample size is too small and the intervention period is quite short. It would be useful to replicate the study using larger sample size across the other areas and conduct a longer intervention period to provide more insight into the effectiveness of the therapy, even though the chance of drop out is greater.

Conclusion

The present study identified that acupressure therapy is effective to reduce the level of nausea and vomiting in cancer patients undergoing chemotherapy. The findings lead us to propose that this therapy should be utilized as an option of nursing intervention for such patients. We suggest further study to examine explore the involvement of comorbidities among patients when receiving acupressure therapy with probability sampling technique to be able to provide a better generalization. Comparative studies with other types of treatment such as aromatherapy may also be considered.

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