The Effect of Acupressure Point of LI4, PC6, ST25, and ST36 on Increasing the Immunoglobulin and Weight Loss among Toddler

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Article info

Abstract. The eating disorder was a common problem among two-year children. It causes a problem with growth, decreasing immunity, sleep disorder, less aggressiveness, impulsivity, and stunting. The acupressure therapy points of ST36 (Zusanli), CV12 (Zhongwan), SP3 (Taibai), SP6 (San Yinjio), and ST25 (Tianshu) can increase appetite. It was characterized by the rise of immunoglobulin A and weight gain on a toddler. The study aimed to determine the effect of acupressure therapy on Immunoglobulin A(IgA) and weight gain on a toddler. A quasi-experimental, pre-test, and post-test with a non-equivalent control group was applied in this study. A total of 40 samples were recruited using the consecutive sampling, and allocated into the experimental group was 20 samples as well as 20 samples in the control group. Data analyses used were Paired Sample T-Test, Wilcoxon Signed Rank Test, Independent Sample T-Test, and Mann Whitney Test. Acupressure therapy has a significant impact on the toddler's body weight. However, acupressure therapy does not affect immunoglobulin A. Health care institutions can apply acupressure therapy as an alternative treatment to overcome poor nutrition or malnutrition in children under five years old. The community can use acupressure therapy as a solution to handle cases of difficulty increasing weight on toddlers since the method is easy, safe, and economical.

Keyword: acupressure point of LI4 PC6 ST25 ST36, Immunoglobulin A(IgA), weight gain, toddler

INTRODUCTION

Rejang Lebong District Health Office (2017) reported from 14,195 toddlers from nutritional status monitoring, eight were identified as severely malnourished or below the red zone, and nine were

identified as malnourished. In 2017 reported that 154 incidences of low birth weight babies (LBW) from 4,570 newborns in the Rejang Lebong Regency. One of the highest percentages was in Sambirejo Health Center, Selupu Rejang Sub-district, from 119 newborns, there were 17 newborns (7.2%) suffered from the low birth weight (1).

Inadequate nutrient intake in children is the consequence of eating disorders. Eating disorders among children are as follows: eating difficulty, diet, sensory eating disorders, picky eater, and psychological behavior to avoid food, rejection syndrome, tactile defense, neophobia, and toddler anorexia (2). A research conducted in New Zealand showed 24% of respondents had children developed eating difficulty at the age of two years, and 18% occurred until the age of four. This had caused disrupted growth and development, decreased immunity, sleeping disorders, impaired balance and coordination, children's aggressive behavior, impulsive, and stunting (3). The causes of eating difficulties are loss of appetite and damaged digestive function. Eating difficulties are characterized by refusing to chew, to swallow, food vomiting, playing with food for a long time, closing the mouth tightly, and refuse to feed (4).

Multivitamins supplementing children for an extended period to deal with eating difficulties can have a negative impact. An alternative method that recently had been developed is acupressure (acupoint). Various scientific studies have shown the benefits of touch and massage therapy on a child's health. Acupressure is a traditional Chinese medicine therapy based on the same principles as acupuncture (5). Acupressure is a non-invasive technique that uses fingers to rub, squeeze, pinch and press on different acupressure points on the body. Acupressure stimulates the acupoints of the body surface to boost energy or Qi. Hence, it can create comfort and positive benefits for health (6). Some scientifically proven acupressure points in increasing toddler's appetite are ST36 (Zusanli), CV12 (Zhongwan), SP3 (Taibai), SP6 (San Yinjio) and ST25 (Tianshu) which located between the left and right navels treated when appetite decreased (7). These meridian points can facilitate blood circulation to the spleen and digestive system through the brain wave mechanism (hypothalamus), which plays a significant role in response to hunger and appetite. Hypothalamus produces *ghrelin*, which has an appetite effect (8).

A recent study has reported massage therapy can improve the health and development of premature and low birth weight babies (7). Infants who received massage therapy experienced weight gain 5 g/day in the experimental group compared to infants in the control group who did not receive daily massage. Other previous research has also found there were body weight gain and sleep length increase in infants aged 1-3 months that massaged for one month. In addition, babies who are often massaged had a lower frequency of illness than babies who were rarely massaged (9). Furthermore, another study found that the average infant weight aged 0 to 3 months before the massage was 4560 gr, while after massage increased to 5,350 gram (an increase of 17.35%) (10).

Several studies have also found that an increase in babies' weight massaged for one month was higher compared to babies who were not massaged (11). The growth of babies' weight is due to the decrease of stress hormones in the babies and lead to drinking breast milk more and consequently increased their body weight. Several studies have shown that massage therapy is beneficial for children because it can promote blood circulation, normalize central nervous system function, and reduce tissue stiffness (12).

OBJECTIVE

This study aimed to determine the effect of acupressure therapy on Immunoglobulin A (IgA) and weight gain among toddlers.

METHOD

This study was a quantitative analytic study with a quasi-experiment approach with a non-equivalent group control (13). Forty samples were selected using a consecutive sampling technique. The experimental group received acupressure therapy at points ST36, ST25, Li4, PC6 (with vegetable oil media to facilitate the process of treatment), and nutritional education. In contrast, patients in the control group only received a nutritional education.

The data was gathered using questionnaires and observations. We analyzed the data by using Paired Sample T-Test, Wilcoxon Signed Rank Test, Independent Sample T-Test, and Mann Whitney Test (14). The study was conducted after approval had been obtained from Komisi Etik Penelitian Kesehatan Fakultas Kedokteran Universitas Jenderal Soedirman Purwokerto Semarang Number 1578/KEPK/IV/2019

RESULTS

The effect of Acupressure on IgA hormone level before and after intervention among the experimental group and control group

Table 1 showed the effect of acupressure on IgA hormone levels. The results showed no significant difference in IgA hormone levels for both the experimental and control groups. The IgA level means the difference in the experimental group is 28.05, and the control group is 11.35 at p-value = 0.490 (p>0.05) indicates there is no significant IgA hormone level difference experimental and control groups. It can be concluded that the combination of giving acupressure therapy and nutritional education does not effectively increase the IgA hormone levels. Based on the Wilcoxon Sign Rank Test results, the following results are obtained characteristics of respondents based on gender, age, and duration of diabetes. The gender characteristics showed that the majority of respondents were female (60%). Age characteristics showed that most respondents were in the age range of 56-65 years (61.4%). The duration of DM that most respondents suffered from DM for 1-5 years (47.1%)

Table 1. Effect of Acupressure on IgA hormone levels

	Group	Average Level of IgA Hormone (μg/ml)	Standard Deviation	Deviation (Δ)	p-value
Pre-test	Experimental	133.25	64.068	26.250	0.144
	Control	107.00	56.768		
Post-test	Experimental	105.20	67.305	13.150	0.626
	Control	118.35	80.005		
deviation (Δ)	Experimental	28.05	72.365	39.400	0.490
	Control	11.35	109.845		

The average of IgA hormone level before and after intervention among the experimental group and the control group

Table 2 shows a series of IgA hormone levels based on the results of the examination of Immunoglobulin A (IgA) through saliva with Enzyme-Linked Immune-Sorbent Assay technique showed the average of IgA hormone level pre and post in both experimental and control group. The experimental group has a different average score of 28.050 with a significance value of 0.108 (p>0.05) indicates there was no significant average difference of IgA hormone level both in pre and post-treatment. In the control group, the average difference

score between pre and post-treatment was 11.350, with a significance value of 0.823 (> 0.05). This indicates there was no significant average difference of IgA hormone levels before and after treatment.

Table 2. The average of IgA hormone level before and after intervention between the experimental group and the control group

Group		The average level of IgA (µg/ml)	Standard Deviation	Deviation (Δ)	p-value
Experimental	Pre-test	133.25	64.068	28.050	0.108
	Post-test	105.20	67.305		
Control	Pre-test	107.00	56.768	11.350	0.823
	Post-test	118.35	80.005		

Graph 1 shows the IgA hormone level variable based on the examination of Immunoglobulin A (IgA) through saliva with the Enzyme-Linked Immune-Sorbent Assay technique that has no significant different changes in the IgA hormone level average before and after treatment.
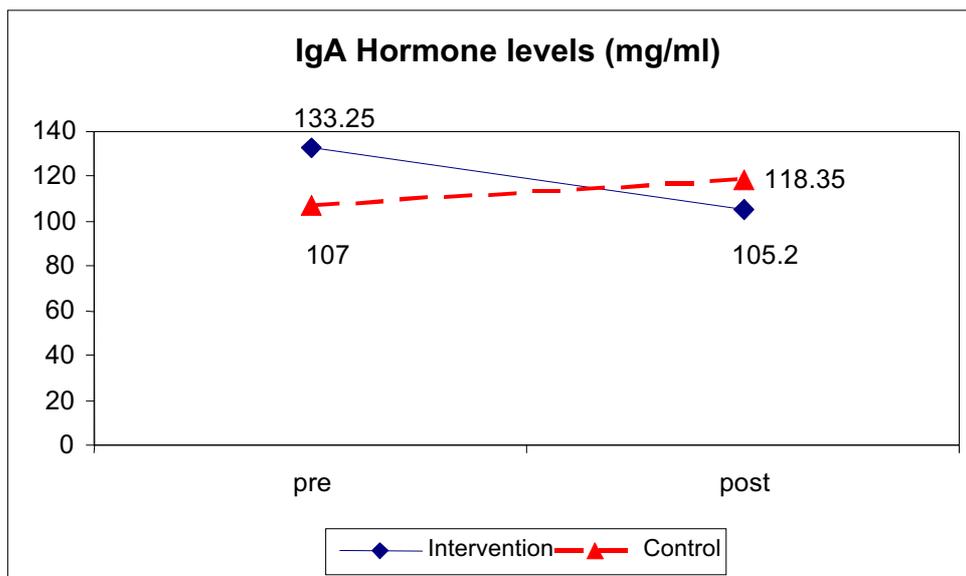
Graph 1 Shows IgA Hormone Level before (pre) and after (post) in the Experimental Group and Control Group.

The weight difference of toddlers between the experimental group and the control group

Table 3 shows the result of a statistical test using the Independent T-test at week 1 to week 3, both groups after treatment had given indicate no significant differences between the experimental and control group. This is proved by the p-value of 0.730, 0.806 and 0.402 (p> 0.05). While at week 4, there is a significant difference between the experimental and control group, this is indicated by p-value 0.024 (p <0.05). It can be concluded that the combination of giving acupressure therapy and nutritional education is more effective in increasing toddler's weight at week 4.

Table 3. The weight difference of toddlers between the experimental group and the control group

Time	Group	Average toddler Bodyweight (Gram)	Standard Deviation	Deviation (Δ)	p-value
Pre	Experimental	12055	1628.197	465	0.494
	Control	12520	2535.142		
Week I	Experimental	12275	1635.744	235	0.730
	Control	12510	2541.218		
Week II	Experimental	12710	1600.625	165	0.806
	Control	12545	2524.506		
Week III	Experimental	13165	1681.251	575	0.402
	Control	12590	2529.177		
Week IV	Experimental	14130	1385.679	1530	0.024*
	Control	12600	2550.748		

The weight difference of toddlers among the experimental group

Table 4 shows the increase in toddler weight in the experimental group every week. The highest toddler weight gain happened in week 4, with an average difference of 2075. Significant value (p-value) difference before treated with acupressure and education up to week 4 was 0.000 ($p<0.05$). It can be concluded there is a significant average weight difference between pre-treated toddlers and post-treated with acupressure and nutritional education to the mother.

Table 4. The weight difference of toddlers among the experimental group

No	Time	Average toddler Bodyweight (Gram)	Standard Deviation	Deviation (Δ)	P-Value
1	Pre	12055	1628.197	220	0.000*
	Week I	12275	1635.744		
2	Week I	12275	1635.744	435	0.000*
	Week II	12710	1600.625		
3	Week II	12710	1600.625	455	0.000*
	Week III	13165	1681.251		
4	Week III	13165	1681.251	965	0.000*
	Week IV	14130	1385.679		
5	Pre	12055	1628.197	2075	0.000*
	Week IV	14130	1385.679		

**The weight difference of toddlers among the control group**

The control group has the highest average body weight change at week 4, with the average body weight of 12,600 grams or an increase of 80 grams from the initial body weight. Significance value (p-value) at week 1 and week 2 is 0.606 and 0.349 (> 0.05). Thus, it can be concluded there is no average body weight difference before and after treatment had given in week I. Whereas, week one and week two p-value was 0.015, and week two and week three p-value was 0.009 ($p <0.05$). Hence, it can be concluded that there is a significant difference between changes in average before and after treatment. However, there was no average body weight difference at week three and week 4 (p = 0.606), meaning that the toddler weight decreased.

Table 5. The weight difference of toddlers among the control group

No	Time	Average toddler Bodyweight (Gram)	Standard Deviation	Deviation (Δ)	p-value
1	Pre	12520	2535.142	10	0.606
	Week I	12510	2541.218		
2	Week I	12510	2541.218	35	0.015*
	Week II	12545	2524.506		
3	Week II	12545	2524.506	45	0.009*
	Week III	12590	2529.177		
4	Week III	12590	2529.177	10	0.606
	Week IV	12600	2550.748		
5	Pre	12520	2535.142	80	0.017*
	Week IV	12600	2550.748		

The weight difference of toddlers before and after receiving the intervention between the experimental group and the control group

In Graph 2., there is a significant increase of toddler body weight in the experimental group before and after treatment. In contrast, in the control group, there was no significant difference in toddler weight gain. Toddler's weight in the group treated with acupressure and education increased sharply compared to toddler's pressure treated with education only.
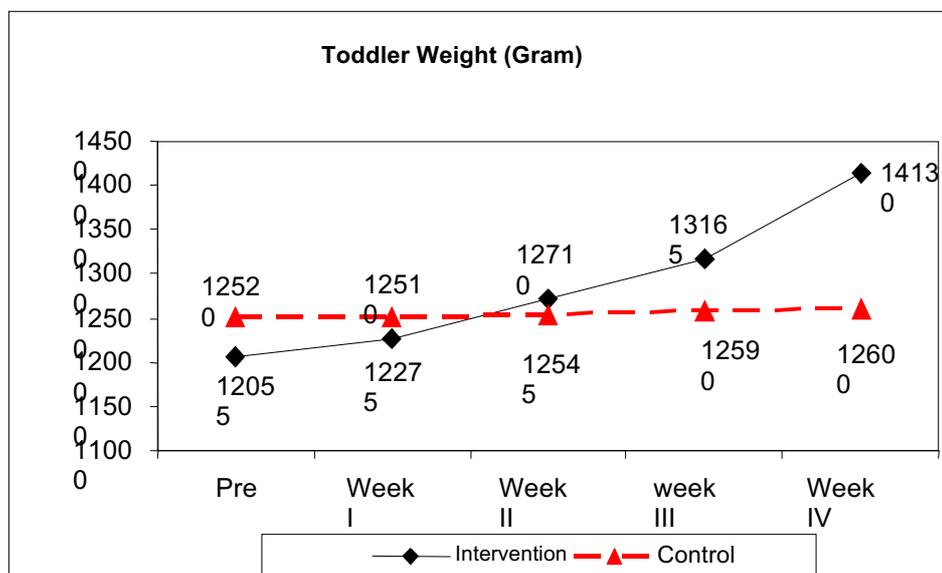
DISCUSSION

The Impact of Acupressure on IgA Hormone Levels

Antibody A (Immunoglobulin A, IgA) is an antibody that plays an essential role in the mucosal immune system. IgA is found in many parts of the body secretions (saliva, mucus, tears, colostrum and breast milk) as Sig A (a secretory form of IgA). It protects the surface of exposed organs by preventing the attachment of bacteria and viruses to mucous membranes. Several factors that influence the level of hormones that play a role in body immunity include eating habits and inadequate food intake, which ultimately affect health and nutritional status

and decrease resistance. In addition, unhealthy lifestyles and environmental conditions also influence the increase of hormone levels, including IgA hormone (15).

The result showed that almost all respondents in the experimental and control group had normal levels of Immunoglobulin A based on laboratory tests on saliva preparations using the ELISA method. In this study, the sampling of saliva for laboratory examination was carried out during the day at around 11.00 WIB (11 a.m. of western Indonesia time area).

Time sampling affects the levels of the IgA hormone in saliva. Lim *et al*. (2018) state the IgA hormone level in the saliva is high in the morning and before noon, while decreases at night. In theory, the sampling time during the day allows for the increase of the respondent's IgA hormone levels, which causes almost all respondents in both the experimental and control groups to have normal IgA hormone (16).

Although the experimental group and the control group in this study both had a normal level of IgA hormone during pre and post-treatment. In the experimental group, there has been a decrease in IgA hormone levels, while the control group has found an increase in IgA hormone levels. This is because, in the experimental group, some children experienced ARI and diarrhea, while the researchers did not find this case in the control group. Based on the theory, Immunoglobulin A (IgA) has a high concentration in mucous membranes, especially in the lining of the respiratory tract and digestive tract and in saliva and tears (17).

The interviews toward mothers with children under five years obtained the description of a child's immune system information, which was indicated by the frequency of the toddler catch a sick every month. Three to five days, until the 4th week of the study, the frequency of toddler catch a sick is reduced to 1-2 times a month. The study was carried out during the rainy season. A toddler is more susceptible to disease, with the help of acupressure in the experimental group making the sick frequency less than before.

The results of this study are in contrast to Rytter *et al.* argues that IgA hormone levels in saliva (saliva) and tears are often reduced in malnourished children. Unlike Rytter *et al*., an article from Egypt reported IgA hormone levels are increased in undernourished children. It is estimated since saliva is generally reduced in malnourished children. The result shows there are no significant average differences before and after treatment both in experimental and control groups. The experimental group shows there is an average decrease of IgA hormone level, with pre and post-treatment difference, was -28 μg / ml. This decreasing number was higher compared to the control group, which is -11.3 μg / ml (18).

The Independent T-test results showed no average difference of IgA hormone level before and after the treatment between the experimental and the control groups. Conversely, Roesli stated the magnitude of the pressure of massage therapy would affect serotonin release. Hence, the capacity of receptor cells that bind adrenaline (glucocorticoid) decrease adrenaline hormone levels. A decrease in adrenal hormones has an impact on increasing the immune system, indicated by the increase in IgM and IgA level. Immunoglobulin A (IgA) is a protein molecule produced by plasma cells functions as an antibody and the first line of defense against various pathogens that enter the body. Immunoglobulin A (IgA), formed by stimulation toward mucous membranes, and plays an essential role in fighting infections in the respiratory, digestive and reproductive tract (15)

Impact of Acupressure on Infant Weight

Respondents of this study were all 2T toddlers in Sambirejo Community Health Center, Sumber Urip Rejang Lebong District. 2T toddler is a toddler who does not gain weight in two consecutive months. The result of this study shows the average body weight in the experimental group was 12.055 grams, which is lighter compared to the average weight control group was 12.520 grams.

Supriasa argues that weight is one of the parameters indicating the body mass. Body mass is susceptible to sudden changes, such as infectious diseases, decreased appetite, or a decrease in the amount of food consumed. Assessment of nutritional status was carried out directly through anthropometric measurements and indirectly through food consumption surveys. Weight is the most crucial anthropometric measure. Weight can also be used to see the rate of physical growth and nutritional status from infants to toddlers (19).

A review on the immune system in children with poor nutrition by Rytter *et al.* concluded that growth failure caused by malnutrition is generally defined by low body weight based on age (underweight), height based on age (stunting), or bodyweight based on height (wasting) (18).

In the experimental group, the average toddler weight difference before and after treatment in 4 weeks shows a marked increase every week. The highest toddler weight increase was at week 4, with an average difference of 2,075 grams with p-value 0.000 (p<0.05). In contrast, in the control group, the significance average difference weight (p<0.005) occurred almost every week except in the 3rd week. This complements the variable results of macronutrient intake, wherein the control group at week three has a decrease in macronutrient intake from 116.45 Mg/ml in week 2 to 94.75 mg/ml week 3. The highest average body weight change occurred at week 4, with average weight difference 80 grams with a p-value 0.017 (p<0.05).

The result shows a comparison between the experimental group and the control group, where the highest average body weight increase found at week 4 with an average difference by 1,530 grams and a significance value of 0.024 (p<0.05). It is shown that the combination of giving acupressure therapy as much as 12 massages (3 massages in 1 week) at ST36, ST25, Li4, and PC6 points as well as providing nutrition education for 15 minutes to the experimental group is effectively increased toddler weight in week 4.

The difference in average toddlers' weight in this study after receiving acupressure therapy affects the activity of the vagus nerve. It was related to food absorption, especially the incorporation of macronutrients in the form of fats, proteins, and carbohydrates. Vagus nerve affects the increase of enzymes level that absorb gastrin and secrete insulin. Consequently, nutrients absorbed optimally and affect toddler weight. This is because the absorption of carbohydrates in the form of monosaccharide influences the energy balance if there is excessive energy or positive energy (energy intake is more significant than energy use), and weight gain occurs. In this study, vagus nerve activity, which is related to food absorption, especially absorption of macronutrients in the form of fat, protein, and carbohydrates optimally found at week 4. It was indicated by an average increase in macronutrient intake of 34% from Nutritional Adequacy Rate (AKG) (20).

The result of this study is in the same vein with research conducted by Irva *et al.* In their study, infant weight difference in the experimental group at pre-test is 4900 grams with a minimum-maximum 3,400-5,800 grams. In contrast, the post-test of the weighted median was 5600 grams with a minimum-maximum 4,200-6,400 grams. In the experimental group, a baby weight increase of 700 grams after massage for two weeks is recorded (21).

Similiarly, Irva (2014) found that infant weight increased higher in the experimental group compared to the control group, with p-value = 0.01. Thus, H_o was rejected, which conclude that massage therapy influences the increase of baby weight.

In addition, another research carried out by Yuliana, Suharto, and Handayani on 3-5-month-old infants found that higher weight increased in routinely massaged babies for four weeks compared to babies not being massaged. This is because of the stress hormones in infants decrease. Consequently, the baby could drink breast milk more and result in increasing the production of breast milk of the mothers and the weight of the babies (22).

Cahyanto also supports this study. He reported 90% of 20 respondents massaged for seven days experienced weight gain. Likewise, Sunarsih's research on 0-3 month infants found the average baby weight in the experimental group before the massage was 4560 grams. The average baby weight after the massage was 5350 grams, highlighting there is body weight increase by 17.35% (23).

Kristanto's research on 20 infants massaged for six weeks, found a significant increase in the baby's body length (a treated group at week 4, control group at week 5), and also a substantial increase in body weight (a treated group at week 5, the control group at week 6 (24). Another study also found that home-based intervention was sufficient to improve the weight among toddlers (25).

LIMITATION

The limitation of this study is the external factors that can influence this research. To assess immunity, a rise in toddler additional time should be added. Besides, climate factors also affect one's immunity, especially toddlers. They are very vulnerable to infections.

CONCLUSION

Before acupressure therapy was given at points, LI4 PC6 ST36 ST25, the level of immunoglobulin A was 133.25 µg / ml, and the toddler body weight was 12055 grams. After acupressure therapy was given at points LI4 PC6 ST36 ST25, the immunoglobulin A level was 105.2 µg / ml, and the toddler body weight was 14130 grams.

Acupressure points at LI4 PC6 ST36 ST25 increased the toddler weight, and acupressure at points LI4 PC6 ST36 ST25 didn't give rise to Immunoglobulin A (IgA)

RECOMMENDATION
a. Regional Government institutions should carry out policy efforts to reduce the incidence of poor nutrition and malnutrition through the application of holistic care services. One of them is by providing acupressure therapy to improve public health in general and toddlers in particular.
b. Health care institutions can apply acupressure therapy as an alternative treatment to overcome poor nutrition or malnutrition in children under five.
c. The community can use acupressure therapy as a solution to handle cases of difficulty in weight gain on toddlers since the method is easy, safe, and economical.
d. Future researchers should make efforts to select acupressure points other than points that have been used and combine with different techniques to give a more in-depth reaction to increasing weight, especially in infants

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