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Effect of Nei Guan Acupressure Point as Adjuvant Therapy on Highly Emetogenic Chemotherapy-Induced Nausea-Vomiting in School-Age Children with Cancer

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Abstract

Chemotherapy as a pediatric cancer treatment has nausea and vomiting side effects. Nausea and vomiting in school-age children with cancer can lead to nutritional, emotional, playing, and school function disorders, decreasing the quality of life in children. An adjuvant therapy that can decrease chemotherapy-induced nausea and vomiting is acupressure which is non-invasive and safe. Nei Guan acupressure point uses pressure technique on the wrist. This study was conducted to determine effects of Nei Guan acupressure on nausea and vomiting due to highly emetogenic chemotherapy in school-age children with cancer. The study design was quasi-experimental through a pre-post test design study approach, with single-blind control. Thirty respondents obtained from the average calculation of two population hypothesis test, were divided into a control and intervention group comprising 15 people respectively. Both groups got the same antiemetic. Measurement of nausea was performed three times during the study using the Pediatric Nausea Assessment Tools (PeNAT), while vomiting intervals were documented for every vomiting and retching. Data analysis used the Mann Whitney and independent t-test. The analysis result in the control group showed that the average nausea value tended to increase and the vomiting interval was faster than in the intervention group. In conclusion, Nei Guan acupressure affects nausea and vomiting due to highly emetogenic chemotherapy in school-aged children with cancer although it is not statistically significant (p-value> 0.05). Nurses are expected to monitor ongoing nausea and vomiting, and consider acupressure as adjuvant therapy, besides providing pharmacological treatment to reduce nausea and vomiting.

Keywords: Acupressure, chemotherapy, nausea, school-age children, vomiting.

Introduction

The Ministry of Health of the Republic of Indonesia (2015) explains that cancer is included in non-communicable diseases and is the cause of around 8.2 million deaths in the world in 2012. WHO data (2016) revealed the prevalence of pediatric cancer is approximately 4% of all cancer cases, and child mortality in the world due to cancer is estimated at 90,000 children each year. The Indonesian Hospital Association Data and Information Center (PERSI) (2014) reports that 2–4% of cancer incidence in Indonesia occur in pediatric patients. It estimates that every year there are approximately 11,000 cases of childhood cancer, and about 10% of child mortality is caused by cancer.

Childhood cancer management includes surgery, chemotherapy, and radiotherapy. The therapy can be single or combined. Providing treatment through radiotherapy and surgery is a local therapy while giving treatment through chemo is a systemic therapy (Balduci, 2008). The primary goal of chemotherapy is to cure, control or reduce the growth of cancer cells (Price & Wilson, 2009).

The incidence of side effects in pediatric patients is bone marrow depression, diarrhea, stomatitis, hair loss, skin disorders, and vomiting and nausea (Apriany, 2010). Chemotherapy-induced nausea and vomiting are the most common side effect in children. The study of Millennials, Baraz, Baraz, Nourt, and Baeis (2015) explained that the prevalence of chemotherapy-induced nausea and vomiting in pediatric patients is 54% -96%. The most feared experience by patients is nausea, while in the third place is vomiting. The response of vomiting to chemotherapy can occur after emetogenic agents have chemically stimulated the vomiting center. Emetogenic agents directly stimulate the release of serotonin (5 HT3) from intestinal enterochromaffin cells to the Chemoreceptor Trigger Zone (CTZ) in the area postrema of the cortex and arouse the vomiting center, resulting in nausea and vomiting reactions (Rhodes & Mc Daniels, 2001). Related to this, chemotherapy drugs are classified into 4 emetogenic levels, which are high (> 90%), medium (30% – <90%), low (10% – <30%) and minimal (<10%) (Children's Oncology Group, 2015).

School-age children are the group at risk of experiencing nausea and vomiting. Batson et al. (2016) reveal that school-age children with cancer, who experienced nausea and vomiting after three months of chemotherapy show 24% increase in anxiety level and 28% in depression rate which results in emotional behavior changes, and nutritional disorders. This condition can interfere with the primary task of school children, namely fulfilling adequate nutritional needs, carrying out school functions and playing (Wong, Hockenberry, & David, 2011).

Nutrition is a top priority in the growth period of school-age children as at this age children need sufficient energy to think and move according to their developmental tasks (Ball, Bindler, & Cowen, 2012). Also, a study conducted by Nurhidayah, Hendrawati, Mediani, and Adistie (2016) found that 53.3% of school-age cancer patients had a poor quality of life with the lowest score on school functions due to chemotherapy-induced nausea and vomiting. The impact of nausea and vomiting on school function results in children often skip school, get quickly tired when attending lessons and have difficulty to concentrate while studying. The playing function impairment in school children may be caused by fatigue due to chemotherapy-induced nausea and vomiting.

The management of nausea can be performed by pharmacological and non-pharmacological therapy while the non-pharmacological management can be performed on pediatric patients as adjuvant therapy both in hospitals and at home as palliative care to improve quality of life. According to Suardi (2011), the use of complementary therapy can divert a person's uncomfortable perception so that a balance between body, mind, and spirit is expected to reduce the stress he/she faces. Nurses, as health workers can perform complementary traditional health services which are empirically beneficial and safe, as is stated in the Government Regulation of the Republic of Indonesia No. 103 the Year 2014, article 30 paragraph 2.

Some types of complementary therapy that can be executed in pediatric cancer patients are music therapy, food supplements

(herbal), aromatherapy, imaginary guidance and massage therapy (Ball et al., 2012). Massage therapy in the form of applying pressure to specific points has advantages over other treatments in reducing chemotherapy-induced nausea and vomiting in children can be performed in a caring room, is non-toxic, free of charge, harmless and does not use any media.

Acupressure uses fingertip pressure. The pressure is applied using the fingertips, beginning with mild stress then gradually the pressure is increased until a gentle but painless sensation is felt (Rusdiatin & Maulana, 2007). This therapy is derived from an acupuncture therapy based on the concept of ancient China that uses special needles to acupuncture points (Xie Wei) (Jie, 2008). The central principle in acupressure is to balance between yin and yang. In the human body, there is a meridian line (Jing Luo) which is a channel for flowing vital energy (Qi) and blood (Xue) and serves to connect Zhang Fu organs that are associated with four limbs (Sukanta, 2008). The choice of acupressure as a complementary therapy is safe and effective which can minimize the side effects of nausea and vomit with the pharmacological treatment provided (Hosseini, Tirgari, Forouzi, & Jahani, 2016). One of the acupressure points to reduce chemotherapy-induced nausea and vomiting is the Nei Guan point. A study conducted by Shen & Yang (2016) state that Nei Guan acupressure therapy can significantly increase energy on the meridian line by reducing severe vomiting nausea in cancer patients receiving chemotherapy. This acupressure point is easier to use in pediatric patients than other positions because the location of the pressure point is accessible, easy to learn, non-invasive and recommended for the recovery of the digestive tract (Miao et al., 2017).

Based on the previous explanation, the inference is that Nei Guan point acupressure can be performed quickly, effectively, and is well tolerated in pediatric cancer patients as adjuvant therapy. Acupressure is non-invasive, so it is not painful and is a touch therapy. The difference with the above research is that the study would be carried out by considering highly emetogenic chemotherapy and specific nausea and vomiting instruments to pediatric patients. This study aimed to determine the effect of Nei Guan acupressure point as adjuvant therapy for highly emetogenic chemotherapy-induced nausea and vomiting in school-age children with cancer.

Method

This research was a quantitative study with a quasi-experimental research design using a single-blind approach to pre-post test design study. The study was conducted at the Kenanga 2 Room, Dr. Hasan Sadikin Hospital Bandung in August-September 2017. This study obtained approval from the Health Research Ethics Committee of Universitas Padjadjaran with number LB.04.01/A05/EC/204/VII/2017.

The study subjects were obtained in parallel based on a randomized allocation list (randomization table) that was made without the knowledge of the researcher and was only known by the coordinator rater as the study was single blind. The selection of study subjects was through consecutive sampling technique based on specific criteria until the minimum number of study subjects was fulfilled. Inclusion criteria for the study subjects used in this study included obtaining highly emetogenic pharmacology, platelets > 50,000 / mm3, obtaining intra-vena or intrathecal chemotherapy.

The number of the study sample was 30 people obtained from the results of calculation of the average hypothesis test of two populations. The study sample was school-age children (6–12 years) who received highly emetogenic chemotherapy. The sample was divided into two groups, namely the control and intervention group as many as 15 people respectively. The control group received standard pharmacological therapy in the form of anti-emetic administration, while the intervention group received standard pharmacological treatment in the form of anti-emetic and intervention of Nei Guan acupressure as adjuvant therapy. Nei Guan acupressure is performed for two days and given three times a day, 30 minutes before chemotherapy, before breakfast and before dinner. Five raters (research assistants) who were previously trained, assisted in the

acupressure treatment and data collection.

The measuring instrument used in this study is the Pediatric Nausea Assessment Tools (PeNAT) made by L. Lee Dupuis, M.Sc., Phm., FCSHP. The researcher has received permission to use the instrument and change the language, so the researcher conducted a back translation, content validity and reliability test with the Interclass Correlation Coefficient (ICC) test to 5 raters using media hand out and video. The content validity test was carried out by two experts, namely child nursing and palliative care experts. The result of the test obtained a value of 0.75 after using the Gregory formula, so it indicated that the instrument had a high validity value. The reliability test was carried out on ten pediatric patients with cancer whose results were obtained with a kappa value of 0.866 which indicated that the degree of conformity among the five raters had high stability.

Measurement of nausea value was carried out three times, namely 1 hour after chemotherapy (P1), after waking up the second day (P2) and before going to bed the second day (P3). Measurement of vomiting interval in both groups was carried out on the first day of chemotherapy until the second day. After the respondent parents' submitted the informed consent, the researcher explained about recording the time of vomiting/nearly vomiting for two days. Vomiting intervals were recorded in the sheet provided by the researcher. Parents wrote down the time each child experienced vomiting or almost vomited.

The numerical comparative hypothesis test in pairs for the measurement of nausea values P1, P2 and P3 in each group used the Friedman test because measurements were performed more than twice and were not normally distributed. The numerical comparative hypothesis test between the control and intervention group in the nausea scale measurement P1, P2 and P3 used the Mann Whitney test because it was not normally distributed. The analysis was also used to determine the difference in mean of vomiting interval between the control and intervention group calculated in minutes. The measurement of an unpaired numerical comparative hypothesis test for the difference in vomiting interval used unpaired t-test because it was normally distributed.

Result

Table 1 Frequency Distribution Based on Characteristics of Respondents in Control and Intervention Group (n = 30) at Dr. Hasan Sadikin Hospital Bandung

Variable	Total	%	Group	
			Control (n=15	Intervention (n=15)
Sex				
Man	17	56.67	9 (60,0)	8 (53,3)
Woman	13	43.33	6 (40,0)	7 (46,7)
Age (years)				
6–8 years	19	63.34		
9–10 years	4	13.33		
11–12 years	7	23.33		
Average				
± SB			8 ± 3	8 ± 2
Range			6–12	6–12
Type of Cancer				
Systemic	11	36.67	4 (26,7)	7 (46,7)
Solid	19	63.33	11(73.3)	7 (46.7)
Experience of Vomiting				

Yes	25	83.33	11(73.3)	14(93.3)
No	5	16.67	4(26.7)	1(6.7)

Table 2 Nausea Value Differences on First (P1), Second (P2) and Third (P3) Measurement in Control Group

Control Group (n=15)	Nausea Value			p[a]-Value
	First Measurement (P1)	Second Measurement (P2)	Third Measurement (P3)	
Median	1,00	1,00	2,00	0,001*
Min.-max. Range	1,00 – 2,00	1,00 – 3,00	1,00 – 4,00	

** Analysis using the Friedman test, significant p≤ 0.05*

Table 3 Nausea Value Differences on First (P1), Second (P2) and Third (P3) Measurement in Intervention Group

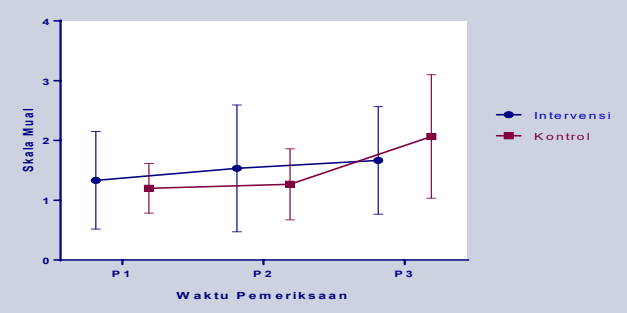
Intervention Group (n=15)	Nausea Value			p[a]-Value
	First Measurement (P1)	Second Measurement (P2)	Third Measurement (P3)	
Median	1.00	1.00	2.00	0.244
Min.-max. Range	1.00 – 4.00	1.00 – 4.00	1.00 – 4.00	

Note: Analysis using the Friedman test, significant p≤ 0.05

Table 4 Nausea Value Differences among P1, P2, and P3 in Control and Intervention Group

Measurement	Control Group (n=15)		Intervention Group (n=15)		p-Value
	Median	Min-Max	Median	Min-Max	
First (P1)	1.00	1.00–2.00	1.00	1.00–4.00	0.967
Second (P2)	1.00	1.00–3.00	1.00	1.00–4.00	0.713
Third (P3)	2.00	1.00–4.00	1.00	1.00–4.00	0.305

Note: Analysis using the Mann Whitney test, significant p≤ 0.05



Graph 1 Differences in mean values of nausea in the control and intervention group

Table 5 Differences in Vomiting Intervals between Control and Intervention Group

Vomiting Interval (Minute)	Group		p-Value
	Control n=11	Intervention n=9	
Median ± SD	289,4 ± 148,4	313,6±187,0	0,751
Range	82,5 – 513,3	84,6 – 724,5	

Note: Analysis using an unpaired t-test, significant p≤ 0.05

The characteristics of the respondents indicated sex was dominated by male (56.67%). The highest age in the two groups was 6–8 years on average (63.34%) (Table 1). Most cancers were solid tumors (63.33%) with the most diagnosed disease, Rhabdomyosarcoma. Most respondents in both groups had previous experiences of nausea and vomiting (83.33%).

The mean of nausea value in the first measurement and the second measurement had the same value (median = 1). The mean value of nausea in the third measurement tended to increase (median = 2). Results of the Friedman test obtained a p-value of 0.001 (p-value ≤0.05) so it can be inferred that in the control group there was a significant difference in the mean value of nausea between P1, P2, and P3 (Table 2).

There was no difference in the mean value of nausea for the three measurements because they had the same value (Median = 1.00). Statistical tests using the Friedman test obtained a p-value of 0.244 (p value> 0.05), so the result showed that in the intervention group there was no significant difference in the mean of nausea value between P1, P2, and P3 in the intervention group (Table 3).

Statistical test results on measurements between the control and intervention group using the Mann Whitney test showed that the first measurement (P1) was 0.967, the second measurement (P2) was 0.713, and the third measurement (P3) was 0.305. The three measurements showed that there were no significant differences marked with a p-value > 0.05 (Table 4).

Furthermore, there was a tendency of rising nausea values in the control group compared to the intervention group (Graph 1). The study results explained it as clinically significant, but statistically insignificant (Dahlan, 2010).

Also, the mean vomiting interval showed that the vomiting interval in the control group was faster (289.4 minutes) compared to the intervention group (313.6 minutes). The results of unpaired t-test showed that the use of acupressure affected vomiting/ almost vomiting after chemotherapy even though it was not statistically significant (p-value> 0.05) (Table 5).

Discussion

Nausea and vomiting are side effects of chemotherapy which are most often felt by pediatric cancer patients. The response of vomiting to chemotherapy can occur after the vomiting center receives chemical stimulation from the emetogenic level. The acute phase of nausea vomiting occurs when chemotherapy and radiation drugs cause serotonin release from enterochromaffin cells in the intestine. Increased serotonin receptors or 5-Hydroxytryptamine type 3 (5HT3) in the central nervous system area, especially in the CTZ area, will cause nausea and vomiting. Vomiting occurs when the CTZ stimulates the vomiting center, and efferent impulses are sent through cranial nerves V, VII, IX, X, XII and spinal nerves to the central area of salivation, abdominal muscles, respiratory center, and nerve center (Rhodes & Mc Daniels, 2001).

Some of the effects of nausea complained by several study subjects were reduced appetite and sleep disorders. Decreased appetite can lead to a risk of nutritional deficiencies. Owen, Hanson, Mc Arthur and Mikhailov (2013) explain, approximately 46% of children and adolescents with cancer are malnourished or at risk of malnutrition. Many of those who lose appetite do not even want to eat at all. Hence, it is often found that hospital food is still left or not touched at all. Besides a decreasing appetite is the impact of chemotherapy side effects, it can also be due to the type of food that is not generally served

like at home, while school-age children need adequate nutritional intake in increasing growth and development according to their age level.

Rahmayanti and Agustin (2015) explain school-age children with cancer who get chemotherapy have poor sleep quality. Nausea can cause sleep disorders which causes discomfort. Discomfort due to nausea from chemotherapy effects can decrease the quality of life of children with cancer as nausea causes fatigue (Sefrina, Nurhaeni, & Hayati, 2014). Fatigue can interfere with the developing tasks of school children whether playing or studying.

Several study subjects felt nauseous complaints a few hours after undergoing highly emetogenic chemotherapy. This is in line with several studies explaining that the peak of nausea and vomiting can occur after 1–2 hours after chemotherapy, but other studies reveal that the height of acute vomiting will reach a maximum of 5–6 hours in the first 24 hours after administration of chemotherapy (Enikmawati, 2016; Rithirangsriroj et al., 2014).

The administration of antiemetic drugs before chemotherapy aims to prevent nausea and vomiting as a result of the highly emetogenic level. Gilmore et al. (2013) explain that without prophylactic antiemetic drugs, the incidence of chemotherapy vomiting is between 30% and <90% in chemotherapy drugs with moderate and high emetogenic levels, so administration of antiemetics should be before chemotherapy. Prevention of nausea and vomiting with antiemetic administration will successfully control nausea and vomiting in the acute phase, namely 0–24 hours after the chemotherapy administration.

The administration of antiemetic therapy in both groups was in the form of ondansetron via intravenous. Ondansetron is one of the types of antiemetic which is antagonistic for serotonin receptors. Katzung, Master, and Trevor (2013) describe serotonin receptor antagonists as potent antiemetics with the mechanism of action of blocking serotonin receptors in the vomiting center and Chemoreceptor Trigger Zone mainly through peripheral serotonin receptor blockade in spinal afferent nerves.

The statistical test results between the two groups showed that the test results were not significant but from the mean values between groups explained that acupressure had the effect of suppressing chemotherapy-related nausea. The results of the mean nausea value showed that the control group tended to increase the mean value of nausea, while the intervention group did not experience an increase (Graph 1).

Acupressure is one of the adjuvant therapies by applying pressure to the skin on the acupoints. The pathological state of nausea and vomiting can occur due to a chronic disease which causes weakness in the stomach (Wei). Applying acupressure can accelerate the circulation of energy (Qi) and blood (Xue) through the flow of meridian lines (Jing Luo), after performing massage stimulations to the appropriate points (Jie, 2008). The acupoint for nausea and vomiting is the Nei Guan point. This point will stimulate the release of alpha beta (αβ) and alpha (α) fibers through sensory receptors. These fibers will interact with the central nervous system which results in endorphogenic cells removing endorphins from the hypothalamus. The increased levels of endorphins in the blood and cerebrospinal fluid will cause a sense of comfort and decrease the impulse of nausea and vomiting in the area of Chemoreceptor Trigger Zone (CTZ) and vomiting center (Dastgir, 1988; Syarif et al., 2011).

Nausea and vomiting felt by people with cancer who get chemotherapy are acute and slow nausea and vomiting. Syarif et al. (2011) explain that patients who receive chemotherapy will experience mild nausea and vomiting on the first day and will increase on the second day. This study contrasted with the explanation because the intervention group which received acupressure in this study did not increase the mean value of nausea on the second day. This result is in line with the study result by Eunice (2012), explaining that the effect of Nei Guan acupressure is noticeable on the second day to the fifth day.

The administration of acupressure and antiemetics has a similar goal, which is to provide comfort by decreasing the value of nausea and vomiting. The mechanism

of decreasing nausea and vomiting in both is different; acupressure is by increasing endorphins and antiemetics by blocking serotonin receptors. The effect of acupressure administration was illustrated in the intervention group with the value of nausea in the first to third measurements did not increase, and the vomiting interval was longer. This showed that the administration of adjuvant therapy along with pharmacological treatment was more influential in decreasing the value of nausea compared to merely pharmacological administration. The inference was that giving acupressure affected suppressing nausea and vomiting due to chemotherapy.

Conclusion

Based on the study results, the majority is male respondents; they have a solid tumor type, and previous nausea and vomiting experiences. Also, the study results show that the control group tends to increase in the mean of nausea and vomiting, and vomiting intervals are faster. The conclusion is, the effect of applying acupressure to emetogenic chemotherapy-induced nausea and vomiting in school-age children with cancer is clinically significant, even though statistically not significant.

There are limitations in this study, namely taking too many raters can affect the depth of acupressure suppression, and the intervention was carried out for two days to obtain data on the trend of nausea due to the administration of highly emetogenic chemotherapy and applying pressure on other acupressure points given singly or combined.

For health services: it expects that the study results may be input for the hospital as a service standard in handling chemotherapy-induced nausea and vomiting, and coordinating with the health promotion section to facilitate the creation of leaflets and videos on Nei Guan acupressure. Giving acupressure can be considered as an option for nurses and patient's parents as adjuvant therapy which is carried out simultaneously with the provision of pharmacological treatment.

For researchers: it expects that the study results can be used as input to carry out further research related to the use of acupressure to reduce chemotherapy-induced nausea and vomiting by considering the homogeneity of cancer types, other age of children, and cycle of chemotherapy. Besides Nei Guan point, further research can be carried out to other points, both singly and in combination.

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